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Fostering the Engagement of Corporate Establishments in the Innovation-Driven Development of Russia's Regions

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Abstract

This paper addresses the need for the innovation-driven development of the Russian economy in reliance on large business and regional innovation-driven development. The authors provide a rationale for the need to develop the national and regional innovation systems and bring to light their strengths and weaknesses based on assessments by experts from around the world; conduct an analysis of innovation activity within the corporate sector, provide a description of the architectonics of innovation activity by corporate establishments amid the impact of global challenges, and stress the need to develop the nation's open innovation model and put together a wide field of communications encompassing small and medium-sized enterprises within the area of presence; conceptualize a cluster approach to boosting regional innovation activity and its feasibility in Russian reality; provide a characterization of the key preconditions for the formation of innovation clusters, their structure, objectives, and principles of operation; conduct a comparative analysis of the major types of clusters as production agglomerations and as network ecosystems and stress the promise of the innovation mechanism of clusters' operation based on the Triple Helix model; provide a description of the top priorities for Russia's cluster policy and touch upon its transformation amid the current complicated geopolitical situation and sanction restrictions; come to the conclusion about the inevitability of Russia becoming one of the world's top innovatively developed economic powerhouses and propose a set of activities aligned with the ideology of the upward-trending development scenario that are aimed at creating the optimum conditions for the engagement of all economic agents in innovation activity and filling the economy with innovation-related content.

Keywords: innovation; cluster; innovation; innovation-driven development; modernization of the economy; corporation

JEL Classification: O10; O14; O31

Introduction

Amid a globalizing economy and the simultaneous occurrence of the processes of intensifying competition among the national economies and their integration, scholars, economists, and politicians are getting increasingly focused on addressing the latest issues in scientific-technical, economic, and social progress and ways to resolve them. Without question, an effective instrument for comprehensive modernization is innovation processes across industry, the financial sphere, and the science-and-education environment. The acceleration of the pace and expansion of the scale of innovation transformations is inevitably leading to the need to give up on outmoded products and technology employed in activity, which may now be regarded as a sort of barrier in the path of the progressive development of human civilization. In a climate like this, it appears to be highly important for all subjects of economic relations to realize the significance of fostering innovation transformations and stepping up their innovation activity.

The purpose of this paper is to analyze the country's national and regional innovation systems and establish the role of corporate establishments in the innovation-driven development of the area of presence, as well as to explore the mechanism underpinning the operation of innovation clusters directly influencing the efficiency of innovation transformations in a climate of Russia's economic instability.

The work owes its relevance to the need to find a way out of a unique situation in which Russia has found itself on the highway to an innovation-driven economy, the cause whereof being the confluence of a set of negative factors of an internal and external nature. Thus, by the late 2014 the Russian economy started to clearly show signs of a slump. Things have only gotten worse since then, with the nation's GDP shrinking 3.7% and the price of the ruble dropping 127% at year-end 2015. Today, Russia is at the height of a severe economic recession. The aggravation of the nation's economic problems has been facilitated by a variety of factors, like dropping oil prices, economic sanctions, as well as a weakened internal market. In a climate of this kind, there is a clear awareness of the need to take urgent measures aimed at creating the conditions necessary to resolve Russia's innovation-based objectives of modernizing the domestic economy in reliance on large business and innovation-driven regional development.

1 Methods

In conducting the study, the authors summarized the major approaches taken by foreign and domestic researchers specializing in corporate management, innovation activity, and regional development. The study relies on the concept of national innovation systems (C. Freeman), the theories of innovation (J. Schumpeter), territorial development (A. Markusen), integration (F. Machlup), competitive advantage (M. Porter), etc. The cluster-based theory of economic development has been explored from the standpoint of the economic schools of M. Porter and P. Krugman. Works by a number of domestic scholars (N.V. Kiseleva, M.P. Merzlova, E.G. Popkova, N.V. Smorodinskaya, A.V. Sharkova, *etc*.) have helped conceptualize the characteristics of Russia's cluster policy and gain an insight into the specificity of the operation and trends in the development of innovation clusters in Russia.

To formalize and summarize the results of this study, the authors employed a set of general scholarly methods of cognition, as well as special methods of empirical cognition, like scientific modeling, analysis of economic-statistical indicators, expert evaluation, *etc*. Theoretical methods were utilized in analyzing the literature, which made it possible to identify some of the problem areas in the innovation-driven development of Russia and its regions.

2. Results

2.1 Relevance of creating the country's national and regional innovation systems

The 21st century, marked by processes of economic globalization taking place amid intensifying competition and, at the same time, integration among the national economies, is vividly attesting to a number of changes taking place in the paradigm of global development. Among the most crucial components of the realities of today's global economy is the shift to a new way of coordinating the operation of subjects of economic activity – from the

market-hierarchical to the cluster-network form of interaction. In a climate of the economic repartition of the world and formation of a global economy (Krugman 2008), as a single planetary network economy, what is becoming the only technology for being able to integrate into the geo-economy is the innovation sphere. This suggestion is predicated on acknowledging that at the hubs of the network economy are large multinational corporations, their branches and groups of companies, which are engaged in dividing the world market. Furthermore, the market for traditional goods is virtually entirely divided among the more technologically advanced nations of the world and it appears to be impossible to get into it. Under today's conditions, creating novel, cutting-edge technologies and products is something that can be done only within the innovation sphere and only companies that can create such products can become real subjects of the global economy. Thus, a top priority on today's agenda is putting together the country's national and regional innovation systems goal-oriented toward the creation of the optimum conditions for the efficient operation of business entities.

The emergence of the concept of national innovation systems (Nelson 1993) has led to innovation activity being construed as a multi-sector process involving the interaction of numerous participants with different interests, competencies, and potential that are continually engaged in the exchange of knowledge and interaction with a view to creating innovations – novel products or technological processes (Schumpeter 1995).

The term 'national innovation system' was first introduced into scholarly discourse by C. Freeman in 1979 (Freeman and Soete 1997). The national innovation system is construed as a network of institutions created within the public and private sectors to help organize activity and interaction on initiating, modifying, and diffusing new technologies. Among the definitions of the national innovation system proposed by Russian scholars of particular note is the one suggested by Ivanova (2010): "The national innovation system is a set of interrelated organizations (establishments) engaged in the production and commercial realization of knowledge and technology within the limits of the national borders... Within the framework of the national innovation system, science is to be viewed not as a closed system isolated by academic institutes, universities, and scientific centers but as an organic element of economic processes taking place within national states, economic sectors, large corporations, and small companies".

The innovation system is to be viewed as a subsystem of the national economy alongside its traditional systems – production, financial, HR, marketing, social, etc. The interaction and mutual fit between all of the above subsystems act as a factor for the success of the entire economic system as a whole. The major objective for the innovation system is to ensure making it efficiently through the entire lifecycle of the innovation process, and there is a set of legal, economic, organizational, and financial measures aimed at achieving it.

A bit later – in the early 1990s – there emerges the concept of regional innovation systems. Among the objective preconditions for its emergence are a sharp intensification of the competitive struggle in the global market and boosts in scientific-technological potential in conjunction with the development of novel instruments for exploring and applying the results in the practice of economic activity. These processes facilitated the accurate identification of issues with traditional models for regional economic development. Concurrently, it is them that stimulated the creation of new clusters in the sphere of high technology at the regional level (Popkova 2013).

Among the major reasons that triggered the exploration of innovation processes at the level of regions are: 1) the possibility of using a set of unique local advantages favorable for the operation of enterprises and/or their divisions that could be set up in the area in a climate of intense global competition; 2) the greater efficiency of the regional level of management in creating a supporting environment, including in developing non-trade relations; 3) the commonality of economic interests and close social-economic ties between subjects of innovation activity within the boundaries of a region may ensure a synergetic effect from their activity (Markusen 1987).

The concept of regional innovation systems was recognized and given wide use in the practice of numerous nations. EU members alone are currently implementing over 150 programs for the development of regional innovation systems. The efficient application of the concept of regional innovation systems as part of economic policy has been exhibited today by many dynamically developing nations, like China, India, and certain Latin American countries.

During the last decade, research into regional innovation systems has been taken up by Russian scholars as well. Thus, for instance, Ivanov (2006) construes the domestic innovation system as a federal-regional economic system the formation whereof involves integrating macro-level innovation systems – created in the nation's regions and expected to ensure the development of relevant territories – into the nation's single innovation hyper-system.

Thus, research into innovation processes – those of creating, assimilating, spreading, and utilizing innovations – has been carried out in today's science in all their complexity and across a variety of dimensions:

- the macro-level – innovation processes and managing them at the level of the country;
- the meso-level – innovation processes and managing them at the level of the region;
- the micro-level – innovation processes and managing them at the level of the enterprise.

The unifying definition from most of the research into the stratification of innovation processes construes the innovation-driven type of development as a purposeful continual process of searching for, preparing, and implementing innovations that would enable the subjects (the country, region, and enterprise) to boost production efficiency and, ultimately, satisfy most of society's needs (Mendell and Ennis 1985). It is the innovation-driven type of development that is conducive to boosts in people's quality of life and competitiveness in all developed countries across the world. Considering innovation's strategic significance to the nation's social-economic development, there is a greater level of state responsibility for fostering innovation entrepreneurship and its investment support and developing promising mechanisms for innovation-driven development (Merzlova and Sharkova 2013).

The efficiency of Russia's national innovation system is emphatically reflected in the dynamics of its ranking indicators in the Global Innovation Index (Table 1).

Table 1. Russia's ranking in the Global Innovation Index

	Global Innovation Index	Innovation Input Sub-Index	Innovation Output Sub-Index	Innovation Efficiency Ratio	State of cluster development	Innovation linkages	Intensity of local competition	University/industry research collaboration
2016	43	44	47	69	101	112	74	67
2015	48	52	49	60	118	118	106	62
2014	49	56	45	49	117	126	60	126
2013	62	-	-	-	108	109	52	109
2012	51	-	-	-	93	118	43	118
2011	56	-	-	-	82	83	37	83

Note. Data from Suslov (2015) and Higher School of Economics (2016).

As is evidenced from Table 1, the weakest aspects of the domestic innovation system are: its state of innovation linkages, state of cluster development, intensity of local competition, innovation efficiency ratio, and university/industry research collaboration. It is worth noting that these indicators constitute a problem field with respect to organizing scientific research to come up with solutions to existing problems acting as barriers in the path of the innovation breakthrough of the Russian economy.

Since the innovation-driven type of development depends on not just the capacity of a country or a region to generate knowledge but also their potential to implement scientific achievements in the economy (Szanto 2005), *i.e.* the capacity of specific enterprises for innovation, much significance is getting attached to exploring the role and interaction of enterprises with different production volumes within innovation systems. It is also worth noting that a standalone regional enterprise representing small or medium-sized business that is engaged in implementing a strategy for innovation-driven development may oftentimes lack the potential necessary to resolve problems and deal with restrictions that may arise under conditions of economic turbulence. A possible

solution to this is to set up an innovation cluster in the region that would rely on corporate establishments, one that is capable of boosting the business activity of the regional business community and, as a consequence, the territory's investment attractiveness.

2.2 State of innovation activity by Russia's corporate sector

The current stage in the development of corporate establishments is demonstrating to the world a process of serious transformations in the business strategies of the largest companies. These changes are due to the corporate sector shifting from the long-entrenched "closed" model for the conduct of research-and-development and experimental-design activity to a new model – the open innovation model, which is based on active interaction with external sources of novel ideas and technology. It is worth noting that the open innovation model may not only ensure the influx of new knowledge and technology into the corporation by way of their direct purchase but may also help effectuate the reverse process – *e.g.*, during the active commercialization of its own technological solutions by the company (through licensing them) or during the process of open exchange of knowledge between economic entities interested in them.

There are a great many scholarly publications on open innovation currently known to us that provide a description of the various forms and practices of active employment of this novel business model, like: strategic alliances/partnerships, joint ventures, and standalone companies based on universities, sub-contracts and outsourcing, technology licensing, and joint use of technological equipment. Among the most common types of open innovation are outsourcing of innovation processes, aimed at moving some of the crucial business functions, including R&D, out of the company with a view to enlisting the services of foreign partners prepared to perform them.

It appears to be worth conducting an analysis into the way global development trends are reflected in the activity of Russian corporate establishments and the way they react to global challenges from a perspective of their innovation activity.

There is a belief that, when it comes to R&D, Russian companies are quite inert and tend to purchase all their technology from foreign partners, without making a personal effort to develop innovative products. Below are some of the findings of a special quantitative research study conducted by a group of Russian researchers (Kuznetsov *et al.* 2011). The study featured 100 domestic companies representing large, small, and medium-sized business and involved a total of 29 expert interviews with members of the senior management of 22 companies. On processing the results, it was found that large businesses evinced a clear interest in research and development, as well as implementation of innovations. A major reason behind the increased interest in innovation activity was a decline in the competitiveness of products turned out.

About 84% of respondent executives of large companies stated that a major objective for the R&D block of a large business is to enhance existing and develop new products (goods and services). A mandatory condition for the active implementation of innovations in enterprises was stated to be the completion of the ongoing modernization process with a view to reducing the technological gaps, minimizing production costs, and bringing the quality of the company's products to relevant competitive levels. Companies characterized by major technological lags may consider as the most preferable form of modernization the purchase of ready-made technology, which may help minimize risk, reduce production costs, and boost competitiveness – but will only enable you to close some of the gap on your competitors without actually moving ahead of them. Victory in the competitive struggle will only be with companies that will be capable of getting into the market totally novel products, achieving major cuts in production costs, achieving significant boosts in labor production, and creating new markets. Such results must be a consequence of the company developing a research and development system of its own.

About 87% of respondent executives of large companies acknowledged that at the present time a top priority for Russia's large business are innovations aimed at enhancing products and technologies that already exist in the market, while 78% voiced the need to create totally new products. It is worth noting that already today many Russian companies are laying down the groundwork for an upcoming innovation breakthrough. Based on the findings of this study, a large portion of production companies operate their own research-and-development

institutions and centers. In the machine-building and metallurgical industries, such centers are in place in 90% of respondent companies and in 85% in the manufacturing industry. A personal R&D center is in place in less than 50% of respondent companies, more specifically – in the fuel-and-energy sector (40%) and in the sphere of commerce and professional services (38%). The opinions of respondents obtained during depth interviews were found to substantiate the trend in question – personal R&D centers are in place in 14 companies out of the 22 surveyed. All the companies exhibited positive dynamics for such centers – there was not a single corporation that had closed down or reduced the work volumes of their R&D divisions during economic crisis periods.

The active formation of corporate R&D centers in companies and the fast pace at which their heft is built are becoming today a major trend in the development of large Russian corporations. It is worth noting that corporate R&D centers do not engage in competition with outside research-and-development centers. On the contrary, apart from performing their own work, these centers perform a really important function of initiating orders for the conduct of research by outside developers. Consequently, corporate R&D centers are not an alternative to the open innovation model – they form an indispensable part of it, playing the role of an interface for interaction. Companies that do not have personal R&D centers can only purchase readymade innovative solutions and are incapable of becoming a competent orderer of novel solutions and carry out custom R&D.

Most respondent corporation executives arrange work related to research and development on the object of interest in accessible form, open to the possibility of engaging in the process competent specialists from partner organizations. Thus, for instance, leading the way as partners to large business are universities and enterprises formed on their basis – engaged in interaction with these are 67% of respondent large companies. Universities are followed by sectoral research-and-development institutes and enterprises representing medium-sized business (56%), which are followed by enterprises representing large business and independent developers (53%). In addition to Russian companies, domestic corporations are known to also enlist the services of foreign partners to conduct R&D. This type of interaction was found to be popular with 78% of respondent companies representing large business, 10% ahead of universities, the most popular Russian partner.

Without question, the process of interaction with outside suppliers of innovative solutions will enrich Russian corporations with positive experience. However, there may also be certain complications and issues to deal with. In this respect, just 2% of companies representing large business stated there were no difficulties of any kind that they faced. Among the rest of the problems, cited among the touchiest issues were developers being unprepared to meet the requirements set by the client company (noted by 51% of respondent companies representing large business) and there being a shortage of outside developers with the required level of qualification prepared for and capable of producing innovative solutions (47%). The causes of this situation, according to representatives of large business, are lack of qualified personnel responsible for interaction with developers (42%) and lack of funding for the generation of innovative solutions by the actual corporation (33%).

Government support aimed at stimulating innovation activity among domestic companies, provided over the last decade, has extended to the sphere of large business as well. However, most members of the senior management of corporations, along with members of the nation's bodies of state authority, have found these measures of support to be lowly effective. The findings of this research study indicate quite an insufficient degree of interaction between Russian large business and development institutions set up by the state. Thus, for instance, less than half of the respondent companies representing large business (48%) are currently interacting, or planning to work, with the Russian Corporation of Nanotechnologies, a government-owned company that is currently among the nation's most popular development institutions. 40% of respondents were found to be interacting with Vnesheconombank (VEB), the rest of the nation's development institutions accounting for 20% – the Russian Venture Company (RVC), 16% – the Russian Bank for Development, and 12% – the Foundation for Facilitating the Development of Smaller Forms of Enterprise in the Scientific-Technical Sphere. The results from the survey of respondents by way of depth interview revealed an even more unsettling picture – none of the respondents admitted to ever having requested any kind of state support or stimulus for innovation. That being said, the respondents brought forward a set of recommendations for the bodies of state authority containing proposals that may be structured into two groups: 1) improving the general conditions of economic activity in the

country and 2) fostering the development of innovations in companies, enhancing technical policy, etc. Those within the 1st group proved the more active respondents – with 28 proposals versus the second group's 13.

A generalized analysis of the study's findings suggests that we may expect boosts in interest in innovation on the part of Russian corporations, which is due to the completion of the mass modernization of production operations, intensifying competition in the national and global markets, and rivalry for investment. What is becoming a top priority for the corporate sector is the formation of personal R&D centers, although there is also the danger of these centers "closing in on" themselves while following the sustainable trend of conducting R&D using internal resources exclusively. To prevent this from happening, it may worth for the founders of R&D centers to plan out, , at the initial stage of formation of corporate innovation systems already, the "open interface" format and put in place relevant communication channels that, going forward, will be used by the company to interact with outside developers. A promising area for developing the domestic sector of applied research on the basis of corporations is creating on their basis sets of innovation clusters based on the open innovation model.

2.3 Cluster-based approach to boosting a region's innovation activity

It has been proven by the world's top technologically developed nations, like the US, Sweden, France, and Germany, that, in light of the current shift in the paradigm of global development (Porter 1987), it is innovation clusters that are expected today to become the most effective form of organizing innovation activity. It is worth noting that there are kindred definitions of this category suggesting the existence of intellectual-innovation and innovation-industrial clusters, while there are certain differences between them, too (Kiseleva 2016). Thus, for instance, an intellectual-innovation cluster implies organizing intellectual cooperation among subjects of innovation activity aimed at minimizing production costs, exchanging productive experience, achieving a synergetic effect from joint activity, and making active use of and building up intellectual capital with a view to boosting the business activity of regional companies.

Innovation-industrial clusters are, normally, created and developed in areas where the nation enjoys technological leadership in production of a certain product – so, consequently, a cluster may be created here to help maintain leadership in an already existing sphere (*e.g.*, clusters across Sweden and Germany).

An innovation cluster is a non-formal association of various organizations, like research centers and universities, industrial enterprises and sole entrepreneurs, bodies of state governance and nonprofit organizations, and appears today to be the most efficient form of achieving a high degree of competitiveness for its participants. The synthesis of scientific-industrial, economic, and social policies cultivated within the framework of innovation clusters is aimed at putting together and maintaining an environment that ensures the production and active use of innovations. The key strategic objective behind the creation of innovation clusters covering as much of the nation's territory as possible is to boost the competitiveness of the present-day domestic economy. Note that the success of achieving this goal may depend on not just creating and implementing knowledge with a view to attaining an effect in the form of achievements in the area of inventions – a major role in this process is played by organizational transformations intended to ensure the commercialization of innovative results and scientific-technical solutions.

The basic premises underlying the formation of innovation clusters (Smorodinskaya 2015) include the following:

- most clusters are created in the high-tech sector – this is due to the fact that this is the only sphere where it is possible to create novel products and technologies, conducive to the creation of new markets and new companies;
- most clusters are created based on the Triple Helix model, with interaction among participants within the "government – business – university" triad undergoing modification and new platforms getting created for the conduct of scientific-technological research based on the consolidation of the resource base of science-and-education organizations and business and comprehensive government support;
- interaction within the cluster ought to be organized based on collaboration and the relationship contract (horizontally);

- the cluster's network nature implies that its participants can interact using information-communication technology both in a traditional way – by being territorially/regionally sited – and via the Internet;
- the creation of cross-network cluster establishments amid integration processes taking place in the global economy;
- the possibility of building a model for interaction in the cluster based on the principles of public-private partnerships, which, in turn, begets a totally new corporate establishment.

An innovation cluster may incorporate:

- industrial enterprises specializing in one particular field or forming part of an integrated establishment, oriented toward innovation-driven development;
- organizations that make up the cluster's business entourage (consulting and engineering firms, educational institutions of higher learning, business incubators, technoparks and technopolises);
- organizations interacting with cluster participants by way of outsourcing or franchising;
- bodies of state authority and municipal institutions that have established ties with enterprises within the cluster;
- financial establishments acting as sources of funding.

An analysis of the structure of clusters as *production agglomerations reveals two of their distinctive attributes, which are as follows.* Clusters are (1) special multi-sectoral establishments incorporating newly-formed groups of interconnected industries – new production sectors and, at the same time, (2) dynamic glocal establishments wherein there takes place the circulation and intertwinement of local and global flows of resources (Figure 1).

Figure 1. Clusters' glocal nature

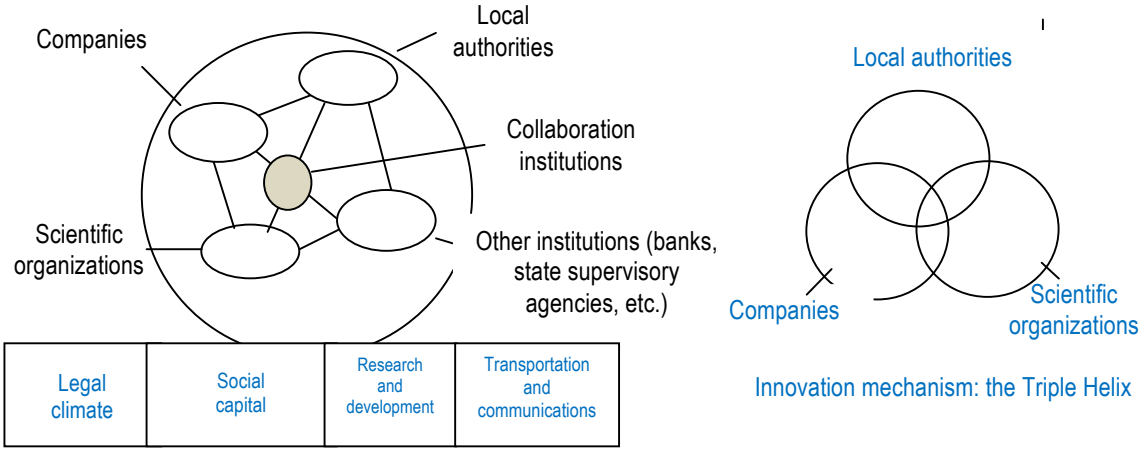
	Local level	**Global level**
Financial capital and factors of production		Components Equipment Patents Technology
Human capital	Foreign specialists Qualified personnel Scientific personnel	
Social capital	Collaboration institutions Network linkages	

This combination enables clusters to structure globalized economic space with quite some success – there is a greater concentration of present-day production in global value chains, which horizontally permeate production sectors and various countries, while acting as localization hubs for these chains are highly-specialized clusters distributed territorially across various geographic areas.

Territories with newly-formed cluster networks continually witness the deepening of specialization with the focus on new, more sophisticated types of activity. As a consequence, both the territory and investors coming into the region stand to reap mutual gains: the territory gains a unique specialization and special investment attractiveness for global investors, while investors gain certain competitive advantages, as entering a cluster and engaging in the process of glocal resource circulation facilitates a flexible combination of sources of development and boosts in the pace of upgrades. Evidence from practice indicates that, in planning the deployment of resources and business processes in specialized clusters in various spots around the world, international companies try to pick for each functional objective a cluster that will be most efficient in resolving it.

Another type of clusters is *network ecosystems, which encompass quite a wide* network of independent, yet inter-supportive, agents with different specialties (sectoral, functional, and institutional), whose lineup and roles may be determined by the nation's characteristics, as well as the stage of the cluster's lifecycle. A distinctive characteristic of this type of clusters is the presence of collaboration institutions coordinating the activity of agents via network platforms (Figure 2).

Figure 2. Clusters as a network ecosystem.



Of critical significance to creating a mature cluster and getting it to achieve innovative results is collaboration among agents representing the 3 major institutional sectors – the government, business, and scientific organizations (universities), which involves interactive cooperation and drawing together among their functional spheres engaged in the process of co-evolution, which, in the end, ensures the cluster dynamic self-development. This mechanism is known as the *Triple Helix model* (Etzkowitz and Leydesdorff 2000), whereby the functional concatenation of the institutional sectors ensures the coordination of their interests and becomes a universal institutional matrix for innovation-driven growth.

It is worth noting that, regardless of the type of establishment, integrating into an innovation cluster does not lead to a spontaneous chaotic concentration of various technological inventions – there forms a strictly oriented and ordered system of diffusion and translocation of new knowledge, technologies, and innovations. It is the making of a network of sustainable ties within the cluster's boundaries that ought to be regarded as the necessary and crucial condition for being able to efficiently turn inventions into innovations with a view to gaining indisputable advantage in the competitive struggle. The generation of ideas and production of innovations occurs across virtually all areas of the cluster's operation, involving technology, goods and services, marketing, and organization of work. In addition, a clear advantage that is provided by the network structure of innovation clusters is simplified access to monetary resources, knowledge and technology, and new information on the market situation and the expectations of product consumers.

There is a totally new objective that gets resolved in putting together an innovation cluster – to form, based on existing breakthrough areas of research, a new market and, consequently, put together an establishment that would ensure its operation. In this situation, the cluster is regarded as a technology for entering the global economy with a view to structurally reforming the national economy itself and developing it going forward. The cluster drives changes to approaches to putting together industrial policy, requiring that totally different information be used to make macro-economic decisions – not across sectors but across markets and companies, which, in turn, may help improve the work of supplier companies, innovation organizations engaged in adjacent research, banks, engineering companies, etc. These processes may set the stage for the structural rebuilding of the national economy and its sectors (Popkova 2013).

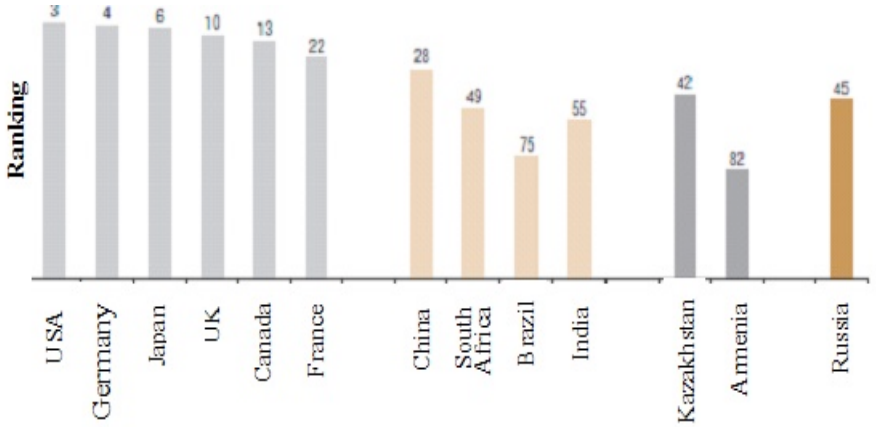
Relations within an innovation cluster are built based on the following principles: freedom to enter and exit the cluster; openness and transparency; proportionality; equilibrium; freedom of contract; cooperation and collaboration. Implementing project strategy as part of the first stage in putting together an innovation cluster requires properly establishing the cluster participant lineup and organizing the corporate management system. Achieving a successful transition to process strategy – the second stage in creating a cluster – requires establishing sustainable linkages between cluster participants. This needs to be done in order to determine – during the subsequent development of the cluster – all relevant business processes via the creation of a sort of map of cluster linkages featuring their confluences and starting and ending points. The coordination function in the cluster is performed by the Cluster Coordination Center, which is formed of members of innovation organizations, making up the cluster's core, the process engaging members of science-and-education centers, business establishments, and members of authorities (*e.g.*, the Ministry for Science and Technology - formerly the State Committee on Science and Technology). The major objective for the Coordination Center is to select projects by way of screening and put together systemic projects within the framework of research being conducted at the moment.

2.4. Top priorities for Russia's cluster policy

By the 2010s, clusterization was practiced by about half of the world's top economies, with over 100 countries and regions engaged, to one degree or another, in implementing cluster policy (Bortnik *et al.* 2015). The degree of successfulness of the implementation of these transformations may be judged by a nation's ranking in the Global Competitiveness Index (Figure 3), which since 2008 has been compiled using an assessment methodology developed by Porter (2011).

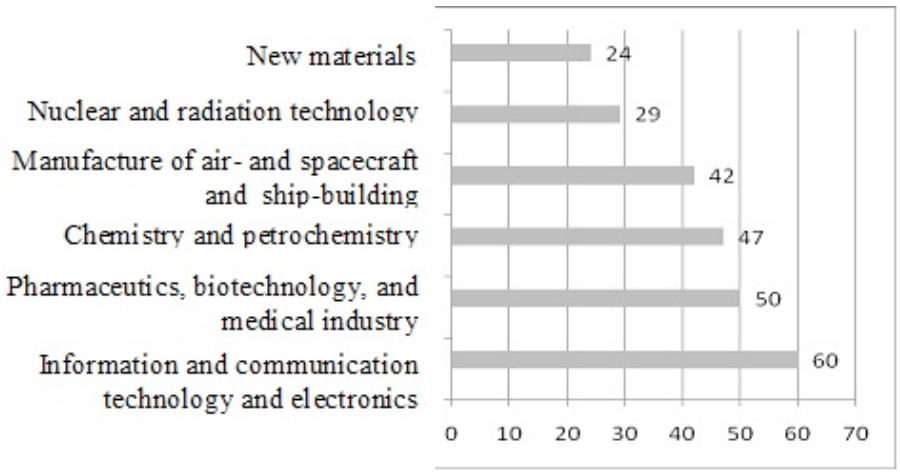
Russia entered the group of nations implementing cluster policy in 2012. A basis for this was the government's so-called 'Roster of Pilot Programs for the Development of Innovation Territorial Clusters', centered around the idea of selecting a number of promising projects on a competitive basis. As a result, a total of 25 cluster projects with high scientific-technical potential were selected. At present, most of these projects are implemented in the territory of science cities, closed administrative-territorial units and technology implementation areas called 'innovation enclaves', which enjoy special preferences (Gokhberg and Shadrin 2015).

Figure 3. Ranking of certain nations in the Global Competitiveness Index, 2015–2016 (World Economic Forum: The Global Competitiveness Index 2015–2016, 2015).



An analysis of the sectoral presence of official participants in innovation territorial clusters indicates that most of them are from the sphere of information and communication technology and electronics and the pharmaceutical, biotechnological, and medical industries (Figure 4). This may be due to the active development of innovation-driven small and medium-sized entrepreneurship, leading to growth in the overall number of companies.

Figure 4. Average number of official participants in pilot innovation territorial clusters across Russia's sectors (ea.) (Kutsenko 2015)



The Russian government has plans to provide innovation clusters with extensive support via subsidies, state programs, development institutions, and additional concessions. To be specific, over the period 2013–2017 as much as 25 billion rubles worth of federal subsidies will have been extended to 14 out of 25 cluster projects. Support for the rest 11 cluster projects will be provided at the first stage through participation in the implementation of federal targeted programs and interaction with development institutions and state-run companies. Subsidies are provided toward a specific cluster project upon request from the Cluster Coordination Center, with the costs getting reimbursed by way of co-financing: 33% – central authorities, 14% – RF constituents, and 53% – participants (Merzlova and Sharkova 2013).

What makes the issue fundamental is that the efficient operation of cluster networks is impossible within a business environment that is not adequate to their objectives and is characterized by the prevalence of monopolized establishments, lack of horizontal relationships, and maximum social disintegration. In the institutional aspect, the Russian economy has yet to attain maturity in terms of its market system, which continues to be dominated by the state over science and business and where the Triple Helix model is just starting to gain a foothold (Popkova 2013). In this situation, the development of innovation processes and processes of diversification is becoming problematic, with the conditions of catch-up industrialization making it extremely hard to implement cluster projects aimed at the making of an innovation-driven economy (Kiseleva 2016).

It is worth acknowledging that domestic cluster programs are grounded in the logic of industrial growth and linear innovation, which is not very attractive for investors interested in long-term strategy. This suggestion is predicated on the following circumstances:

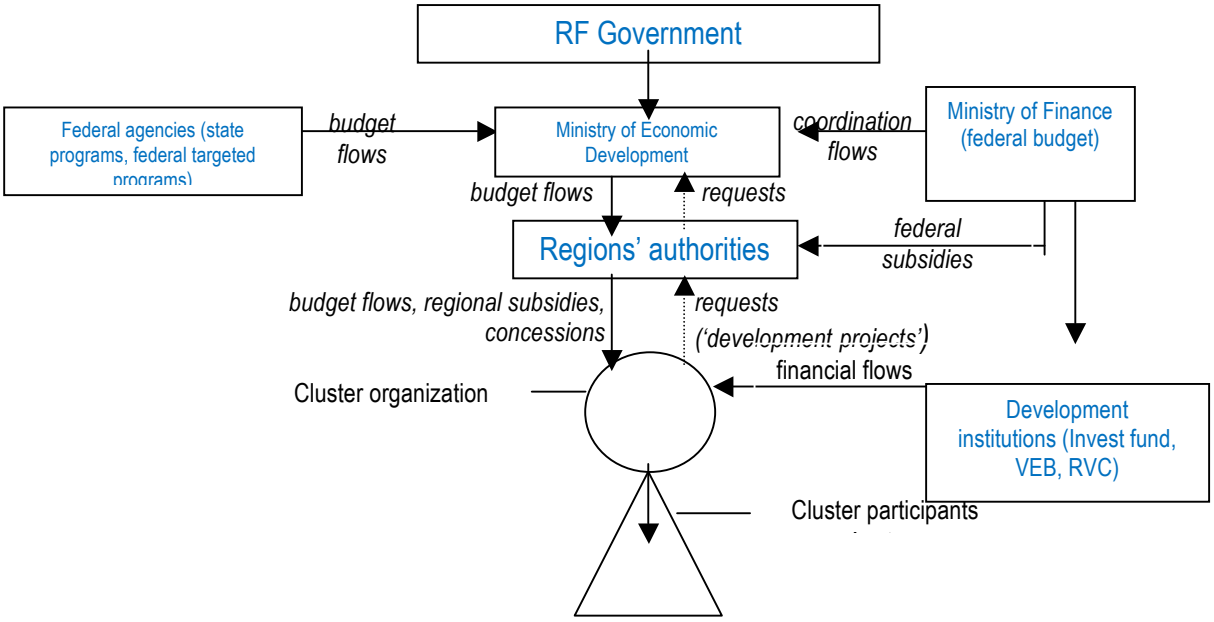
- Russian clusters that have made it through a competitive selection process tend to be created based on decisions made by the central authorities – without undergoing the so-called preliminary "trial by the market", which is mandatory as per the methodology established by M. Porter's school of thought. In addition, most special regimes – like, say, that of closed administrative-territorial units – are little aligned with the principles of open network ecosystems prepared for unconstrained information and knowledge translocations beyond their boundaries;
- there is a possibility that unique network effects from innovation clusters may be replaced with classic agglomerative ones as a consequence of "concentration and cooperation", and unique cluster projects within the Triple Helix model – with production-infrastructural complexes. An effective cluster policy ought to begin with the creation of open social platforms for interactive dialogue between parties interested in innovation transformations, whilst in practice it is only managing cluster organizations that

are created. The issue of establishing and expanding the horizontal communications of participants in innovation processes is often resolved in the aspect of infrastructural development of cluster territories;

- the principle of selectivity of financial support for innovation clusters, which implies the selection of key participants in a cluster, determination of their activity specialization, and establishment of their production plans by government officials, contravenes the principles of present-day cluster policy, its "golden rule" being that the state: should not selectively pick potential cluster participants and pass judgement on what their projects and development priorities must be for them to receive the subsidies; may participate in co-financing a cluster and initiating its creation; ought to support existing and emerging clusters – without any exceptions and without any priority – in all sectors of the economy and ensure accessible statistics at the level of each cluster. Evidence from practice indicates that to assess the outcomes of activity by domestic clusters they use the parameters for economies of scale, as opposed to the methodology of identifying competitive innovation establishments commonly employed in developed countries (Smorodinskaya 2015).

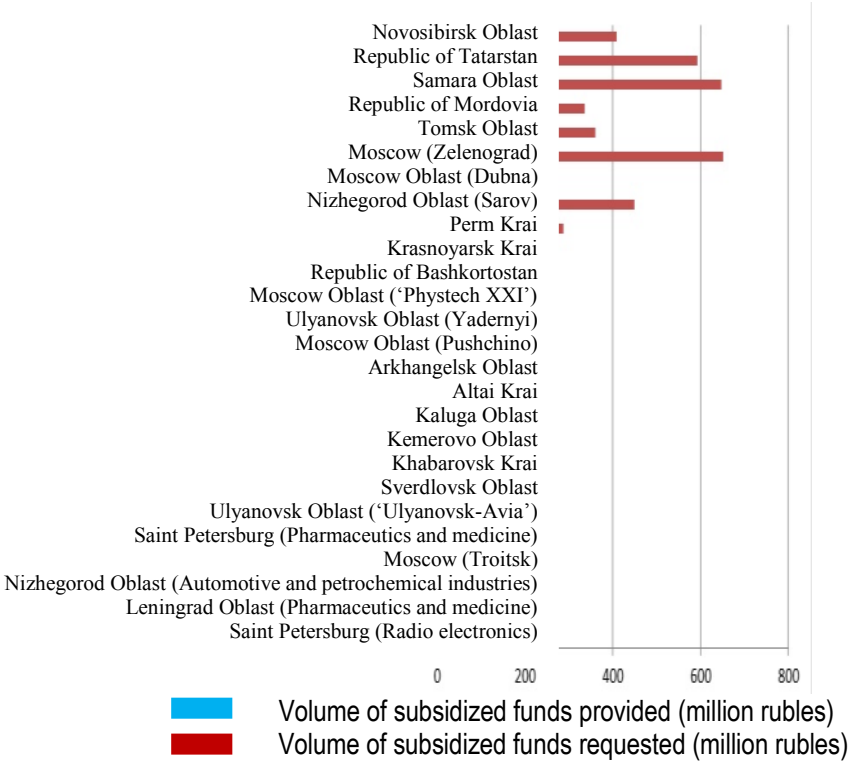
Issues related to getting all barriers in the path of cultivating an environment for the self-generation of cluster networks removed ought to be addressed as a top priority on the agenda of the development of cluster policy. The process of implementation of plans by the Ministry of Economic Development in the area of clusterization of the economy is, unfortunately, demonstrating a sustainable vector in the direction of the formation of a series of inter-agency miniverticals, where the network partnership of the key institutional participants – the state, business, and science – comes down to just the process of co-financing the costs (Figure 5).

Figure 5. Flowchart illustrating Russia's inter-agency minivertical in the implementation of a cluster program (Smorodinskaya 2015)



It is worth noting that, despite the fact that no purposeful assessment of the outcomes of using state funds allocated for the development of regional cluster programs has been conducted, just comparing requests for co-financing put in with the regional authorities' points to a considerable increase in their volume – in 2013 it was 1.9 billion and in 2014 – 5.2 billion rubles (Figure 6).

Figure 6. Volume of federal subsidies requested or planned to be provided to be used for the implementation of activities under regional programs for the development of innovation territorial clusters (Russian Cluster Observatory, 2014).



In 2015, amid a complicated geopolitical – and, as a consequence, economic – situation in the country, cluster policy underwent a certain degree of modification, which brought it more in line with Russian reality. The key idea underlying cluster policy, which is about the development of innovation territorial clusters, has been transformed into the one of creating and developing just territorial clusters as a wide association of enterprises and organizations within the industrial complex, including its hi-tech sectors. The major purpose of territorial clusters, which are retaining innovation clusters within their structure, is to create a closed production chain in a particular industry or a number of industries with the focus on implementing import substitution programs, making up for declines in the import of foreign technology, and minimizing the effects of restrictions imposed by the sanctions.

3. Discussion

This research study into Russia's innovation development is based on the methods of empirical and theoretical cognition. Through their analysis and systematization of economic information and summarization of statistical data, the authors have found it to be possible to substantiate the hypothesis that the success of Russia's innovation-driven economic development depends on the degree to which each of its economic agents realizes their role and their place in the system of economic relations, including innovation territorial clusters, and on their choice of unique path of innovation-driven development adequate to Russian reality. In conducting their theoretical analysis, the authors highlighted a primary objective of the Russian government to be the innovation-driven modernization of absolutely all spheres of activity, involving not just making timely decisions within the production complex but also organizing economic management at a totally different level.

The high credibility of this study's results is predicated on works by scholars as: Porter (1987), Etzkowitz and Leydesdorff (2000), Krugman and Obstfeld (2008) from EU or USA and inland as: Kiseleva *et al.* (2016), Merzlova and Sharkova (2013), Popkova *et al.* (2013), Smorodinskaya (2015). A distinctive characteristic of this

research study is the attempt to view the current issues in the innovation-driven development of Russian regions through the prism of fostering the engagement of large domestic business – corporations – in the process amid restrictions imposed by the sanctions, including technology import constraints and the pressure of external economic conditions. Among the non-alternative objectives aimed at restoring Russia's former capacity for dynamic economic development are searching for new instruments for stimulating innovation activity by business entities (from small to large business), developing a new efficient mechanism for the interaction of the nation's institutional sectors (state – business – science), and ramping up investment activity over the coming years.

Conclusion

Thus, the research study reported in this paper cogently attests to that imparting an innovation-driven nature to the Russian economy requires the large-scale implementation of scientific, technical, and technological innovations, which may be regarded as true attributes of an innovation-driven economy. This requires carrying out a set of measures, including: developing existing and creating novel hi-tech production operations aimed at turning out competitive products; shifting to non-resource-based economic development, including via the creation of hi-tech lines of business; implementing import-substitution programs with support for domestic manufacturers, boosting the efficiency of exports against the backdrop of declining imports, and stimulating increases in internal consumer demand for domestic products; boosting energy and resource efficiency and the efficiency of managing property and fostering the development of infrastructure capable of minimizing transaction costs in all sectors of the economy; creating territorial clusters where it would be possible to implement mega- and infrastructural projects; attracting internal and external investment based on well-reasoned decision-making and implementing efficient investment projects based on the principles of private-public partnerships; creating incentives for the innovation activity of enterprises, reducing the polarization of regions based on the development of the system of strategic management of regions, and boosting the potential of subsidized regions; boosting the sustainability of the financial system, putting together flexible tariff, customs, and tax policies, and fostering budgetary financial support for small and medium-sized business.

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Supply Chain Optimization of Outsourced Blending Technologies

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Abstract

Blending technologies play a significant role in manufacturing, especially in the field of chemistry. The design and operation of these technologies represent a special field of supply chain management because of the significant approach of technological and logistic aspects. The aim of this paper is to present a model framework and a mathematical model of outsourcing possibilities of manufacturing processes applying blending technologies. After a careful literature review, this paper introduces a model framework including purchasing, manufacturing and distribution functions. The proposed mathematical model describes a typical supply chain of blending technology based manufacturing including suppliers, manufacturers, outsourcing possibilities and customers. The optimization problem includes decisions focusing on procurement, supplier selection and outsourcing allocation problems. Numerical results with different datasets demonstrate how the proposed model takes technological and logistic aspects into consideration and the results of the analysis confirm that outsourcing is a valuable cost-cutting tool for blending technologies.

Keywords: outsourcing; blending technology; cost analysis; economical evaluation; manufacturing

JEL Classification: L60; L90; M11; M21

Introduction

The efficient blending of components to meet specifications has been a growing research area in recent years. In short, blending problems can be described as follows: multiple component streams with various parameters enter manufacturing plants using blending technologies where they are assumed to be perfectly blended in some desired proportion to meet the predefined specifications. The goal of this problem is to define the optimal material flow, which can be determined by procurement decisions, supplier selection and outsourcing allocation. Based on the importance of the petrochemical industry, it can be concluded that the research topic is quite relevant. The increasing importance of the petrochemical sector and the intention to find cost-cutting solutions for blending technologies was a motivation for writing this paper. Besides this introduction, the remaining parts of the paper are divided into four sections. Section 1 presents a literature review, which systematically summarizes the research background while section 2 and 3 presents the model framework and the mathematical model of outsourcing possibilities of manufacturing processes applying blending technologies. Section 4 contains the results of numerical analysis. The last section concludes the study with some policy options. Conclusions and future research directions are discussed in the last section.

1. Literature review

Within the frame of this chapter we are focusing on the previous research results to answer the following questions: Who is doing what? Who has done what? Who first did it or published it? What are research gaps? Our used methodology of structured literature review includes four important aspects (Lage and Filho 2010):

- search for articles in databases and other sources, like Scopus, Science Direct, Web of Science;
- reduce the number of articles by reading the abstract and identify the main topic;
- define a methodology to analyse the chosen articles;
- describe the main scientific results and identify the scientific gaps and bottlenecks.

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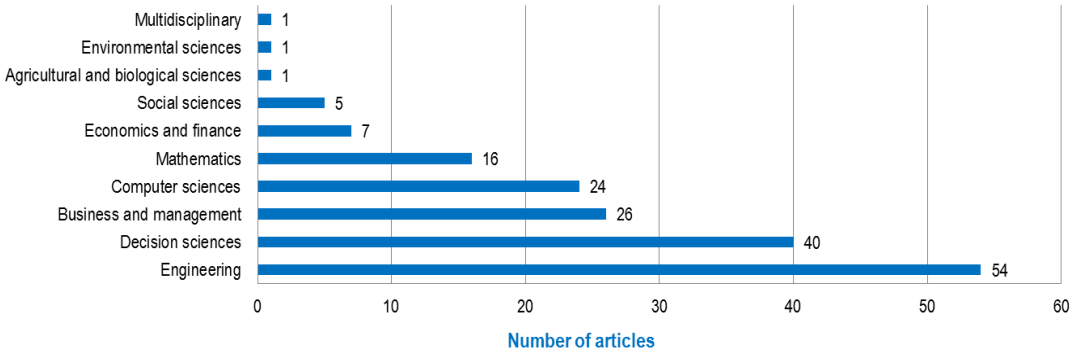
Firstly, the relevant terms were defined. It is a crucial phase of the review, because there are excellent review articles in the field of supply chain management and we didn't want to produce an almost similar review, but we applied the presented methodology (Fiorini and Jabbour 2017). We used the following keywords to search in the Scopus database: "outsourcing" AND "supply chain" AND "optimization". Initially, 176 articles were identified. This list was reduced to 81 articles selecting journal articles only. Our search was conducted in May 2017; therefore, new articles may have been published since then.

The reduced articles can be classified depending on the subject area. Figure 1 shows the classification of these 81 articles considering 10 subject areas. This classification shows the majority of engineering, business and computer sciences.

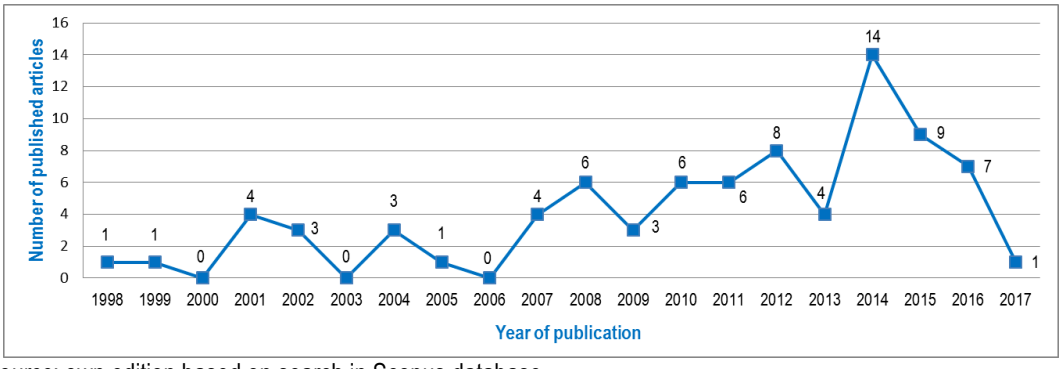
Figure 1. Classification of articles considering subject areas based on search in Scopus database using "outsourcing" AND "supply chain" AND "optimization" keywords.



Source: own edition based on search in Scopus database

As Figure 2 demonstrates, the design and optimization of outsourcing possibilities in supply chain has been researched in the past 20 years. The first article in this field was published in 1998 in the field of management sciences (Chen 1998) and it was focusing on the optimization of batch ordering in a serial multi-stage inventory system. The number of published papers has been increased in the last 4 years; it shows the importance of this research field.

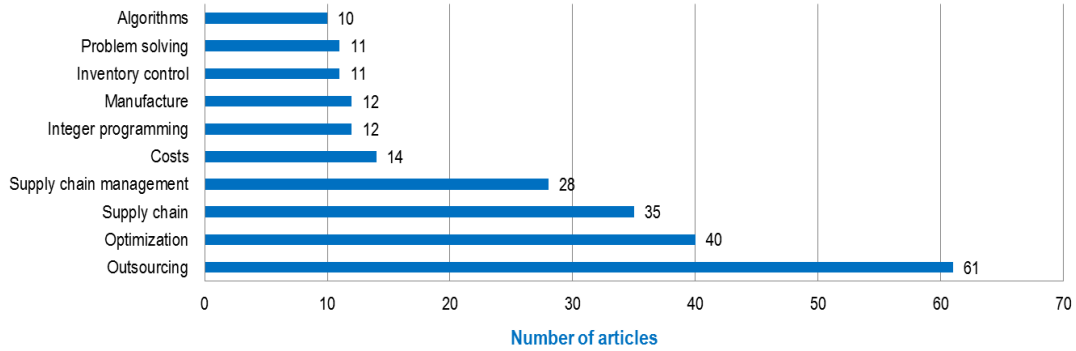
Figure 2. Classification of articles by year of publication



Source: own edition based on search in Scopus database

The distribution of the most frequently used keywords is depicted in Figure 3. As the keywords show, the design of outsourcing in supply chain is based on optimization methods and algorithms to support the economical operation of processes.

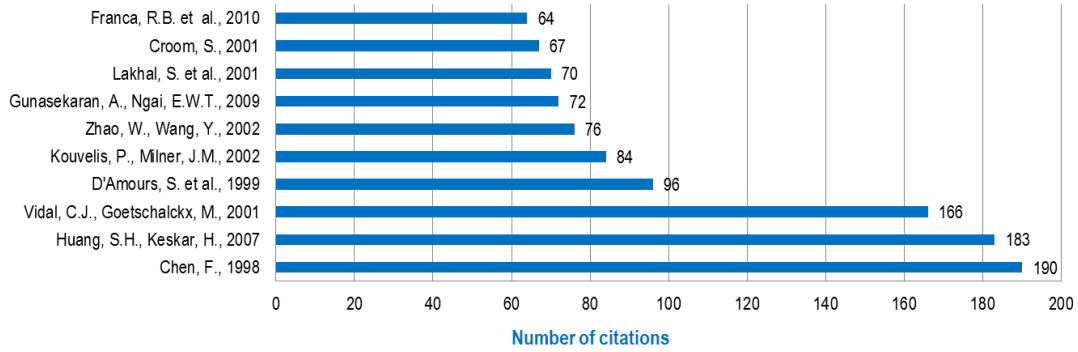
Figure 3. Classification of articles considering the used keywords



Source: own edition based on search in Scopus database

We analyzed the articles from the point of view scientific impact. The most usual form to evaluate articles from the point of view scientific impact is the citation. Figure 4. shows the 10 most cited articles with their number of citations.

Figure 4. The 10 most cited articles based on search in Scopus database



Source: own edition based on search in Scopus database

In the following step, the 81 articles were reduced after reading the abstracts. We excluded articles, which topic did not find our interest and can't be addressed the outsourcing possibilities of blending technologies. After this reduction we got 26 articles. We added 2 other articles selected through separated search (Symonds 1956 and Kumral 2005), so the final list for classification and evaluation from the point of view scientific results includes 28 articles as shown in Table 1.

The mathematical solution of blending problems was described more than 50 years ago as a linear programming problem to calculate the economical refining and blending operations (Symonds 1956). In the last 50 years many recent studies have focused on this problem. However, these studies focus on technology rather than on in-plant material handling, external logistic operation and the outsourcing possibilities of blending technologies. There are research directions, where blending and homogenization problems are solved using quadratic programming. In these cases, multiple production variables are taken into consideration (Kumral 2005).

There are single-echelon and multi-echelon supply chain solutions. However single-echelon supply chain problems exist in manufacturing (Kouvelis and Milner 2002), but multi-echelon solutions has a deep impact both on the production and the service sector (Yang *et al.* 2012). The main research directions in the field of multi-echelon supply chain are the design of inventory strategies (Chen 1998), investigation of the outsourcing risk (Wu *et al.* 2013 and Franca *et al.* 2010) and capacity optimization (Li *et al.* 2014).

The 3rd and 4th party logistics (3PL and 4PL) service providers is an area of research which has seen remarkable growth over the last few years. Researchers investigated the advantages of 3PL solutions focusing on network optimization (Baligil *et al.* 2011) and selection of providers (Wong 2012).

In the last decades, business management and supply chain management practices have been developed, trying to integrate economical and logistic aspects into organizations (Huang and Keskar 2007 and Ruiz-Torres *et al.* 2008). In this context, the principles of business management underlining the importance of financial optimization of supply chain solutions (Vidal and Goetschalckx 2001 and Zhen 2014), the integrated IT solutions of sharing information (D'Amours *et al.* 1999) or the analysis of centralized and decentralized supply chain (Zhao and Wang 2002). The globalization of the economy shows, that industrial enterprises and service companies have to change their organizational structure to fulfil the dramatically changed customers' demands. This led to the increased importance of co-operation and networking. Networking problems are typical in the field of purchasing and distribution (Arabzad *et al.* 2015 and Ivaković *et al.* 2010), where the stochastic optimization (Lin and Yeh 2010) is a new trend to find the best operation strategy for separated or agile supply chain solution (Abbasi *et al.* 2014).

It remains a key challenge for companies to develop strategies for outsourcing of their technological and logistic operations required to fulfil customers' orders. In recent years there have been many studies solving outsourcing allocation problems using decision making methods (Ouhimmou *et al.* 2008), simulation techniques (Caputo *et al.* 2009) and analytical or heuristic optimization algorithms (Wu *et al.* 2012 and Fu *et al.* 2016). Re-engineering possibilities are also focused by researches (Croom 2001) and the closed loop economy and Extended Producer Responsibilities (EPR) shows new directions of supply chain researches (Li *et al.* 2014).

Table 1. Scientific contribution of analysed articles

Article	Short scientific contribution of article
Chen, F. 1998.	Developed efficient algorithms for computing echelon reorder point and installation reorder point in a serial multi-level inventory system.
Huang, S.H., Keskar, H. 2007.	Suggested a business strategy based hierarchical metrics for selection of suppliers to optimize both the firm's business model and its supply chain strategy.
Vidal, C.J., Goetschalckx, M. 2001.	Developed a heuristic algorithm to solve a non-convex problem formulating the after tax optimization problem of a multinational corporation.
D'Amours *et al.* 1999.	Reported the impact of information sharing of a manufacturing network. Characterized the business relationship from the point of view business strategy.
Kouvelis, P., Milner, J.M. 2002.	Suggested single-period and multi-period models to support supply chain capacity and outsourcing decisions.
Zhao, W., Wang, Y. 2002.	Showed the existence of a manufacturer's price schedule to adopt decisions in the decentralized setting to achieve the performance of a centralized supply chain.
Gunasekaran, A., Ngai, E.W.T. 2009.	Review article focused mostly on modeling and analysis of just-in-sequence supply, like make-to-order and build-to-order strategies.
Lakhal, S. *et al.* 2001.	Investigated a heuristic algorithm to optimize the supply chain structure of a conventional manufacturing company with distribution functions.
Franca, R.B. *et al.* 2010.	Suggested a multi-objective stochastic model that uses Six Sigma measures to evaluate financial risks in supply chain.
Croom, S. 2001.	Reported the optimization of purchasing for maintenance, repair and operating supplies through purchase process re-engineering and information channel innovation.
Yang, W. *et al.* 2012.	Proposed optimization algorithm for replenishment polices in the case of single-warehouse multi-retailer systems.
Ouhimmou, M. *et al.* 2008.	Demonstrates a decision making method for furniture supply chain including procurement, inventory, outsourcing and demand allocation policies.
Wu, D. *et al.* 2013.	Investigated the outsourcing risk of multi-level supply chain operations in the case of stochastic parameters.
Wu, J.Z. *et* al. 2012.	Suggested a multi-objective optimization to support outsourcing related decisions, focusing on outsourcing order allocation.
Lin, Y.K., Yeh, C.T. 2010.	Developed an optimal carrier selection method for stochastic logistic networks of global enterprises.

Article	Short scientific contribution of article
Wong, J.T. 2012.	Supposed a combination of multi-objective optimization and expert systems of decision support systems for selection of 3rd party logistics service providers.
Caputo, G. *et al.* 2009.	Proposed a simulation technique for production cost reduction through optimized production plan. Reported the impact of outsourcing possibilities.
Li, X. *et al.* 2014.	Developed optimal contracts to minimize the cost and satisfy the collection constraints prescribed by Extended Producer Responsibilities.
Arabzad, S.M. *et al.* 2015.	Developed an evolutionary algorithm for a new multi-objective location-inventory model in a distribution network with transportation modes and third-party logistics providers.
Baligil, H. *et al.* 2011.	Suggested a multi-level distribution network optimization model for 3rd party logistics service providers.
Ruiz-Torres, A.J. *et al.* 2008	Supposed outsourcing strategies that consider trade-offs between outsourcing cost and average tardiness.
Zhen, L. 2014.	Proposed a three-stage decision making model outsourcing and production decisions in context of global supply chain and tax policies.
Fu, Y., Lai, K.K. *et al.* 2016.	Formulated a robust optimization method to support the selection of the best suppliers and the allocation of outsourcing demands.
Abbasi, M. *et al.* 2014.	Developed an integer linear programming model for optimization of agile supply chain network.
Li, J. *et al.* 2014.	Investigated an optimal decision problem in a single-period, two-stage supply chain with capacity reservation contract.
Ivaković, Č. *et al.* 2010.	Proposed an optimization method of distribution network applying outsourcing possibilities of logistic operations.

Source: own edition based on search in Scopus database

More than 50% of the articles were published in the last 5 years. This result indicates the scientific potential of this research field. The articles that addressed the optimization of supply chain processes are focusing on conventional manufacturing processes (Lakhal *et al.* 2001 and Gunasekaran and Ngai 2009), but none of the articles aimed to identify the optimization aspects of supply chain of blending technologies. Therefore, blending technologies still need more attention and research. It was found that heuristic algorithms are important support tools for design since a wide range of models determines an NP-hard optimization problem. According to that, the main focus of this research is the modelling and analysis of outsourcing possibilities of manufacturing companies using blending technologies, also taking into account the whole supply chain including purchasing, manufacturing and distribution functions of logistics.

The main contribution of this article includes: (1) the model framework of blending technology based supply chain that combines technological and logistic operations and functions; (2) definition of typical supply chain solution including manufacturing based on blending technology; (3) mathematical descriptions of a typical supply chain model with blending technology including suppliers, manufacturers, outsourcing possibilities and customers; (4) computational results of the described model with different datasets.

2. Model framework of blending technology

Within the frame of this session the model framework of the supply chain of blending technologies is described. Closed loop economy includes four logistic functions: purchasing, production or services, distribution and inverse processes. Our model framework focuses on purchasing, manufacturing and distribution functions of this supply chain and description of the different models are based on the following aspects:

- *Type of procurement*: The procurement processes can be divided into two main streams. Non-competitive procurement has only one supplier and this supplier is able to produce and sell all required components for the manufacturer. In the case of multi-source procurement there is a competition among the suppliers. The multi-source procurement has a greater operational cost but it has greater reliability.

- *Component's source*: The required components can be purchased only from one supplier or there are more sources and the manufacturer can choose the best one.
- *Type of supply chain:* There are two diverse ways to operate a supply chain. Components can be supplied directly into the manufacturing plant, while in the case of indirect supply components are transported into a consignment warehouse or a crossdocking facility. Consignment warehouses store consignment inventory, which is in the possession of the user (in our case the manufacturer using blending technology) but is still owned by the supplier. Consignment inventory is not always a good cost cutting problem, because the operation of the warehouse and the management of consignment inventory increases the management costs of the supply chain. Cross-docking facilities are hubs, where components incoming from suppliers can be loaded into outbound vehicles to transport to the manufacturer. Conventional cross-docking facilities usually do not have significant storage capacities although it can improve the quality of logistic services.
- *Blending technology:* There are single-level and multi-level technologies depending on the complexity of the blending technology and the complexity of the final product. Multi-level blending technologies are represented by petrochemical industry.
- *Outsourcing possibilities:* There are an enormous number of reasons to outsource blending or pre-blending technologies: lower operational and labour costs, freeing up internal resources or core competences for more value-added processes, delegate responsibilities and add manufacturing resources to increase the fulfilment rate of orders.
- *Distribution*: Depending on the complexity, number and geographical distribution of customers it is possible to distribute products to the customers directly (through intermediate storages) or indirectly.
- *Customers*: Depending on the blended products buyers can be individual customers or customers' clusters.

As Table 2 demonstrates, it is possible to build a wide range of models depending on the characteristics of the supply chain and technology. This model framework includes the following parts of a traditional supply chain: suppliers, manufacturers, customers and 3rd party logistics suppliers.

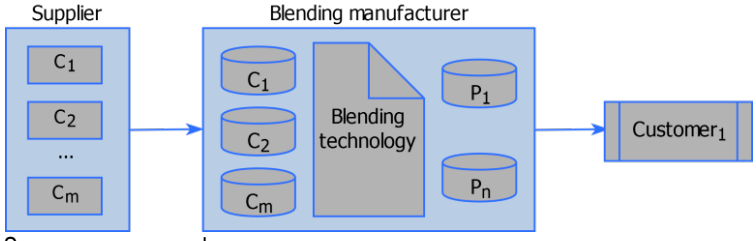
Table 2. Structure of supply chain model of blending technologies

Number of suppliers	Single-source procurement	Multi-source procurement
Component's source	From one supplier	From more suppliers
Supply	Direct supply	Indirect supply through consignment store, cross docking facility or intermediate store
Blending technology	Single-level	Multi-level
Outsourcing	No	Yes: blending and/or pre-blending
Distribution	Direct	Indirect through distribution centre
Customers	Individual customers	Customers' clusters

Source: own research

Model 1: Figure 5 demonstrates the basic model of blending technologies. The required components for final products are purchased from the same supplier, the supply of the manufacturing plant is direct without intermediate store, crossdocking plant or consignment store and the distribution of blended final products is a direct distribution without a distribution centre. This model is valid for binary gas mixture technologies, like helium-oxygen, nitrogen-oxygen or helium-nitrogen-oxygen preparation (Albiou *et al.* 2017). This model can be used for modelling coal blending process of coal-fired power plants, where the decision of optimal coal blending scheme is influenced by carbon emission limitation, pollutants treatment capacity, requirement on quality of coal and volume of required coal to produce energy (Lv *et al.* 2016 and Dai *et al.* 2014).

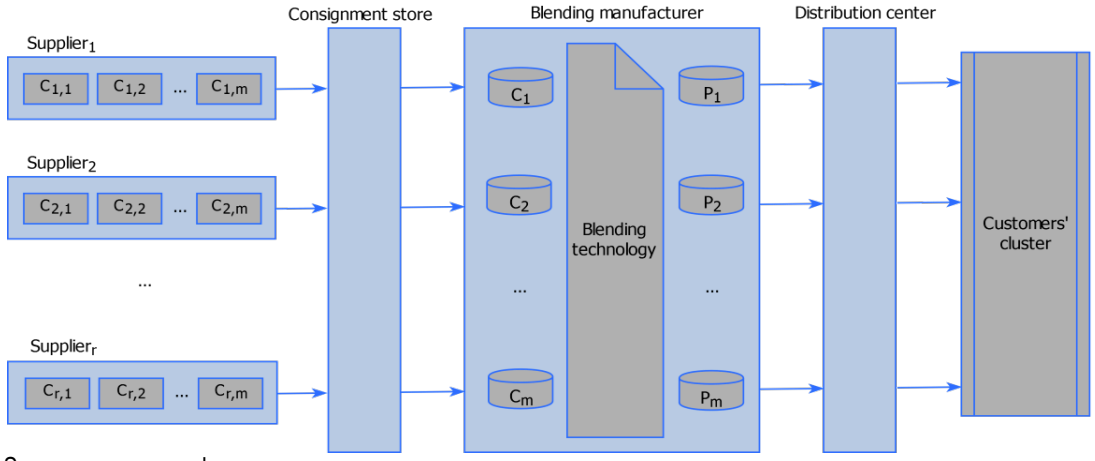
Figure 5. Supply chain of blending technology with multiple suppliers, pre-blending and direct supply



Source: own research

Model 2: Figure 6 demonstrates the single-plant model of blending technologies without outsourcing possibilities and pre-blending technologies. The blending manufacturer is indirectly supplied through a consignment store and the distribution of final products is realised through a distribution centre. This model is valid for blending technologies, where final products are distributed to a wide range of customers or customers' clusters. This model can be used to describe blending problems, like mixing various ingredients to produce food (Winston 1993) or mixing diverse types of used papers to produce recycled papers (Sultan, Lou and Mativenga 2017). This model can be combined with other design aspects of paper recycling supply chain, *e.g.* dynamic land allocation and recycling rate determination to optimize the impact of recycling from the point of view forest area, social net benefit and volume of wood harvested (Tatoutchoup 2016). This is a crucial model, because with the expansion of the Internet e-business solutions many manufacturers using blending technology have chosen to distribute their products through online retail channels (Yu, Cheong and Sun 2017) or use dual-channel supply chain with conventional and online channels (Gao and Su 2017).

Figure 6. Supply chain of blending technology with multiple indirect suppliers and indirect distribution

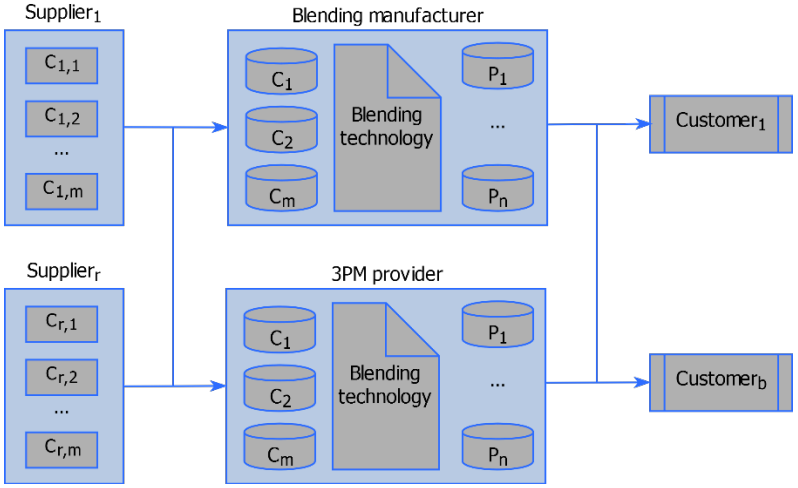


Source: own research

Model 3: Figure 7 demonstrates the basic model of blending technologies using 3rd party manufacturing (3PM) providers outsourcing possibilities to produce customers' demand. The model includes more suppliers and more customers. However, this model includes only the outsourcing possibility of blending technologies, but other business processes can also be outsourced, like warehousing, material handling, payroll management, facility management, quality control. However, drivers of outsourcing are logistics costs and improved service, but limited blending technologies are also important factors from the point of view order fulfilment (Aktas *et al.* 2011). Large capital purchases are required to increase the capacity of the available blending technologies (*e.g.* vertical or ribbon blenders, multi shaft mixers and discharge systems are expensive technologies), therefore outsourcing offers an economical suitable solution to fulfil all orders of customers. Outsourcing decisions must take into

consideration the disadvantages too, like risk of exposing confidential information or synchronisation problems of deliveries.

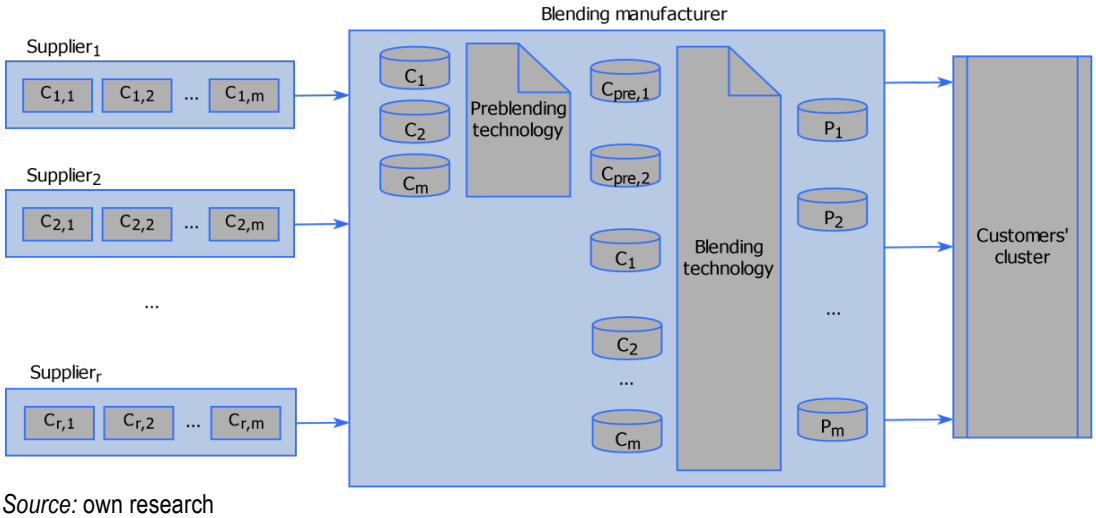
Figure 7. Supply chain of blending technology with outsourced blending and direct supply and distribution



Source: own research

Model 4: Figure 8 demonstrates the supply chain model of blending technology with direct supply and distribution and optional in-sourced pre-blending technology. This model is valid for some refinery processes, but the most typical application area of this model should be the field of wastewater treatment problems, because wastewater treatment is a distributed treatment with multi-level blending technology, where the parameters of blending problems could be the following quality measures: total organic carbon (TOC), total petroleum hydrocarbons (TPH), total suspended solids (TSS), or oil and grease (Bagajewicz 2000). This model makes it possible to describe the allocation and treatment process of wastewater treatment technology, because a wide range of treatment methods, like solar technologies, anaerobic digestion, and aerobic treatment are available to reclaim water (Bustamante and Liao 2017).

Figure 8. Supply chain of blending technology with multiple suppliers, pre-blending and direct supply

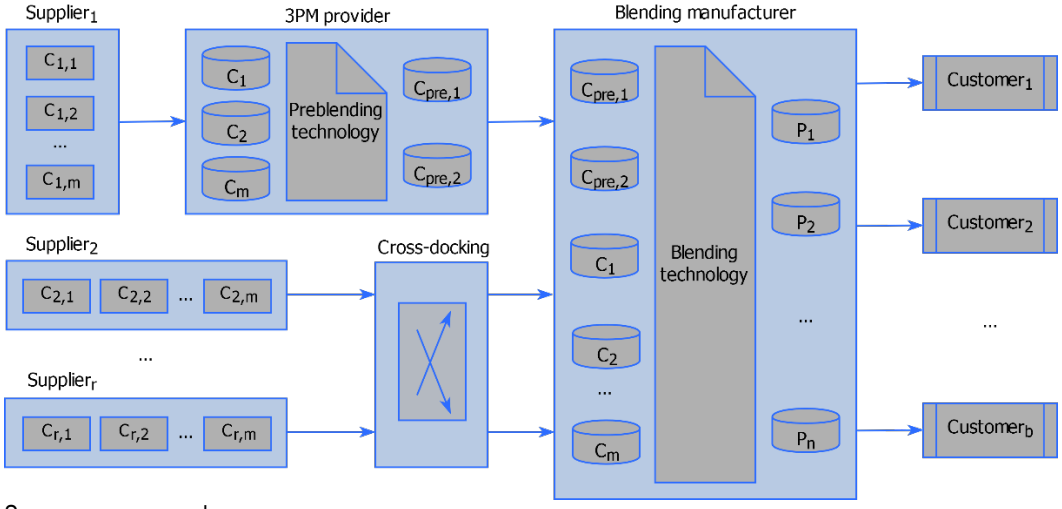


Source: own research

Model 5: Figure 9 demonstrates the supply chain model of a multi-period blending technology with pre-blending option. The supply of components is based on a mixed supply: the components for outsourced pre-

blending are purchased directly from component suppliers, while the main manufacturer feed its blending machines indirectly through crossdocking facilities and the pre-blended components are transported directly from the pre-blending company to the blending manufacturer. The distribution of the final products is a direct distribution to the customers. Typical application field of this model is the multiple liquid stream technology, where liquids with various properties enter supply tanks, then they are fed into blending tanks and then they are fed into demand tanks (Kolodziej *et al.* 2013). This model is valid for fuel management systems and a wide range of optimization problems can be involved into this model, like balancing fuel supply and demand (Fu *et al.* 2017).

Figure 9. Supply chain of blending technology with multiple suppliers, outsourced pre-blending and indirect supply through crossdocking facility



Source: own research

The above described models can be generalised and used for modelling of other supply chain problems including purchasing, manufacturing and distribution functions. Within the frame of the next session the mathematical model of a typical supply chain of blending technology based manufacturing will be proposed.

3. Mathematical model of outsourced blending technology

The chosen model includes r suppliers, m different components for blending technology, one manufacturer and q outsourcing possibilities, n final products and a customers' cluster. The model is shown in Figure 10.

Decision variables: The decision variables define the decisions to be made. In this model the following decisions must be made: (1) how many components must be purchased from which suppliers to blend them in a desired proportion to produce goods in a defined quality; (2) which blending operations must be outsourced to which outsourcing possibilities. With this in mind, we can define the following decision variables:

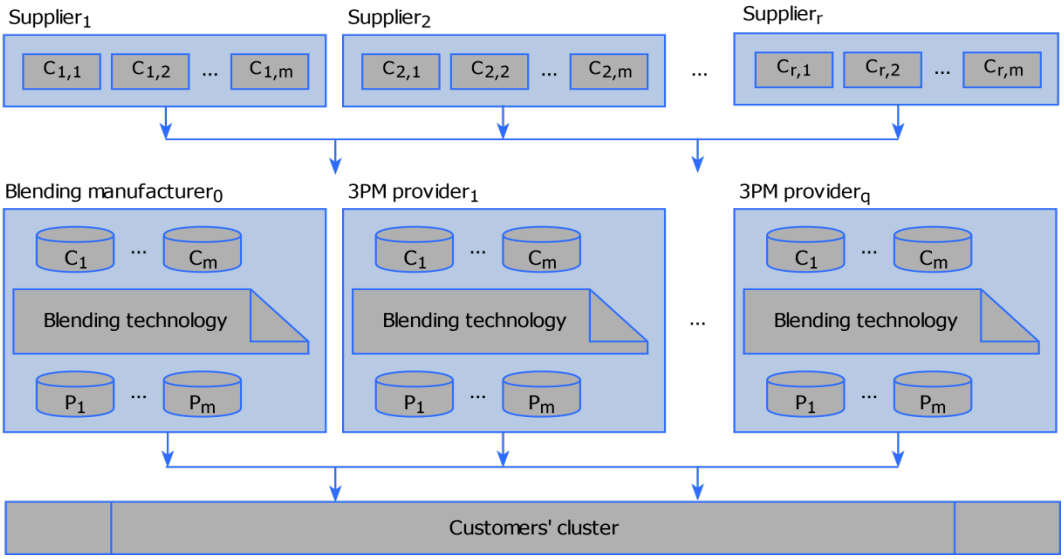
- for the model without outsourcing: $X_{i,j,0,1}$ is the number of the i^{th} purchased components for the j^{th} final product for the manufacturer from the l^{th} supplier;
- for the model with outsourcing possibilities: $X_{i,j,k,1}$ is the number of the i^{th} purchased components for the j^{th} final product for the k^{th} outsourcing manufacturer from the l^{th} supplier.

Objective function: The objective function of the problem describes the minimization of the costs of the operation of supply chain including the followings: price of required components, transportation from the suppliers to the manufacturing plant, warehousing costs in the suppliers, intermediate storages (*e.g.* consignment stores or cross docking facilities) and the manufacturer, packaging, processing at the manufacturer and processing at the outsourced manufacturing plant.

$$\min C = C^{pu} + C^{tr} + C^{wa} + C^{pa} + C^{pro} \quad (1)$$

where C^{pu} is the total purchasing cost; C^{tr} is the total transportation cost of the purchased components; C^{wa} is the total warehousing cost of the required components; C^{pa} is the total packaging cost of the components to be transported to the manufacturing plants and C^{pro} is the processing cost of purchased components to be processed and mixed to produce final products.

Figure 10. Structure of the mathematical model of blending technology with outsourcing possibilities



Source: own research

The purchasing cost depends on the purchasing strategy and includes two major parts: unit cost and overhead cost or order cost. Purchasing cost can be calculated as a straight-forward calculation, where the unit cost of components is multiplied with the required number of components, but discount can also be applied depending on the number of ordered units. The purchasing cost can be obtained as straight-forward calculation in the case of centralised purchasing as follows.

$$C^{pu,1} = \sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{l=1}^{r} c_{i,l}^{pu} x_{i,j,0,l} + \sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=1}^{q}\sum_{l=1}^{r} c_{i,k,l}^{pu*} x_{i,j,k,l} \quad (2)$$

where m is the number of components; n is the number of final products; q is the number of possible manufacturers, where the required blending technology can be outsourced to produce the required amount of final products; r is the number of component suppliers; $c_{i,l}^{pu}$ is the unit purchasing cost of the i^{th} component for the manufacturer from the l^{th} supplier; $c_{i,k,l}^{pu*}$ is the unit purchasing cost of the i^{th} component for the k^{th} outsourcing manufacturer from the l^{th} supplier.

In the case of decentralised purchasing, volume discount can be applied, because the required amount of the manufacturer and the outsourcing manufacturers are purchased in one batch.

$$C^{pu,2} = \sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=0}^{q}\sum_{l=1}^{r} c_{i,l}^{pu,vd}\left(x_{i,l}^{sum}\right) x_{i,j,k,l} c_{i,l}^{pu,vd} \quad (3)$$

where: $c_{i,l}^{pu,vd}$ is the unit cost of the i^{th} component depending on the order quantity (volume discount) and $x_{i,l}^{sum}$ is the total order quantity of the i^{th} component from the l^{th} supplier.

However, there are different factors influencing the transportation cost, like size or capacity of vehicles, distance, speed, energy consumption, required human resource, but they can be classified in two groups: unit costs and overhead cost.

$$C^{tr} = \sum_{l=1}^{r}\sum_{i=1}^{m}\sum_{k=0}^{q}\left(c_{i,l,k}^{tr}\sum_{j=1}^{n} x_{i,j,k,l}\right) \quad (4)$$

where: $c^{tr}_{i,l,k}$ is the specific transportation cost of the i[th] component from the l[th] supplier to the k[th] manufacturing plant.

The warehousing cost covers the inventory holding costs in various stages of the supply chain (Korponai *et al.* 2017a and 2017b) paid by the manufacturer.

$$C^{wa}=\sum_{l=1}^{r}\sum_{i=1}^{m}\sum_{k=0}^{q}(c_{i,l,k}^{wa}\sum_{j=1}^{n}x_{i,j,k,l}) \quad (5)$$

where: $c^{wa}_{i,j,k,l}$ is the specific warehousing cost of the i[th] component purchased for the j[th] final product from the l[th] supplier to the k[th] manufacturing plant.

The packaging cost depends on the quality of the packaging material and the tooling cost of production of packaging. Plastic bags, stand-up pouches, paper bags and folding cartons belong to the lower price category, while corrugated boxes, paper or plastic bulk bags and rigid boxes are more expensive (above 0.5 USD/piece).

$$C^{pa}=\sum_{l=1}^{r}\sum_{i=1}^{m}\sum_{k=0}^{q}(c_{i,l,k}^{pa}\sum_{j=1}^{n}x_{i,j,k,l}) \quad (6)$$

where: $c^{pa}_{i,j,k,l}$ is the specific packaging cost related to the i[th] component purchased from the l[th] supplier to the k[th] manufacturing plant.

The processing cost of components is not a logistic related cost; it belongs to the technological costs. Typical processing costs of blending technologies are stirring and mixing.

$$C^{pro}=\sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=0}^{q}\sum_{l=1}^{r}c_{i,j,k,l}^{pro}\,x_{i,j,k,l} \quad (7)$$

where: $c^{pro}_{i,j,k,l}$ is the specific processing cost of the i[th] component required for the j[th] final product, bought from the l[th] supplier in the k[th] manufacturing plant (including outsourcing manufacturing).

Constraints 1: The components have different parameters, they differ in their quality and attribute (*e.g.* fluids consist of components that are either dissolved, or contain a dispersion of particles). The final product's parameters must be between the lower and upper limit of the predefined parameters (Kaczmar 2015).

$$\xi_{j,f}^{min}\le\sum_{j=1}^{n}x_{i,j,k,l}\xi_{i,l,f}\Big/\sum_{j=1}^{n}x_{i,j,k,l}\le\xi_{j,f}^{max} \quad (8)$$

where: $\xi^{min}_{j,f}$ is the lower limit of the f[th] parameter of the j[th] final product, $\xi^{max}_{j,f}$ is the upper limit of the f[th] parameter of the j[th] final product and $\xi_{i,l,f}$ is the f[th] parameters of the i[th] component purchased from the l[th] supplier.

The constraints expressed by Equation (8) is a nonlinear constraint, but it is possible to rewrite this constraint as linear nonequalities:

$$\sum_{j=1}^{n}x_{i,j,k,l}\xi_{i,l,f}-\sum_{j=1}^{n}x_{i,j,k,l}\,\xi_{j,f}^{min}\ge 0 \quad (9)$$

$$\sum_{j=1}^{n}x_{i,j,k,l}\xi_{i,l,f}-\sum_{j=1}^{n}x_{i,j,k,l}\,\xi_{j,f}^{max}\le 0 \quad (10)$$

Constraints 2: Blending technologies belong to the expensive technologies, increasing the blending capacity of a plant requires major re-investment; therefore, the blending capacities are typical limited. The standard demands of customers must not reach the blending capacity of the manufacturer. If there are outsourcing possibilities, and the total blending capacity of the manufacturing plant and the outsourcing manufactures not exceed the customer's demand, the customer's demand can be produced.

In the case of no outsourcing possibility the constraints for the blending capacity can be written as follows:

$$\varphi_j\le\varphi_j^{max}\quad and\quad\sum_{j=1}^{n}\varphi_j\le\varphi^{max} \quad (11)$$

where: φ_j is the customers' demand of the j[th] final product, φ_j^{max} is the upper limit of blending capacity of the j[th] final product and φ^{max} is the total blending capacity of the production network.

In the case of outsourcing possibilities, the blending capacity's constraints can be expressed as:

$$\varphi_j \leq \sum_{k=0}^{q} \varphi_{j,k}^{max} \quad and \quad \sum_{j=1}^{n} \varphi_j \leq \sum_{j=1}^{n} \sum_{k=0}^{q} \varphi_{j,k}^{max} \tag{12}$$

where: $\varphi_{j,k}^{max}$ is the upper limit of the blending capacity in the k[th] manufacturer in the case of the j[th] final product.

Constraints 3: The volume of components offered by the suppliers is limited. This limit can be caused by the given production capacity of the suppliers or by the framework contract. It means that the required number of components must not exceed the available volume of components. It is possible to define not only an upper limit for the purchasable components but also a lower limit can be also taken into consideration. Supplier's framework contracts can influence this lower limit. These constraints can be defined both for non-outsourced and for outsourced blending production:

$$\alpha_{i,k,l}^{min} \leq \sum_{i=1}^{m} \sum_{j=1}^{n} x_{i,j,k,l} \leq \alpha_{i,k,l}^{max} \tag{13}$$

where: $\alpha_{i,k,l}^{min}$ is the lower limit of the value to be purchased in the case of i[th] component, k[th] manufacturer and l[th] supplier; $\alpha_{i,k,l}^{max}$ is the upper limit of the value to be purchased in the case of i[th] component, k[th] manufacturer and l[th] supplier.

Constraints 4: The standard blending problems are defined as non-dynamical problems, where production time, required time span for supply and the dynamical characteristics of customer's demand are not taken into consideration. This constraint makes it possible to take notice of the different production times of blending technologies of the different manufacturers as follows:

$$\sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{q} x_{i,j,k} \tau_{i,j,k}^{bt} \leq \tau_z^{cus} \tag{14}$$

where: $\tau_{i,j,k}^{bt}$ is the specific processing time (required time-span for blending) of the i[th] component for the j[th] final product in the k[th] manufacturing plant, τ_z^{cus} is the time span to be available to produce customer's demand.

In the case of outsourced production, the manufacturing processes are overlapped and the constraints expressed by Equation (14) can be written as the maximum of required total manufacturing time of each manufacturer (including outsourced manufacturers).

$$\max_k \sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{q} x_{i,j,k} \tau_{i,j,k}^{bt} \leq \tau_z^{cus} \tag{15}$$

Sign restrictions: The decision variables can only assume nonnegative values, so we associate sign restrictions with the decision variables as follows:

$$x_{i,j,k,l} \geq 0 \tag{16}$$

4. Numerical analysis

The above described model makes it possible to define the optimal value of decision variables, like blending proportion of components and outsourcing order allocation. Within the frame of this section, four scenarios will be analysed. The 1st scenario describes a general model of manufacturing/assembly based on blending technologies. There are two products, two components and the quality of them is defined by two parameters.

In the case of the 1st scenario the manufacturer bought 267pcs from the 1st component and 250 pcs from the 2nd component and blended 517 final products with a revenue of 2,561.8 USD per order. 483 final products were blended outsourced; the 3PM provider bought 163 pcs from the 1st component and 320 pcs from the 2nd component. The 3PM provider made a profit of 1,960.3 USD per order, so the total revenue of the order was 4,522.1 USD per order. The processing time for blending was 64,967 sec at the manufacturer and 50,755 sec at the 3PM provider. As a 2nd scenario the objective function is the minimization of the total processing time. In this case the model is a mixed nonlinear integer programming (MNLIP) problem. The total processing time is 58,578 sec and the total revenue is decreased to 4,373 USD per order.

Table 3. Dataset of the 1st and 2nd scenario with outsourcing possibilities (flexible total order is 1000 pcs and the available time span to fulfil the order is 65,000 sec)

Type of parameter	Components for manufacturer		Components for outsourcing	
	1st component	2nd component	1st component	2nd component
Price	1.00 USD/pcs	1.05 USD/pcs	0.95 USD/pcs	0,85 USD/pcs
Specific transportation cost	0.60 USD/pcs	0.90 USD/pcs	1.65 USD/pcs	0.65 USD/pcs
Specific warehousing cost	1.10 USD/pcs	1.40 USD/pcs	1.10 USD/pcs	1.60 USD/pcs
Specific handling cost	1.30 USD/pcs	1.10 USD/pcs	1.30 USD/pcs	0.80 USD/pcs
Specific processing cost	0.70 USD/pcs	1.05 USD/pcs	1.50 USD/pcs	1.60 USD/pcs
Specific packaging cost	0.40 USD/pcs	0.50 USD/pcs	0.40 USD/pcs	0.50 USD/pcs
Required processing time	101 sec	152 sec	125 sec	95 sec
Lower and upper limit for order	100 and 400 pcs	250 and 800 pcs	100 and 400 pcs	100 and 320 pcs
Parameters describing the quality	2 and 8	2.5 and 9	2 and 8	2.5 and 9
	Final products			
	Manufacturer		3PM provider	
	1st product	2nd product	1st product	2nd product
Limits of the 1st parameter	4.05 - 8.12	3.05 - 6.88	4.05 - 8.12	3.05 - 6.88
Limits of the 2nd parameter	3.25 - 8.25	5.12 - 6.98	3.25 - 8.25	5.12 - 6.98
Processing capacity	100 - 600 pcs	100 – 700 pcs	- 400 pcs	- 350 pcs

Source: own research

In the case of the 3rd scenario we are applying the dataset depicted in Table 4. The manufacturer bought 709 pcs from the 1st component and 291 pcs from the 2nd component and blended 1000 final products with revenue of 5,129.1 USD per order. As a 4th scenario we analysed the impact of increased processing time of the cheaper components on the profit and volume of blended final products. The total processing time of the order was 64,286 sec.

Table 4. Dataset of the 3rd and 4th scenario without outsourcing possibility (flexible total order is 1000 pcs and the available time span to fulfil the order is 65,000 sec)

Type of parameter	Components for manufacturer	
	1st component	2nd component
Price	1.00 USD/pcs	1.05 USD/pcs
Specific transportation cost	0.60 USD/pcs	0.90 USD/pcs
Specific warehousing cost	1.10 USD/pcs	1.40 USD/pcs
Specific handling cost	1.30 USD/pcs	1.10 USD/pcs
Specific processing cost	0.70 USD/pcs	1.05 USD/pcs
Specific packaging cost	0.40 USD/pcs	0.50 USD/pcs
Required processing time	80 (variable)	26 sec
Lower and upper limit for order	100 and 1000 pcs	250 and 1000 pcs
Parameters describing the quality	2 and 8	2.5 and 9
	Final product	
	1st product	2nd product
Limits of the 1st parameter	4.20 – 6.50	4.20 – 6.50
Limits of the 2nd parameter	3.60 – 5.60	3.35 – 7.25
Processing capacity	150 - 750 pcs	225 - 820

Source: own research

Within the frame of the 4th scenario the impact of the processing time was analysed. As Table 5 shows, the processing time influences not only the total revenue, but also the volume and proportion of blended products.

Table 5. Results of the 4th scenario

Processing time [sec]	1st product [pcs]	2nd product [pcs]	Order fulfilled [pcs]	Revenue [USD]
80	180	820	1000	5129
90	180	820	1000	5039
100	180	820	1000	4965
110	180	820	1000	4908
120	180	820	1000	4863
130	183	817	1000	4828
140	420	580	1000	4786
150	623	377	1000	4751
160	744	245	989	4677
170	722	227	949	4486
180	676	230	906	4285
190	642	225	867	4101
200	607	225	832	3937
210	573	225	798	3778
220	542	225	767	3633
230	512	225	737	3492
240	485	225	710	3366
250	458	225	683	3239

Note: the processing time of the cheaper component is a variable between 80 and 250 sec
Source: own research

As these scenarios shows, outsourcing is a valuable cost-cutting tool for the supply chain of blending technologies. The parameters of the logistic operation (material handling costs or time span) and parameters of technology (processing time, capacity) influence the revenue of the entire system. By the aid of the above described model blending processes can be optimized from the point of view different objective functions.

Conclusion

This study developed a methodological approach for supply chain optimization of manufacturing companies using blending technologies. In this paper, firstly we review and systematically categorized the recent works presented for outsourcing optimization of supply chain. We analysed the selected articles1 from the point of view subject area, year of publication, used keywords, citation and scientific contributions. Then, motivated from the gaps in the literature, a model framework for supply chain including outsourcing possibilities of blending technologies was proposed: the model framework makes it possible to define typical models depending on the problem and complexity of the supply chain. We proposed a mathematical model for the description of a typical supply chain of blending technology based manufacturing including suppliers, manufacturers, outsourcing possibilities and customers. The optimization problem includes three decisions: volume of components to be purchased to blend them in a desired proportion to produce goods in a defined quality; selection of suppliers and outsourcing allocation. Computational results of the described model are presented with different datasets.

As the results show, outsourcing possibilities are cost-cutting tools for blending technologies, but the parameters of logistics and technology influences the efficiency. The results can be generalized, because the model can be applied for other technologies, especially in the case of assembly sector. The described method makes it possible to support managerial decisions; the operation strategy of the supply chain and the procurement contract can be influenced by the results of the above described contribution.

However, there are also directions for further research. First, although the logistic costs are considered in this paper, logistics strategies (*e.g.* inventory holding or routing) are not taken into consideration. In further studies, the model can be extended to a more complex model including logistic strategies. Second, this study only considered the problem as MILP and MINLP problems but in the case of increased complexity the problem can

be described as an NP-hard problem. Third, the model can be tested with real data sets. This should be also considered in the future research.

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The New Decomposition Asset Growth Effect. An Empirical Evidence of Indonesia

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Abstract

This paper provides new evidence for a causal effect of asset growth on stock returns by using decomposition method. The sample used in this research is non-financial manufacturing firms listed in Indonesia Stock Exchange (IDX) in the year of 2010 - 2015. The asset growth testing was done by conducting regression analysis. The paper results were indicated by using decomposition method for a causal effect of asset growth, book-to-market, and firm size on stock return. In addition, assets and liabilities decomposition known that the growth of fixed assets and retained earnings have a positive influence to return firms. The result by decomposition method asset growth has a positive effect on stock returns, or in other words, the higher the asset growth, the higher the stock return. Others, the cash growth negatively affect to stock returns at the time of the asset and operating liabilities have a negative significant effect on stock returns. The decomposition method asset growth has a positive effect on stock returns, in other words, the higher the asset growth, the higher the stock return. At last, the cash growth negatively affects to stock returns at the time of the asset and operating liabilities have a negative significant effect on stock returns.

Keywords: asset growth; decomposition method; return; size; book to market

JEL Classification: F36; G10; C12

Introduction

The value of the firms according to Fama *et al.* (2008) showed solely a function of investment opportunities in a perfectly competitive market while the presence of the growth firms in the future was indicated by the growth of opportunities. This can be seen by the opportunity to invest is owned and available for firms in the future. Badrinath and Wahal (2002) examined the variables asset growth with the firms' risk level. The firms with a high level of asset growth will increase the risk. The firms are considered to have a high risk, in case if it has a high uncertainty of the rate of return on assets (Prasetio 2010). The uncertainty return on the assets in the future will affect the accuracy of the firms to predict the revenue that will be received in the future.

Investors ensure the value of the company to determine its shares. The value of the company according to Fama *et al.* (1995) showed solely a function of investment opportunities in a perfectly competitive market while the presence of a growth company in the future is indicated by the growth of opportunities. This can be seen that the investment opportunities are owned and available to the company in the future. A number of investment opportunities in the future is reflected in the market value of the company in which, investment opportunity is a combination of assets in place and the present value of growth opportunities of the company.

Investors also make an assessment by looking at the fundamental aspects of asset growth of the firms invested. The growth of the firms' assets is expected to increase a number of assets where the firms' production will increase the production capability so that the results will increase one's corporate profits. With the increasing profitability of the firms and the effect on increasing the return, both are expected by investors (Laksana 2016).

The terms of firm funding involving decisions made in the firm compose funding sources are used by the firm to finance the production. There are several sources of funding that can be used by firms such as long-term debt, preferred stock, and common stock. Firm's funding decisions will be influenced by the trade off between timing and risk to be gained when it uses these funding sources. Internal funding sources such as retained earnings will strengthen the financial position of the firm in the future. And part undistributed profits to the owners will be used to back up to face the risk of losses in the future as well as to increase the firm's assets.

A research by Fairfield (1994) conducted a test about the effect of growth in operating assets by looking at the presence of mispricing at accrual earnings. The firms' growth may occur due to the firms' net assets is lower than the market value. Carlson *et al.* (2004) also conducted research focused on cash flow decomposition including fixed costs, income from assets, and the opportunity to grow the firms. Cooper *et al.* (2008) used annual reports from 1968 to 2003 examined the effect of asset growth on stock returns, using cross-sectional growth in assets of funding and investment. This paper is crucial especially for the asset growth evidence in emerging market such as Indonesia. Investors, currently, used the CAPM model (Capital Asset Pricing Model) in estimating the return of a security. Capital Asset Pricing was used to determine the return of an asset at equilibrium conditions.

Fama *et al.* (1992b) examined the relationship between the beta and the average cross-sectional in the period 1963 -1990 by taking samples NYSEX, AMEX and NASDAQ. The research included for the size, leverage, book-to-market equity and earnings price. When these factors are included, it found an empirical evidence that the cross-sectional variation in returns strongly associated with variable size and book-to-market equity. Fama and French with three-factor models asserted significantly that this model has a better ability than the single factor of CAPM. At last, this paper incorporates the asset growth as a risk factor that affects on stock returns by size, book to market and applies decomposition method.

1. Data and summary statistics

Our main sample used population manufacturing firms "go public' which is listed on the Indonesia Stock Exchange from 2010 to 2015. The population is the criteria of a particular sample as preferred by researchers and carefully chose some samples that are relevant to study design. As in previous studies, this research will issue a sample of firms that belongs to financial industry since the firms generally have a small physical relatively to capital investment and to avoid the difficulty in calculating the variables research (Carlson *et al.* 2004). The sample firms have to require such requirements: The firms must be listed on the Stock Exchange in the year 2010 - 2015, it has a positive asset growth at each year from 2010- 2015, and has financial reports and data for five years started from 2010 to 2015. The firms' financial reporting period ended on December 31 at each. These shares have a size and book to market value ratio in December of year t-1.

This paper uses a comprehensive variable to measure the growth of firm's assets by using the percentage change in total assets from year to year. Lag Asset Growth used the changing percentage of Asset Growth at total change assets from t-3 to t-2, (Titman *et al.* 2004), Lag Asset Growth is categorized as independent variables in testing. Lag growth (Cooper *et al.* 2008) was used to explain whether the assets in the prior year asset growth affect the current stock return or not. Book Market obtained by dividing the stock price and the book value per strip. The data are available in the annual balance sheet of each firm issued in the form of annual reports by IDX. It is the division between the book value of equity with a market value of equity. The distribution of samples is based on the value of BM December year.

2. Measuring the Asset Growth Effect

Investors make an assessment by observing the fundamental aspects of asset growth of the firm invested. The growth of the firm's assets is expected to increase a number of assets in which the firm's production will increase

the production capability so that the results increase a corporate profit. Basically, assets stated economic benefits to the resources are owned by the firm including goods and rights that provide benefits in the future and the transactions that occurred in the past. Assets are used to earn income and to support the operational activities of the firm.

Asset growth is the change in the value of assets over time. Firms that grow a number of assets will tend to increase. Berk *et al.* (1999) and Anderson *et al.* (2010) also explained that firms which are trusted by the market will achieve asset growth rate higher than the firm that shows the expected lower growth rates. It is also found that the main factor that explains the difference between the asset growth firms is the expectation about desired corporate profit growth investors to the firm in the future. Polk *et al.* (2008) suggested that the rate of profit growth can also be seen as an investor expectation about the prospects of the firm in the future which is reflected in the stock price.

The value of the firm showed solely a function of investment opportunities on the market perfect competition while the indications of the growth in the future indicated by the opportunity. Fama *et al.* (1992a) in his research about a cross-sectional regressions of stock returns on asset growth. This paper also found that the growth of assets in the short term may affect to stock returns, where this study used capital investment. A research by Titman *et al.* (2005) also found that the growth in capital investment also affects to annual stock return. Another research by Hirshleifer *et al.* (2004) stated that the cumulative accrual to net operating of its asset has a positive effect on stock return. Whether the asset growth has an effect on stock returns in cross section. A test is shown by looking at the coefficient interaction containing elements using the model is developed by Cooper *et al.* (2008), based on the equation with modification using decomposition method:

$$R_{i,t} = \hat{\gamma}_0 + \hat{\gamma}_1 ASSETG_{i,t} + \hat{\gamma}_2 L3YASSETG_{i,t} + \hat{\gamma}_3 Size_{i,t} + \hat{\gamma}_4 BM_{i,t} + \varepsilon_{i,t} \quad (1)$$

where: $\hat{\gamma}$ denotes a constant model of Fama MacBeth. Lag asset also be used to determine whether asset growth in the previous year affecting in returns of the next year will strengthen an asset growth as one of the risk factors.

The continuous growth of the firm will also be followed by increasing the burden of the firm. Due to the use of assets, it will require a fee. In this case, if asset increases, the fees for the use of such assets will also increase. If the asset growth was not accompanied by a rise in earnings in balance, then the asset growth will decrease the firm's profit.

Table 1. The Relationship between Growth Assets and Stock Return. Asset Growth, LagAG, BM, and Size

	Asset Growth	LagAG	BM	SIZE
1 (Low)	0,9451	0,9799	1,0329	0,9945
2	0,9391	0,9672	1,0234	0,9997
3	0,9750	1,0124	0,9895	0,9925
4	0,9696	0,9757	1,0261	0,9953
5	0,9917	0,9650	1,0054	0,9832
6	0,9961	0,9933	0,9944	0,9941
7	0,9951	1,0399	0,9651	1,0048
8	1,0667	1,0370	0,9930	1,0069
9	1,0524	1,0174	1,0087	1,0037
10 (High)	1,0615	1,0486	2,7455	1,0051

The following research by Cooper *et al.* (2008), showed a beginning with descriptive statistics to the relationship between the stock of asset growth, book-to-market of high and size. The relationship of data

consisting of 456 observations is divided into 10 deciles from the lowest to the highest based return. The division is made to look in detail whether it has an effect of changing variables studied from the lowest to the highest decile. Kelley (2003) found the evidence that the current assets negatively affect to stock returns in a weak financial statement for a large firm. By decomposition method, this paper obtains a result that growth current assets other than cash negatively affect the stock return.

Figure 1. Level of asset growth in firms

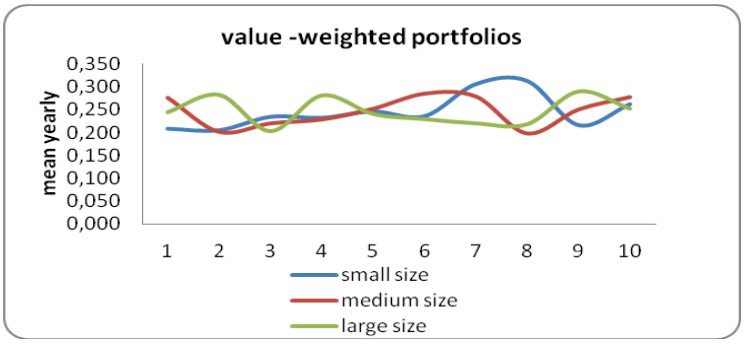

Figure 1 indicates that the asset growth has a positive value at every size firms. The growth of assets in the figure also showed an enhancement of decile 1 from the spreads is positive at all type of size firms. The largest spread is shown at a small size firm (0.053) compared to medium and large size. The small firms on figure indicated the tendency to produce a higher return than medium or a large firm. It implied that the trend of the firm of a small size has an additional expectation of return where it will compensate the highest risk.

Table 2. Asset Growth, LagAG, Book Market and Size Regression Model

All Firms				
Variable	Model 1a	Model 1b	Model 1c	Model Id
Dependent variable Return	Coefficient (t-stat)			
C	0,950 (47,264) ***	0,961 (45,813) ***	0,983 (39,595) ***	0,983 (37,123) ***
Asset Growth	0,208 (2,789) **	0,219 (2,931) ***	0,218 (2,924) ***	0,218 (2,922)***
LagAG	-	0,80 (1,795) *	0,081 (1,827) *	0,081 (1,823) *
Book Market	-	-	-0,018 (-1,672) *	-0,017 (-1,557
Size	-	-	-	0,02570E-8 (0,077)
Adj. R^2	0,15	0,019	0,023	0,21

Note: *** significance at α = 0.01; ** significance at α = 0.05; * significance at α = 0.10

In the first regression models, Table 2 shows a strong asset growth effect on stock returns with the coefficient value of each model is positive (0.208; 0.219; 0.218 and 0.218) significant at α = 1%. This suggests that the higher asset growth, the higher the average stock return. Another control variable such as Lag Asset growth, Book-to-market and Size are also seen to observe the impact of stock returns. For all firms such as asset growth, lag, are positively have a significant effect on the level of 10%. These results reinforce that the asset growth has a strong influence on the return of the firm. For book market value, it is significantly negative at α = 10% in the model 1c, where the variable size has not been put to the regression model. Other than that, Size has a positive value although it is not significant.

The result that is shown in Table 2 overally consistent with the research by Cooper *et al.* (2008) and Bolbol *et al.* (2005) who examined the effect of asset growth on stock returns. The results stated that the growth

of asset has a positive significant effect on stock returns so that it can be one of the stronger predictors in predicting stock return. These results are also similar to Pontiff *et al.* (2008) which showed that the asset structure, growth, profitability, risk, size, ownership affiliation, payment systems, and the market condition have a positive significant effect on stock returns. While control variables book market got a negative result in all tables.

The results in contrast with the research in the United States shows that the capital market in Indonesia is inefficient in which shares with book-to-market low provide the benefits in excess of the market advantage. For the overall size of each table, it showed a positive value. It means that the higher the size, the higher the tendency stock returns. It then relates to the ability of the firm's assets to finance the investment impact on growth opportunities.

3. Decomposition Method of Asset Growth

Decomposition based on asset growth component in terms of funding and investment. It will show in which components of growth assets strongly affect to stock returns. The result of this decomposition can be used to provide an insight into why the growth in assets can predict returns in cross section especially a case on emerging market such in Indonesia. The component of growth which is seen at overall corporate assets on the variable balance sheet of asset growth is the most influential on stock return. The decomposition method used on the left side of the balance sheet of the firm is: Total asset growth = Cash growth (Δcash) + Noncash current assets growth (ΔCurAsst) + Property, plant and equipment growth (ΔPPE) + Other assets growth (ΔOthAssets). On the right side of the balance sheet of the firm: Total asset growth = Operating liabilities growth (ΔOpLiab) + Retained earnings growth (ΔRE) + Debt financing growth. (ΔDebt).

The regression equation of decomposition:

$$R_{i,t} = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}\,\Delta cash_{i,t} + \hat{\gamma}_{2t}\,\Delta CurAst_{i,t} + \hat{\gamma}_{3t}\,\Delta PPE_{i,t} + \hat{\gamma}_{4t}\,\Delta OthAst_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$R_{i,t} = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}\,\Delta OpLiab_{i,t} + \hat{\gamma}_{2t}\,\Delta RE_{i,t} + \hat{\gamma}_{3t}\,\Delta Debt_{i,t} + \varepsilon_{i,t} \quad (3)$$

Table 3. Decomposition Method on Left Side

All Firm					
Variable	Model 2a	Model 2b	Model 2c	Model 2d	Model 2e
Variable dependent Return	Coefficient (t-stat)				
C	1,008 (102,377)***	1,010 (110,886) ***	0,903 (40,041)***	1,003 (113,227)***	0,914 (39,921)***
Δ Cash	-0,012 (-1,334)	-	-	-	-0,012 (-1,222)
Δ Current Asset	-	-0,039 (-2,569) **	-	-	-0,044 (-2,646) *
Δ Fixed Aset	-	-	0,511 (4,696) ***	-	0,524 (4,843) ***
Δ Other Asset	-	-	-	-0,006 (-0,762)	0,009 (0,949)
Adj. R^2	0,002	0,012	0,044	-9,240	0,057

Note: *** significance at α = 0.01; ** significance at α = 0.05; * significance at α = 0.10

Based on the table, Cash Δ growth negatively affected to stock returns. This model is shown to the value of F test at 1.7807 with a significant value of 0.187, R 2 value (R Square) of 0.0017. The growth of cash on stock returns is statistically10% at a significant level. The coefficient correlation between the growth of cash and stock return is negative (-0.0119). Currently, it was divided into 3 firms and the size table also showed the same thing. The value growth in Cash Δ showed a consistently negative effect on stock returns. This showed that the higher the cash growth, the lower stock returns.

This result supported by Prasetio (2003) examined the use of variable earnings, cash, and operating activities on stock returns. The study stated that the variable profit and operating activities, positively affect to

stock returns but the cash in financing activities negatively affect to stock returns, although it does not show a significant negative effect. The testing results also showed that there is a tendency for the higher growth of the lower treasury stock returns. This is because the shareholders consider if the growing cash is big, it means that a cash allocation for investment is not optimal. Supposedly, the cash can be used for investment activities which increase profits in the future.

The growth of current assets other than cash negatively effects on stock returns. Table 2b models (all firms) were used to test the second hypothesis, showing the value of the F test of 6.5981 with a significant value of 0.010, R 2 value (R Square) of 0.0122. It indicates that the stock return variable variation can be explained by variations in current assets amounted to only 0.12% and 88% is explained by other variables.

The effect of current assets to stock returns is statistically significant at the 1% significant level. It shows that the higher current assets other than cash, the lower stock returns. This study is supported by research (Pontiff *et al.* 2008), (Booth 1998) and (Cooper *et al.* 2008) in the asset growth decomposition resulting in the growth of current assets other than a cash which negatively affects to the stock return.

A growth of other current assets also had a negative effect on stock returns. The result in the table shows the value of F test 6.5981 with a significant value of 0.010, R 2 value (R Square) of 0.0122, This indicates that the stock return variable variation can be explained by variations in current assets amounted to only 0.12% and 88% is explained by other variables. This result is supported by a research (Cooper *et al.* 2008) in the asset growth decomposition clearly get a result at the growth of current assets other than a cash which negatively affects to stock return.

Cash for purchasing machinery had a positive influence on stock returns. This means that an increasing in investment in fixed assets or cash out from investment activities will have a positive influence on stock returns during the announcement of the new investment. Fama *et al.* (2008) stated that the firm has fixed an asset with a high value and it could reduce financial distress. These assets can be used as a payer liability for investors and creditors if the firm went bankrupt.

Table 4. Decomposition Method on Right Side

All Firm					
Variable	Model 3a	Model 3b	Model 3c	Model 3d	Model 3.1
Variable dependent Return	Coefficient (t-stat)				
C	1,005 (117,309)***	1,015 (66,954)***	0,984 (85,844)***	1,001 (118,546)***	1,002 (54,731)***
Δ Operating Liabilities	-0,011 (-2,375) **	-	-	-	-0,015 (-2,980) *
LN_Δ Retained Earning	-	0,008 (0,981)	-	-	0,008 (1,039)
Δ Debt	-	-	-	-0,24E-6 (-0,278)	-2,522E-5 (-,294)
Adj. R^2	0,0100	-0,0023	-0,0022	-0,0020	0,21

Note: *** significance at α = 0.01; ** significance at α = 0.05; * significance at α = 0.10

Table 4, shows the relationship between the coefficient operational expenditure growth with the stock return is negative (-0.0113). The adj R Square of 0.010 indicates that the stock return variable variation can be explained by variations in operating expenses amounted to only 10%. The higher the growth in operating liabilities, the lower the stock returns earned will. This result in line with Hirshleifer *et al.* (2004), examined the influence of NOA on stock returns by distinguishing between the operating assets and operating liabilities. In these studies, the results showed that operating liabilities have a negative effect on stock return. Investors expect the firm's operating expenses from year to year become more efficient. Jacoby *et al.* (2000) also stated that the operational liabilities are the factors that affect the firm's business risk, the greater the operating expenses, the greater the risk of large firms will be. The debt growth also shows a negative effect to the return.

The debt negatively affects to stock returns because firms have to pay the interest obligation, and the principal debt further will reduce profits in the future. Therefore, the increase in debt will negatively affect to return. The firms with a high growth tend to take a little debt. The firms have the option to have less debt because the firms prefer to focus on solving some problems with the debt.

Conclusion

The result of this study provides an empirical evidence and supports the theory proposed by Carlson *et al.* (2004), Pontiff *et al.* (2008) and Cooper *et al.* (2008) which stated that the growth of assets has an influence on stock returns. This research is expected to further clarification both the relationship between asset growth and stock returns using decomposition method, in which it can be used as a benchmark for investors and securities analysts in determining the risk in the investment decision. By decomposition method asset growth, it has a positive effect on stock returns, or in other words, the higher the asset growth, the higher the stock return comes. A cash growth negatively affects to stock returns at the time of the asset and operating liabilities have a significant negative effect on stock returns.

This paper based on asset growth component in terms of funding and investment. Decomposition shows the components of a strong asset growth effects to stock returns. From decomposition, the fixed asset investment growth has a positive effect on stock returns in terms of funding and retained earnings growth and growth equity positive effect on stock returns. This paper uses secondary data and samples public company with manufacturing industry in Indonesia Stock Exchange in the year of 2010 - 2015, and the influence of the type of industry that may affect was not included in the models. The result of this study provides an empirical evidence and the theory supports an asset growth. The firm who is trusted by the market will achieve a higher rate of asset growth than the firm that shows the expected lower growth rate. It also found that the main factor that explains the difference between the asset growth of these firms is the expectation of profit growth and growth equity firm, according to the investors desire to the firm in the future.

The growth of the firm assets could be a special level values for investors. Some factors toward the accuracy of information and speed information will be reflected in the price of securities. Surely, the response of asset growth can not be directly reflected on the spot, but there is a gap between the receipt of information and price reaction in receiving and processing the information. Systematic risk factors will also be reflected in the growth of the firm assets. Then, a failure to grow and develop assets will increase the burden on the company. At last, the greater the risk of failure and load the c firm, investors will tend to release the shares, causing the stock price down.

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Modern Growth Points of the Russian Banking Sector and Their Impact on Economic Development of the Country

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Abstract

The article considers the importance of the banking sector in ensuring the economic growth of the country. The goal of the article is to analyze the current state and tendencies of the strategic planning in the banking activity. Its results allowed to define the basic points of the Russian banking sector growth. The scientific novelty lies in systemizing the modern strategic approaches of Russian banks to planning the activity and forming areas of the Russian banking sector development on the basis of its growth points. Conditions of the globalization of financial markets and banking business cause the necessity to transfer the Russian banking sector from the extensive development model to mainly intensive development. It will considerably increase the competitiveness of Russian banks and national banking sector, as a whole. The conducted research is based on the methods of economic and statistical analysis and economic modeling. The basic result of the research is the development of the matrix related to selecting the strategy of the commercial bank development taking into account the "growth points" and "narrow spaces". Besides, the scenario approach to selecting a specific banking strategy was offered.

Key words: banking sector; commercial bank; strategic planning; growth point; economic growth

JEL Classification: G21; O10

Introduction

In the modern context the development of the banking and real sectors of economy is stipulated by the mutual integration of production and financial processes. The impact of the banking sector on the development of the national economy is defined by the efficiency of the commercial banks development. In the context of the market economy the latter fulfill functions of financial intermediaries and stimulate the work of the mechanism related to transforming savings into investments. The guarantee of success and stability of the banking activity development is its strategic planning based on searching and efficient use of growth points and a specific commercial bank, and the national banking system as a whole (Kazarenkova *et al.* 2014).

Commercial banks make up the basis of the money and credit system. Their activity is closely related to the needs of reproduction of the real sector of economy. Being the central link of financial relations, meeting needs of producers in funds and settlements, commercial banks mediate the relations among the industry and trading, agriculture and population (Hitt *et al.* 1995). The system of commercial banks plays an important role in ensuring a stable economic development by fulfilling controlling and regulating functions imposed on credit establishment. That is why it is difficult to over-estimate the importance of the banking system stability (Brunnermeier and Markus 2009).

Meanwhile, the Russian banking system development is peculiar of the fact that it is subject to a great number of various financial crises of the global, local, and system nature. That is why the majority of national banks prefer to solve current, operative problems rather than to carry out strategic planning that anticipates the estimation of problems and perspectives of the development of the bank activity for a long-term period of time

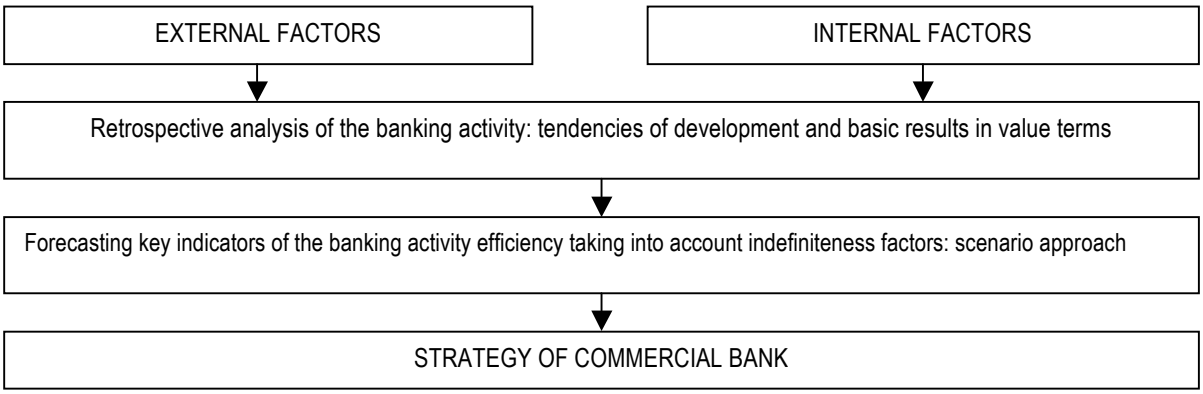
(Sherenov 2015). Taking into account the continuous and deep integration of the Russian banking system in the global and monetary flows, the activity of commercial banks is affected by a lot of factors of uncertainty that make it difficult to forecast the banking activity, and hence to form the adequate and high quality strategy of the banking business growth. In the modern context of Russian banks functioning, it is necessary to have an essentially new approach to planning the activity, analyzing terms and conditions of its development, and estimating the achieved results (Prosalova and Smolyaninova 2015). Solving these tasks belongs to using tools of strategic planning of the banking business.

1. Methodology

At the present time in the financial sector of economy there are constant integrational processes of monetary flows of commercial banks on the international level. It causes the de-regulation of the banking business, development of informational and communicational technologies, securitization, aggravation of the competition on the market of banking services, and increase in the clients' requirements to the bank service. Such development of the banking business is defined by the crisis phenomena in economy and impact of factors of the indefiniteness related to implementing the bank strategy.

Strategic planning is a process that combines all management levels. The complexity of this process, as far as developing the bank strategy is meant, is defined by the impact of a great number of external and internal factors of the banking environment that tend to change even when planned (Ansoff 1989). Changes in the legislation, activity of banks competitors, and ongoing development and implementation of banking innovations create the effect of indefiniteness. The result of the banking strategic planning is a strategy as a conceptual basis of the development of the commercial bank activity that defines goals, tasks and priority of its development, ways of their implementation and identifies a specific bank together with numerous banks in its clients and employees' eyes. The bank strategy development sets basic marks in terms of selecting key market segments, a product line of the bank, efficiency and riskiness of the banking activity as parameters of estimating the efficiency of the banking management. Figure 1 shows a conceptual model of the strategic planning.

Figure 1. Conceptual model of strategic development of Commercial Bank



The banking business is characterized by the following peculiarities that stipulate the selection of strategic planning tools:

- banking services are provided taking into account the compliance with the diversification principles, because, as a rule, providing services to bank clients includes both material and non-material services.
- banking business is rather limited in its development. It stipulates striving for universalization of the banking activity in the modern context.
- the activity of the commercial bank is developed due to the attracted clients that make up the basis of of bank resources, and consequently, bank assets.
- the conservative nature of bank clients who most of all need a specific set of banking products and services.

- strategic planning of the banking business will be successful only if the bank takes into account all actions and decisions of the power structures that influence the development of the banking activity, as well as the tendency of the national economy and banking sector development.

The implementation of the developed banking strategy means the need in ensuring its efficiency. The bank's expenses of both material and non-material nature for developing and implementing the strategy must be at least repaid, and as maximum they must contribute to the accumulation of such a result that would provide intensive development of the banking business.

Based on the comprehensive analysis of the banking activity before and after implementing the bank development strategy, it is possible to form the stipulated conclusion about its efficiency. The combination of the profitability and riskiness of the banking activity rather comprehensively characterizes the quality of the measures taken within the strategy, and defines the level of the financial stability of the commercial bank. Stability of the commercial bank development defines its ability to generate income and earn the profit. This is a goal of the bank strategy of any area: from strengthening the competitive position on the market to expending the product line and increasing the level of bank clients servicing (Kolmykova *et al.* 2015). The use of the strategic planning of the commercial banks activity on the basis of using modern growth points will contribute to improving the efficiency of the banking sector as a whole, and provide its required participation in the development of the national economy.

2. Results

In terms of institution, the Russian banking system is a combination of commercial banks of various ownership forms and universalization levels (Petrova 2014). The institutional structure of the banking system affects the formation of the strategy related to developing a specific bank in terms of the competitive environment of the bank activity and development of its products and services (Baykova 2012). Modern conditions of the Russian banking system development, the urge of the supervisory bodies to consolidate the structure of the banking sector, strengthen operating credit organizations, and increase the capitalization and financial stability of Russian banks as a whole (Aganbekyan 2013) contribute to the fact that the number of reorganized Russian banks constantly grows (Table 1).

Table 1. Russian banks undergoing reorganization procedure

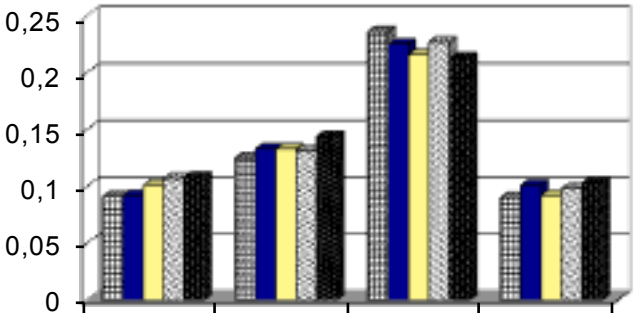
Bank	Reorganization period	Reorganizer	Result
Vneshprombank	18.12.2015-21.01.2016	ASV	License withdrawal
Uralsib	03.11.2015 up to now	BFA Bank	Buyout of 75% of shares, loan in the amount of RUB 14 bln. for 6 years and RUB 67 bln. for 10 years
Gazenergobank	12.08.2015 up to now	SKB-Bank	Reorganization by incorporating with the investor is planned
TRUST Bank	22.12.2014 up to now	Otkritie FG	Incorporating with the investor up to 2020
Baltiyskiy Bank	20.08.2014 up to now	Alfa Bank	Incorporating with the investor up to 2020
Moscomprivatbank	07.03.2014 – 29.04.2015	BINBANK	Loan in the amount of RUB 12 bln., the bank was renamed into BINBANK Credit cards
Bank of Moscow	30.06.2011 up to now	VTB	Loan in the amount of RUB 295 bln. with 0.51% per year, reorganization by separating JSC "BC Bank" ("Special" Bank)

Changes in the institutional structure of the Russian banking system have not considerably changed the level of the banking sector aggregation that still remains high: according to the results of 2014, the share of the first 200 banks according to the amount of assets is 96.5%, *i.e.* the remaining 634 credit organizations account for only 3.5% of the banking services market. The Herfindahl-Hirschman index shows the degree of the aggregation in the banking sector and can be calculated for various segments of the banking services market (Figure 2). The result of calculating this indicator in shares possesses the value from 0 to 1: the value below 0.1

characterizes a low level of aggregation, from 0.1 to 0.8 – a medium level of aggregation, and above 0.18 – a high level of aggregation.

High aggregation of the majority of segments of the Russian banking sector is related to the monopolistic position of the Sbersbank of Russia on it. The specificity of the development of the Russian banking system in terms of the institutional structure is also domination in the aggregate banking assets of banks with public ownership and with the involvement of the foreign capital (Dubinin 2015).

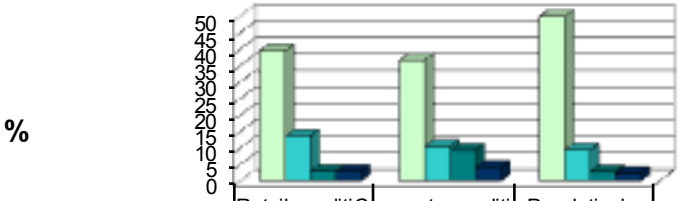
Figure 2. Level of Russian Banking System Concentration



	Assets	Credits and other allocated funds	Individuals' deposits	Capital
2011	0,091	0,125	0,236	0,09
2012	0,092	0,133	0,225	0,101
2013	0,101	0,133	0,216	0,092
2014	0,107	0,131	0,227	0,098
2015	0,108	0,144	0,213	0,103

The domination of state banks in all basic market segments: credit and deposit markets prove the participation of publically owned banks in the formation of the institutional structure of the Russian banking system, and their considerable contribution to its development (Figure 3).

Figure 3. Importance of banks with public ownership in forming the institutional structure of market of banking services of russia according to segments



	Retail crediting	Corporate crediting	Population's deposits
Sberbank	39,4	36,6	49,8
VTB (VTB 24)	13,5	10,5	9,3
Gazprombank	2,9	9,2	2,8
Rosselkhozbank	2,9	4,1	2,3

The contribution of foreign banks to the Russian banking system is also rather considerable. UniCreditBank makes the greatest contribution to the formation of assets and credit portfolio of the Russian banking sector. Its share in these segments is about 2% (the share of Raiffeisen Bank and Rosbank is between 1-1.5%). As for the population's deposits, in this segment Raiffeisen Bank dominates. Its share has inconsiderably fluctuated for the research period but according to the 2015 results it is 1.5% (to compare, the

shares of UniCreditBank and Rosbank is 0.8% each). At the present time there is an outflow of foreign capital from Russia, including from the Russian banking sector (Table 2).

Table 2. Indicators characterizing share of foreign capital in the russian banking system

Indicator	01.01.2014	01.01.2015	01.01.2016
Non-residents' investments in the charter capital of operating banks, RUB bln.	404.8	407.8	400.6
Aggregate charter capital of operating credit organizations, RUB bln.	1,532.6	1,558.1	1,605.0
Non-residents' share in the aggregate charter capital, %	26.4	26.2	25.0

Thus, the current institutional structure of the Russian banking system is characterized by the following provisions: prevailing of large banks publically owned and involving foreign capital in the formation of the aggregate assets of the banking sector of the Russian economy, and a high level of the banking activity aggregation. Such structure of the banking system defines the requirements set to the composition and structure of banking strategies in terms of the institutional character of the external environment: banks must consider the competitive environment without taking into account Sberbank of Russia. When defining key segments of the development of the banking activity, it is necessary to take into account the level of aggregation of this segment and form measures on their development based on the obtained results (Erentsenova 2016). Taking into account institutional peculiarities of the Russian banking system when developing strategies related to developing the activity of the commercial bank, its implementation will be more efficient.

The functional component of the banking system is based on providing the mechanism of transforming savings in investments. It reflects the essence of the banking activity. From the functional point of view, the banking system of the country consists of specialized (mortgage, deposit, and investment) and universal commercial banks (Shumkova 2014). Modern tendencies of the development of the functional structure of the Russian banking system point at the urge to universalize the majority of commercial banks. It undoubtedly affects strategic planning of the banking activity (Ovchinnikova 2013).

The structure of credit operations of the commercial bank considerably affects the development of the banking planning in the long-term perspective. Firstly, the bank strategy must provide a sufficient level of the credit profile diversification. Secondly, methods of attracting retail and corporate clients for crediting differ and require the formation of separate strategic measures (Kazarenkova and Kolmykova 2016).

As a result, the data about the institutional and functional structure of the Russian banking system obtained by the bank after analyzing the external environment will contribute to developing a high quality and efficient banking strategy. Its implementation will result in strengthening the competitive position of the bank on the market, increasing the quality of servicing bank clients, and obtaining positive financial results even under conditions of the heightened risks and impact of the indefiniteness factors.

Today in the Russian banking system a finite number of banks perform strategic planning of the activity. Herewith, far from all banks from the top ten by the amount of bank assets develop strategies. This process takes place in the activity of banks mainly publically owned. Banks involving foreign capital adopt experience of their parent structures or use their strategies. Private joint-stock banks do not perform strategic planning at all. Elements of strategic planning can be partially found in annual reports of banks formed by them according to the results of the financial year when summarizing the activity and defining areas of the further development. 2018 Strategy of the Sberbank of Russia most fully complies with the specified elements of the banking strategy. Other banks only partially specify strategic elements when planning their activity (Table 3).

Table 3. General characteristics of the strategy related to Russian Banks development

Indicator	Sberbank	ROSBANK	Credit Bank of Moscow
Mission	Stated in the strategy	Stated in the Corporate Code	Stated in the strategy
Development priorities	Focus on the client, team spirit, technological breakthrough, financial efficiency, and mature organization	Leadership in servicing and technologies, providing business profitability, and efficient network	Compliance with international standards of business efficiency and quality, formation of the professional team
Analysis of external environment	Available, development scenarios are developed, competitive position is defined	Unavailable, positions of the bank in ratings and rankings are monitored	Unavailable, positions of the bank in ratings and rankings are monitored
Basic development areas	Formed separately for retailing business and corporate business (small and micro-business, medium-sized and large business)	Formed in the context of the product line and clients' categories	Formed in the context of elements that provide the increase in the financial efficiency of the bank
Ways to achieve strategic goals	Improvement of the organizational structure, informational technologies, risks and HR management	Development of distance ways of servicing, comprehensive servicing	Providing financial stability of the bank, increase in the brand awareness
Strategy implementation	Control in the context of financial indicators, quality indicators, competitive position of the bank on the market, and international activity		

It is possible to note that Russian banks are on the way of the strategic planning activity becoming. That is why when developing and implementing strategies, a lot of mistakes occur. However, this way is required for providing stability and steadiness of the banking activity development in the long-term perspective taking into account indefiniteness factors.

3. Discussion

At the present time it is possible to single out the following disadvantages of the strategic planning of the banking activity:

- there is almost no analysis of the external (market) environment of the bank activity. It decreases the veracity of forecasting the banking business development,
- banks do not position themselves on the market, they do not estimate the competitive position. They do not define the competitive environment (competitors and their peculiarities). They do not reveal their competitive advantages and level of competitiveness,
- benchmarks of strategies have a general rather qualitative than quantitative character, *i.e.* it is impossible to define the efficiency of the strategy according to the criteria related to achieving the planned result,
- tools and ways to achieve the set goals and areas of the development of the bank activity are almost not described, and
- the majority of banks lack a special structural subdivision that responds for strategic planning of the activity.

At the same time, taking into account the initial stage of the banking strategies development, it is possible to note their advantages:

- reflection of social aspects in the mission and top priority areas in developing banks activity,
- searching for various approaches to developing the banking activity for clients and assortment groups of the bank,
- great attention is paid to risk management as a part of strategic planning. It allows to decrease the riskiness of the banking activity even under crisis conditions of the national economy development,
- improvement of the system related to servicing the bank clients as an important part of the banking strategy, and

- formation of essentially new approaches to personnel development, corporate ethic and personnel motivation.

In order to choose a specific strategy, at the present time it is reasonable to estimate narrow spaces (weaknesses in the development of the banking activity as a whole or in specific market segments) and opportunities of the bank on liquidating these negative factors. It is reasonable to make a specific choice on the basis of the resistance matrix shown in Table 4.

Table 4. Matrix of choosing the strategy related to developing commercial bank activity

Narrow spaces / Opportunities	Forming the missed profit	Imbalance according to the "risk-profitability" criteria	High riskiness
Flexible price policy	Focusing strategy		Diversification strategy
Diversification of the banking activity	Strategy of the limited growth	Diversification strategy	
Monitoring and minimization of the banking risks	Strategy of the limited growth		Focusing strategy

Not only the weaknesses and opportunities of the bank specified in the matrix but also a number of other factors influence the choice of a specific type of strategy within the development of the commercial bank activity (Thompson and Strickland 2013). They include general concept of the bank development, scale of the bank development, goal of the bank development (expending or narrowing the activity, maintaining the position on the market), and the resources the bank has (including for developing and implementing the banking strategy).

The chosen type of strategy specifies the general areas of strategic planning. For example, the Sberbank Strategy aims at further strengthening of its positions as one of the leading and stable financial institutes of the world. In the nearest 3 years (2016-2018) it is planned to double indicators of the net profits and assets, increase the efficiency of expenses management, grow indicators of the first level capital adequacy, and to maintain the profitability of its own capital on the current high level.

The task on doubling the amount of the net profit and maintaining the annual tempo of its growth on the level of 14-16% per year is rather ambitious under the conditions of the macro-economic instability and growing pressure on the part of regulators and competitors (Vedev 2012). Sberbank of Russia offers to achieve the target indicators by strengthening work on five new areas:

1. strengthening competitive positions of the Sberbank of Russia: maintaining or increasing the share of Sberbank on the majority of markets.
2. maintaining the level of the net interest margin on the level that is higher than the competitors' one. According to the forecasts of Sberbank of Russia, the outlined tendency related to decreasing interest rates will be maintained in the five-year' trend and will affect the net interest margin on all markets.
3. providing the outstripping growth rate of non-credit revenues: to raise the share of non-credit fees in the net operational revenue up to 25-27%.
4. providing high efficiency of Sberbank in managing expenses. Sberbank must become one of the global leaders on the efficiency of its activity.
5. maintaining rather high quality of assets: achieving the optimal correlation of the profitability and risk in crediting operations.

Thus, the Sberbank Strategy up to 2018 aims at further strengthening of its positions as one of the leading and stable financial institutes of the world, *i.e.* by 2018 it is planned to achieve the following indicators: profitability of its own capital – 18-20%, the capital adequacy – above 10%, the correlation of operational expenses and revenues – 40-43%, the correlation of operational expenses and assets – less than 2.5%, doubling aggregate assets, and doubling the net profit. Public ownership in the capital of Sberbank of Russia is a factor of additional nature because under the conditions of the national banking system crisis financial resources and flows are re-allocated, including the ones with the state participation in this process.

The probability of the planned results depends on the level of impact of indefiniteness factors in the measures taken within the bank strategy. That is why when developing its strategy, it is reasonable for the bank to take into account various vectors of events development and their impact on the final result. The latter will define the level of the strategic planning efficiency. In order to form the idea about possible results of implementing banking strategies under the impact of risk factors and indefiniteness conditions, we will represent the development scenario as Table 5.

Table 5. Scenario approach to implementing strategic planning of the bank activity development

Scenario / Strategy	Optimistic	Rational	Pessimistic
Focusing strategy	Focusing on a specific market segment will increase the bank competitiveness and profitability	Choosing a specific market segment for the bank development will contribute to achieving the "risk-profitability" balance due to decreasing expenses for managing	Too narrow specialization and focus on one market segment forms the missed profit of the bank and prevents from risks diversification
Diversification strategy	Mitigation of risks under optimal external factors causes the growth of the banking activity profitability	Optimal re-allocation of active and passive operations of the bank contributes to the mitigation of the majority of banking risks	Mitigation of risks under the negative impact of external factors causes the decrease in revenues and profits of the bank
Strategy of limited growth	Restraining tempos of the development on the level of average values for market segments increases the manageability of the banking activity	Restraining the development of the banking activity within average sectoral values will enable the bank to forecast its development in the general trend. It will increase its veracity	Limiting the tempos of the banking activity growth decrease the managers' motivation and to increase the quality of the management system

Summarizing, it is necessary to note that in spite of the positive dynamics of the majority of indicators, Russian banks have not yet managed to fully implement the process of strategic planning. Sberbank of Russia is the only exception. It can afford expenses for forming a full strategy from analyzing the external environment to tools to implement the banking strategy (Safari 2015).

Along with this, it is necessary to emphasize that to a great degree the further development of the banking business in the context of the Russian economy is defined by objective economic conditions where the banking sector is developed. That is why it must be stimulated by the joint efforts of credit organizations, the Bank of Russia, and the state. It is almost impossible to comply with this condition without full strategic planning of the banking activity. It requires reconsidering of the management approaches, organizational structure of banks, and formation of the HR potential involved in forming and implementing the strategy.

Conclusion

In the context of globalization of financial markets and the banking business, there is a necessity to provide the transfer of the Russian banking sector from the model of extensive development to mainly intensive development. It will considerably increase the competitiveness of the national banking sector (Khasyanova 2014). The formation of the efficient banking system of the country in terms of its institutional and organizational structure lies within both the state's and economic subjects' interests.

The banking system is extremely important in providing the economic development of the country. Commercial banks that make up the basis of any banking system fulfill the functions of financial intermediaries, and influence the stability and efficiency of the economy growth, and improvements of the people's lives. According to the "Strategy of the Russian Financial Market Development for the Period up to 2020", the basic goal of the development of the Russian banking sector is the "active participation in modernizing economy on the basis of the considerable increase in the level and quality of banking services rendered to organizations and population, and providing its system stability".

At the present time there are a lot of types and kinds of strategies that can be developed and implemented in the banking activity in order to develop it. When forming a banking strategy, it is necessary to take into account the specificity of developing the activity of the commercial bank and market of banking services, as well as

importance to provide the bank stability and its impact on the stability of the banking system as a whole. The activity of a modern bank without using at least elements of strategic management cannot be efficient (Khrustalev *et al.* 2013).

According to the results of the conducted research, it is possible to single out the following peculiarities of strategic management in Russian banks: the mission obligatorily includes a social component of the banking activity, the external environment of the bank is almost not analyzed, and the competitive position of the bank on the market is not estimated, criteria and indicators of the estimation of the efficiency of implementing the banking strategy are not defined. After estimating the efficiency of the development strategies implementation in the banks under research on the basis of analyzing efficiency and riskiness of the banking activity, it is possible to make the conclusion about rather high quality of strategies.

Acknowledgments

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The Effect of Dividend Policy on Company's Market Price per Share

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Abstract

The study aims to determine the nature of the effect produced by dividend policy on the market price per share as a factor of company's efficiency. In this regard, the study develops the concept of direct functional effect of the dividend policy on the market price of the company's stock. The principal advantage of this approach is represented by the possibility to determine the intensity of change and the elasticity of the market price per share affected by the dynamics of dividend payout ratio given the institutional environment and the industry the issuer belongs to. It also helps determine the influence and provides arguments for establishing the modern type of companies' dividend policies under the conditions of both developing and developed stock markets. This approach establishes directly proportionate meaningful effect produced by the company's dividend policy on the market price of its shares and makes the basis for improving theoretical foundations of dividend policy management systems in joint stock companies.

Keywords: dividend policy; market value; market price per share; dividend payout ratio; earnings; capital structure

JEL Classification: G32; L59; C49

Introduction

Dividend policy is one of the key factors of redistributing companies' profits and, consequently, of the financial security of their businesses. Dividend policy is understood as a component element of the company's general financial policy optimizing the proportions between consumed and capitalized profits in order to boost the company's market value. Inasmuch as the principal objective of dividend policy is to establish the required proportionality between the current utilization of the profit and its future growth ensured by sufficient investments, this policy can help maximize the market value of a company and secure its strategic development. Traditionally, dividend policy and the effect it produces on the market price of the company's shares represent one of the most controversial aspects of business activity leading to the heated disputes among financiers and scientists. Should the companies pay out the dividends and, if they should, how much of their profits should these dividends make? How would the investors react to dividend announcements? Up to now, there have been agitated discussions on the significance of the dividend policy for the companies' businesses, on whether they should pay out dividends, on whether the payouts affect the market value of the company and the welfare of the shareholders (Brawn and Sevĭc 2015, Lee and Mauck 2016).

1. Relevant scholarship

In the USA, the problem of the effect of dividend policy on the share market price has long been the subject matter of investigations. These investigations were launched in 1961 by American Economists, Miller and Modigliani (1963) - both of them became Nobel Prize winners later. The scientists advocated the theory of dividend irrelevance based upon the postulation that the value of the company was determined by the value of its assets exclusively. Neither investment policy nor the proportions of revenue distribution between dividends and reinvested profit affect the shareholders' total earnings. Thus, there is no any optimum dividend policy as a factor of boosting the company's value. According to Modigliani and Miller (1958), an investor is primarily guided not by the amounts of the current dividend payouts, but rather by the optimal capital structure of the company, which is supposed to secure sustainable profit in future. Investor's attitude is affected not by the present dividend payouts but by the expected profits and by the increased demand for the stock (Aggarwal and Kyaw 2010, Zhou *et al.*

2015). Describing optimal dividend policy, Akyildirim (2014) and coauthors argue that, all things being equal, firms distribute more dividends when interest rates are high and less when issuing costs are high.

The authors of this study believe that this theory is not rational from the perspectives of the issuer's functions. The market value and investment attractiveness as well as the operational and economic efficiency of the issuer's business activity is mostly predetermined by the optimum correlation of the utilized and capitalized profits.

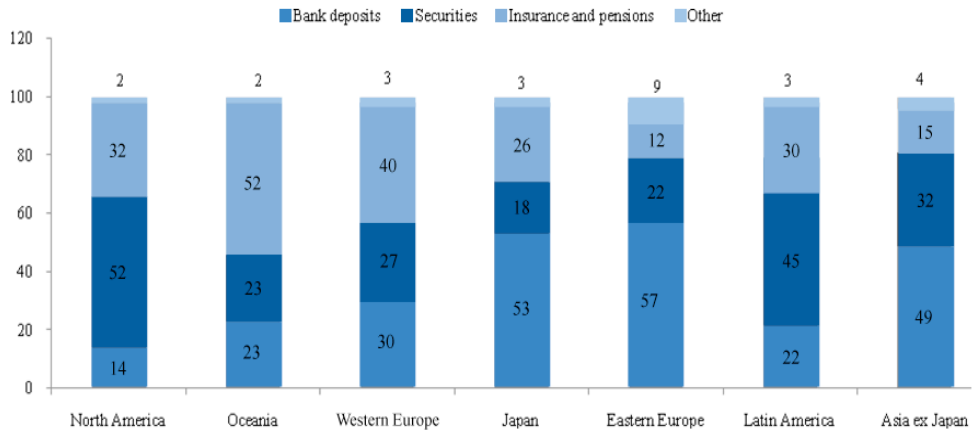
An opposite opinion has been represented within the framework of the investor preference satisfaction theory. This theory developed by Baker and Wurgler (David and Ginglinger 2016, Gonzalez *et al.* 2016, Mori and Ikeda 2015) has been founded on the negation of the assumption of market efficiency. In that research study the authors suggested that, first, the investors, because of some psychological or institutional (in other words, irrational) reasons, prefer the shares that ensure that or another amount of payouts, and, second, the managers of the companies try to customize their dividend policies to meet the changing requirements set by the investors to the payments (Andres *et al.* 2015, Fairchild *et al.* 2914). Consequently, according to the investor preference satisfaction theory, the companies can boost the demand for their shares meticulously customizing their dividend policies to meet the changing demand for dividend payouts.

The signaling model of dividend policy and company value (Bhattacharya 1979, Allen *et al.* 2000), Miller and Rock 1985, Tao *et al.* 2016 and others) is founded on a single reference point: it abandons Modigliani and Miller's assumption of the fullness and symmetry of information. In the world of incomplete information, the investors cannot tell the good companies, the relatively sustainable and stable ones from the companies that are bad with poor cash-flows (Floyd *et al.* 2015, Kaźmierska-Jóźwiak 2015, Florackis 2015). Focused on maximizing the market value of the company, the mangers and the existing investors of good companies find it best to send signals to the market to show off their quality and to make it possible for other investors to distinguish the good quality companies among the bad quality ones. This signal for the investors can well be represented by the dividend policy (Al-Malkawi *et al.* 2014, Batabyal *et al.* 2016, Bäuerle and Jaśkiewicz 2015, Chang *et al.* 2016). However, Karpavičius (2014) does not find support for dividend signaling theory; believing that results depend rather on a firm's performance measure and the environment in which a firm operates.

2. Analysis of trends in global dividend business policies

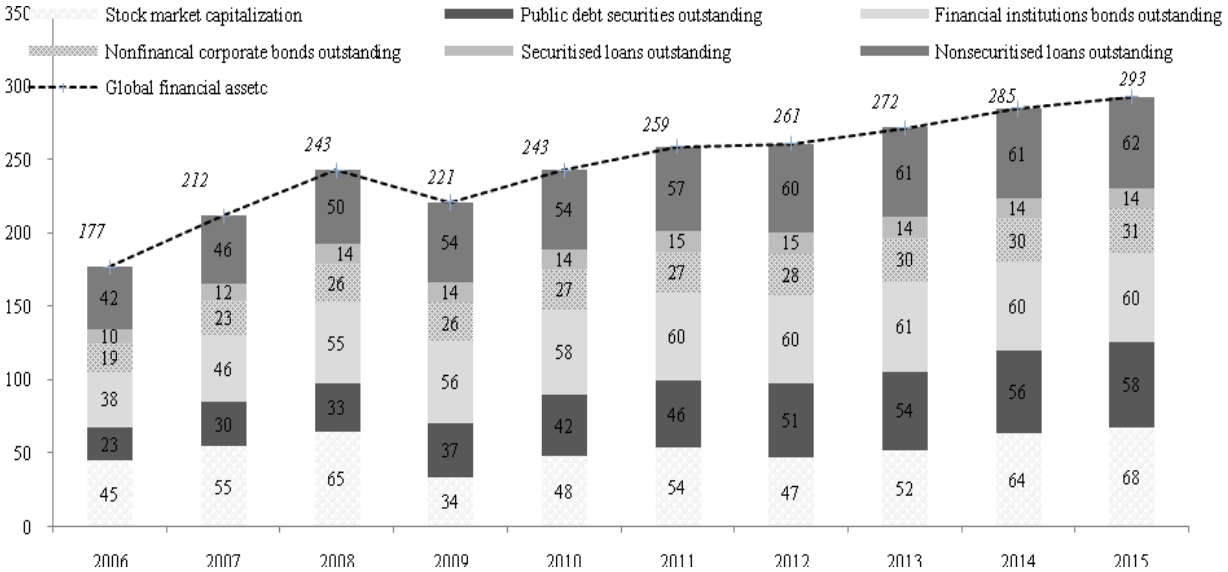
Securities are among the priority areas of investments in the global financial space. Notwithstanding the fact that financial investments considerably differ by the regions of the world (Figure 1), over 39% of the world monetary capital have been invested in securities, of which circa one quarter is represented by equity capital (The Statistics Portal 2015). Traditionally, security investments are of the highest priority in North and Latin America where they account for as much as a half of the total investments (Figure 1) **(**Brandmeir *et al.* 2015, Financial Markets 2015)

Figure 1. Financial investments priority structure broken down by regions of the world as of 2015, %



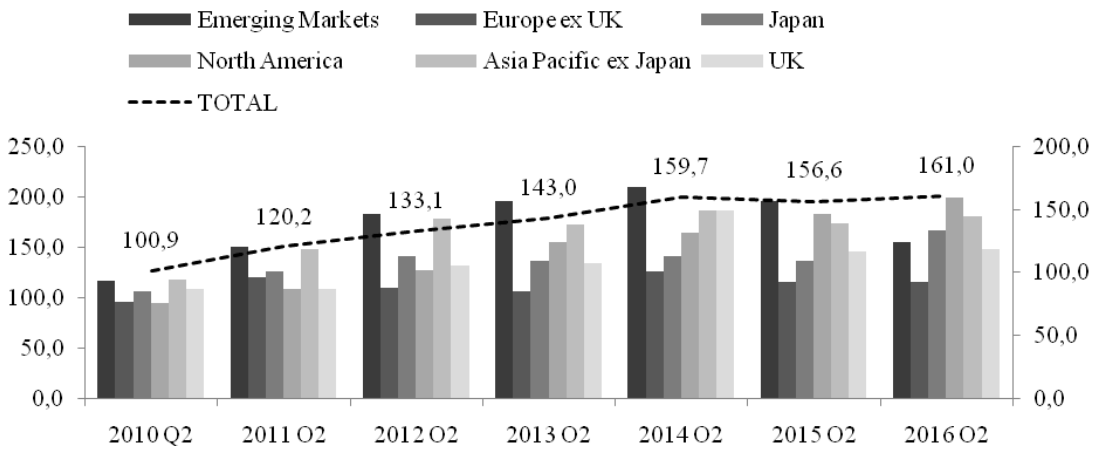
Thus, the amount of stock investments across the world is described by a minor growth over the last decade and by the dominating growing trend within the global investment capital structure see Figure 2. (The Statistics Portal 2015, Ro 2014).

Figure 2. Dynamic structure of financial assets in global stock market, USD trillion.



One of the fundamental factors prioritizing security investments is represented by dividend business policy. The data show that over the last six years the dynamics of the Henderson Global Dividend Index (HGDI) was on the rise testifying of the growing amounts of dividend payouts across the global financial space. Thus, since quarter two of 2010 till 2016 the growth of the dividend index made 60.1. The highest dividend payout ratio was observed in the companies of North America and Asia Pacific. The index growth over the second quarter of 2016 relative to the corresponding period in 2010 made 104.2 and 63.4, accordingly see Figure 3. (Henderson Global Investors 2016).

Figure 3. HGDI dynamics broken down by regions in quarter two over 2010-2016



The largest dividends are paid in the countries with developed stock market, particularly, in the USA and France. As of the second quarter of 2016, the amount of dividend payouts amounted to USD 101.7 mln, exceeding by 104% the figure of the same period of 2010. In France, the amount of the dividends paid in the second quarter of 2016 made USD 40 mln, which is by 16% more than the figure over the same period of 2010.

The smallest amount of dividends is paid in Ireland. Over the period under investigation, the paid dividends amounted to USD 4.5 mln on average. In the countries with developing stock market, the largest amounts of dividends are paid in the Russian Federation (RF), Indonesia and the United Arab Emirates: as of quarter two of 2016 they accounted for over USD 3 mln. The lowest amount of dividends, no more than USD 0.2 mln, is registered in Egypt. However, the countries with the developed stock market has been noted to reveal the growth dynamics of dividend payout rates and these payouts were stable and of systemic nature. At the same time, in the countries with developing stock market, the payouts are rather sporadic and the amounts are small. Thus, it will be safe to say that under current conditions the countries with the developed stock market promote progressive dividend policy while in the countries with emerging stock market conservative dividend policy is still of greater priority.

Dividend policies in joint stock sector differ from industry to industry (Table 1) (Henderson Global Investors 2016, Trading Economics 2016). The largest amount of dividends over the last six years was registered in financial sector of the world economy, accounting for 27.5% of the total amount of the dividends paid. Over 2010-2016 the dividend payout growth rate in this sector of economy made 58.2%. The lowest dividends were paid in Basic Materials sector accounting for just 5 % of the total amount of the dividends paid.

Table 1. Dividend payout volume by sectors of global economy, USD million

Industry	2010Q2	2011Q2	2012Q2	2013Q2	2014Q2	2015Q2	2016Q2
Basic Materials	13.8	19.1	21.1	22.4	22.2	21.6	17.7
Consumer Basics	30.3	36.6	40.2	42.7	46.7	43.6	45.7
Consumer Discretionary	17.4	26.3	29.3	32.8	40.5	40.2	41.8
Financials	65.0	76.2	71.5	80.8	93.5	94.5	102.8
Healthcare and Pharmaceuticals	16.9	19.3	20.8	20.9	23.3	22.6	26.6
Industrials	21.2	33.4	33.0	32.7	39.9	39.6	34.1
Oil, Gas and Energy	29.1	35.0	35.1	36.4	41.6	27.8	25.1
Technology	12.5	14.1	14.7	18.0	21.7	25.2	28.8
Telecommunications	36.0	42.4	38.8	31.4	34.1	31.7	31.5
Utilities	25.5	27.3	23.1	20.8	20.6	18.8	20.0

Moderately positive dynamics of dividend payouts enabled conclusions that such industries as Basic Materials, Consumer Basics, Consumer Discretionary, Healthcare and Pharmaceuticals, Industrials and Technology can be described as those promoting the stable dividend payout policy paying the same amounts over the long period with account of the inflation index.

Financial sector of the world economy represents the progressive dividend policy of ever-growing dividend payouts and stable growth of the amounts of dividends paid per share. The advantage of this policy is that it ensures high market price of companies' shares and creates their favorable image for potential investors in additional issues. It has to be noted that until 2015 this type of policy was also widely adopted in the companies of Oil, Gas and Energy sector where since 2006 till 2014 the average growth of dividend payouts amounted to over 10 %. However, under the conditions of financial crisis and oil price drops the companies shifted to the residual dividend policies based on conservative principles.

Statistical data prove that the joint stock companies in such sectors as Telecommunications and Utilities reveal stable negative trends in dividend payouts. At this stage of development, the companies in this sector of the world economy abide by the residual dividend policies. This type of dividend policy implies the formation of the dividend payout fund only when all other internal financial needs of the company are satisfied with the available profits, including the need for making one's own internal resources to enjoy all investment opportunities of the company.

Thus, under modern conditions of global economic development, dividend policies differ depending on the level of stock market maturity and on the industry the company belongs to, which can affect the market price per share of these companies.

3. Sample and data

This study makes a hypothesis that market price per share depends on dividend policy. Thereat, no clearly formalized dependency between the dividend policy and the dynamics of stock prices has been established. This can be explained by the fact that the market price of shares is affected by a great number of factors, including those that cannot possibly be formalized (for example, psychological, political and so on).

In order to prove the hypothesis, the study undertakes an analysis of the dynamics of the companies' prices per share and their dividend payout ratios. The investigation covered the period of ten years since 2006 till 2015. Statistical aggregate of the investigation was formed based on the market prices per share and on the payout ratios per share of 160 largest companies of the world who used to pay dividends on a regular basis over the years 2005-2015 and whose shares were traded in the stock markets according to the analytical data (Financial Markets 2015, Bloomberg 2015, The Statistics Portal 2015, Trading Economics 2016).

The calculations were carried out for two groups of companies. The first group covered the companies with head-offices in the countries with the developed stock market such as the USA, Great Britain, Germany, Italy, Spain, France, Sweden, Switzerland, Denmark, the Netherlands, Israel, Japan, Hong-Kong, Singapore whose shares were traded in the stock markets in these countries. The second group was comprised of the companies from the countries with emerging stock markets: China, Poland, Czech Republic, Hungary, Russia, Philippines, India, Saudi Arabia, South Korea, Taiwan, Colombia and Brazil. The investigation covered different sectors of economy (Basic Materials, Consumer Products, Financials, Healthcare & Pharmaceuticals, Industrials, Oil, Gas & Energy, Technology and Telecommunications). Each of these industries was represented by 10 companies from the developed countries and by 10 companies from the countries with developing stock markets.

The sampling by industries had to be homogeneous in order to achieve plausible results of the analysis. Homogeneity of both samples was proved checking the statistical hypothesis that the samples belonged to the same law of distribution.

According to the methodology adopted by Morgan Stanley Capital International (MSCI), three groups of stock markets can be distinguished in terms of their levels of development: the developed, developing and transitional (boundary) stock markets (Morgan Stanley Capital International 2016). Given the fact that in the countries with the boundary level of stock market development the joint stock companies are characterized by irregular dividend payments, this study has been limited to the developed and developing stock markets.

Within the framework of the investigation, several hypotheses have been suggested:

- capitalization of the company and the market price per share are in direct proportion to dividend policy;
- influence of dividend policy depends on the level of stock market development and on the industry the company belongs to.

Proving the above mentioned hypotheses, the sensitivity of the level of dividend payouts to the changes of market price per share was found by calculating the elasticity coefficient (Batrakova 2013):

$$E = y'_x \cdot \frac{x}{y} = \frac{\partial y}{\partial x} \cdot \frac{x}{y}, \quad (1)$$

where: y'_x is the first-order derivative of the resulting variable *y* (dividend payout per share growth rate) on factor variable *x* (market price per share).

$$E(\bar{x}) = \frac{\beta_1 \cdot \bar{x}}{y(\bar{x})}, \quad (2)$$

where β_1 is the coefficient of the regression equation with independent variable (x).

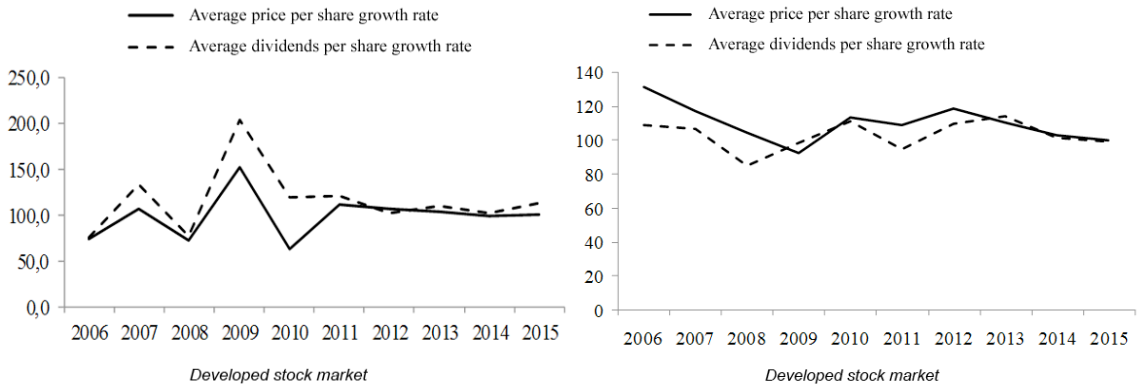
4. Results

4.1. Dependency between dividend policy and market value of company institutional level

The analysis of the trends of dividend payout per share and market price per share growth rates in the countries with the developed and emerging stock markets showed that the dynamics of their development over 2006-2015 was identical (Figure 4).

On this pretext, the strength of relationship between these indicators was determined. The dependency between the growth rates of these indices was calculated applying the correlation coefficient (Damodaran 2013). The results of the investigation showed that the correlation coefficient between dividend payouts per share and growth rates of the leading companies' market value in the countries with the developed stock markets amounted to 0.72. Thus, it will be safe to say that there is a strong relationship between these categories (on the Chaddock scale) and that under the conditions of the developed stock market 52% change in dividend payouts systemically affects the market price per share. The strong correlation is explained by the fact that most companies in the developed economies implement predictable dividend policy to minimize the possibility of paying lower or none dividends. The payouts of either fixed or growing dividends are most readily understood and expected by the investors. Thus, over the last 50 years, the average coefficient of dividend payouts of the public companies in the countries with the developed stock markets amounted to circa 50% of their net profit; thereat, this coefficient varied within the range of 5-10% up to 95-100%. This confirms the results obtained by the authors of this study in terms of the correlations between profits, dividend payouts and market price per share. The higher the level of generated profit, the higher the amounts of dividends the company pays. In turn, the higher the profit and the dividends per share, the better is the share valued in the market.

Figure 4. Dynamics of market price per share and dividends per share in world economy depending on institutional environment (growth rate, %)



The coefficient of the correlation between dividends per share and market price per share growth rates in the countries with emerging stock markets made 0.58. This proves the existence of noticeable direct dependency between these categories (on the Chaddock scale), but this dependency is much weaker than that in the countries with the developed stock markets. Thus, under the conditions of the developing stock market, 34 % change in dividend payouts systemically affects the market price per share. The obtained results can be explained by the fact that in the countries with developing stock markets the joint stock companies usually pay smaller amounts of dividends than the same companies do in the developed economies. Abiding by conservative dividend policies, the overwhelming majority of the companies allocate for these payments no more than 20-30 % of their net profits (The Statistics Portal 2015). However, conservative dividend policy is seldom appreciated by portfolio investors, as they, as a rule, prefer current profits rather than long-term returns on reinvestments and capital growth.

Most of the countries with developing stock markets (according to MSCI classification) are characterized by the high rates of economic growth and, at the same time, by considerable deterioration of capital assets. There are relatively high returns on investments and, simultaneously, the costs of borrowed capital are rather high. Natural monopolies in the economy encourage intensive investments in the whole industries and sectors.

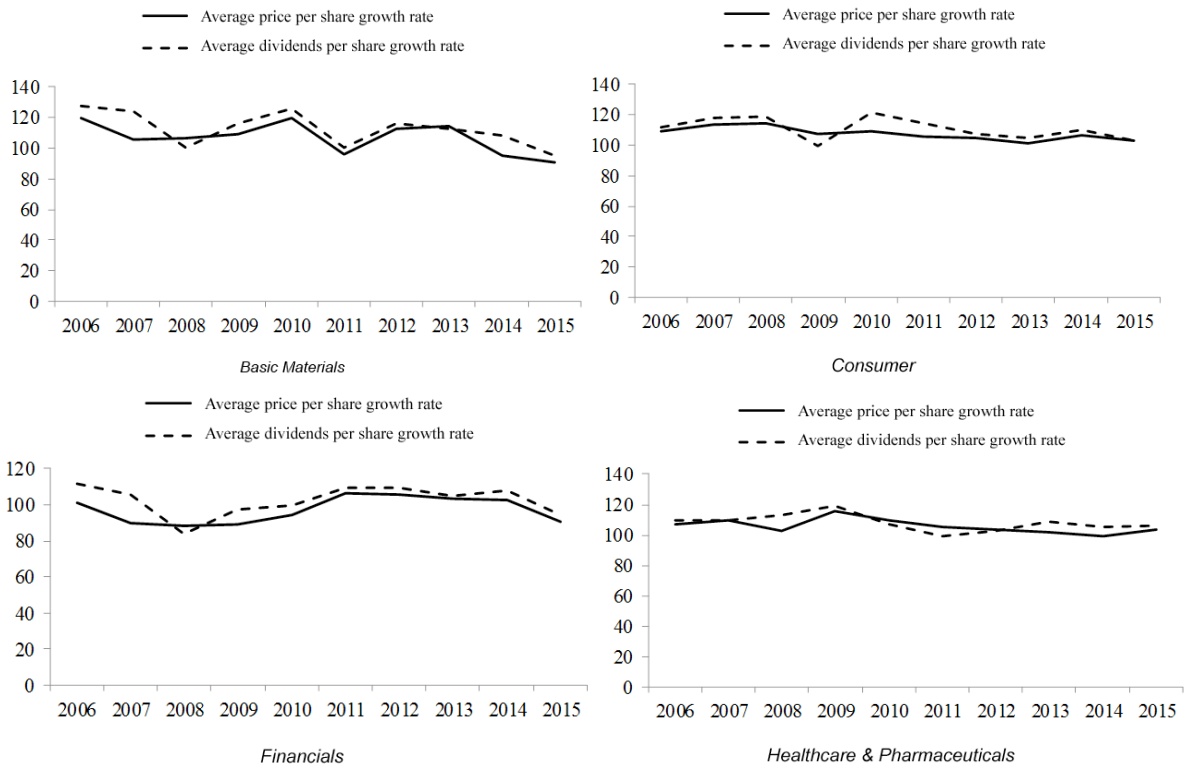
Under these conditions, joint stock companies, as a rule, choose to implement conservative dividend payout policies based on residual principle. This principle results in dividend volatility, but, at the same time, it makes it possible to implement intensive investment policy using internal financial resources.

4.2. Industry level

The analysis of the dynamics of dividend payouts and market value of companies broken down by industries revealed identical growing trends of these indicators across all industries of global economy (Figure 5, 6). Characteristically, there were lower dividend payouts and market prices per share across industries in 2008-2009 following the effect of the world mortgage crisis. This fact served as the foundation for determining the strength of the correlations between dividend payouts and market price per share growth rates in terms of certain industries.

The study suggests calculating the coefficients of correlation between dividend payouts and market price per share growth rate depending on the industries to which the companies belong. The obtained results enable the conclusion that in terms of the sectors of the economy, there is a meaningful direct effect produced by the nature of dividend policy on company's market value. The strength of the correlation has been determined based on the Chaddock scale. The effects produced by dividend growth on market value are of different nature given the stock market maturity and the specifics of industries. The earlier results of the investigation describing the relatively slight effect of dividend changes on the companies' market value (under the conditions of developing stock market) have been once more confirmed by the significant coefficient of correlation across industries, which makes over 0.5 (Table 2).

Figure 5. Dynamics of price per share and Dividends per share broken down by industries in countries with the developed stock markets, (growth rate, %)



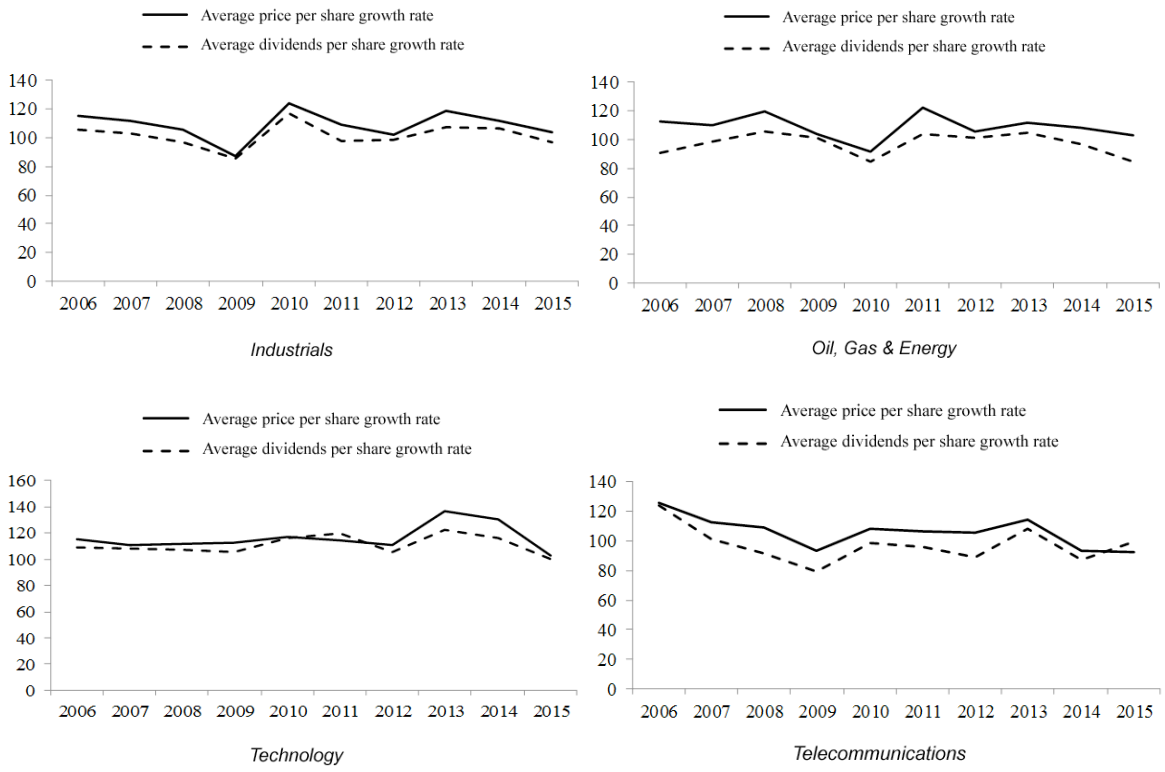
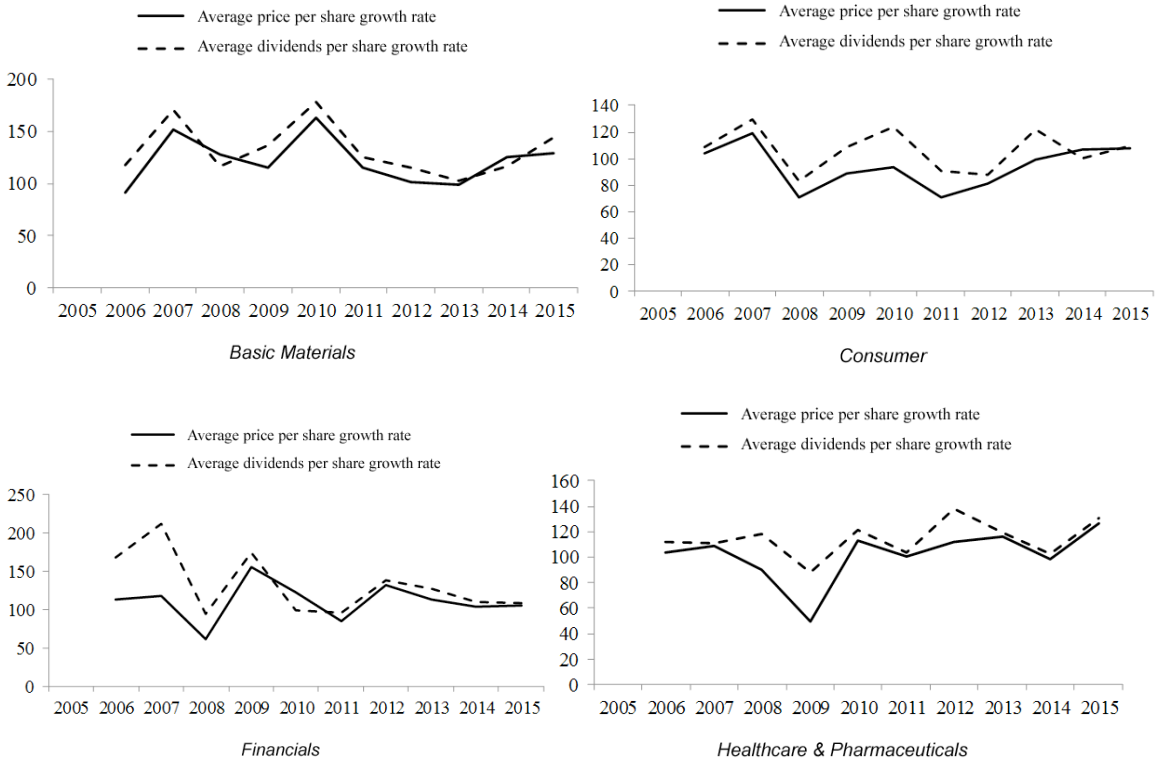


Figure 6. Dynamics of price per share and dividends per share broken down by industries in countries with developing stock markets, (growth rate, %)



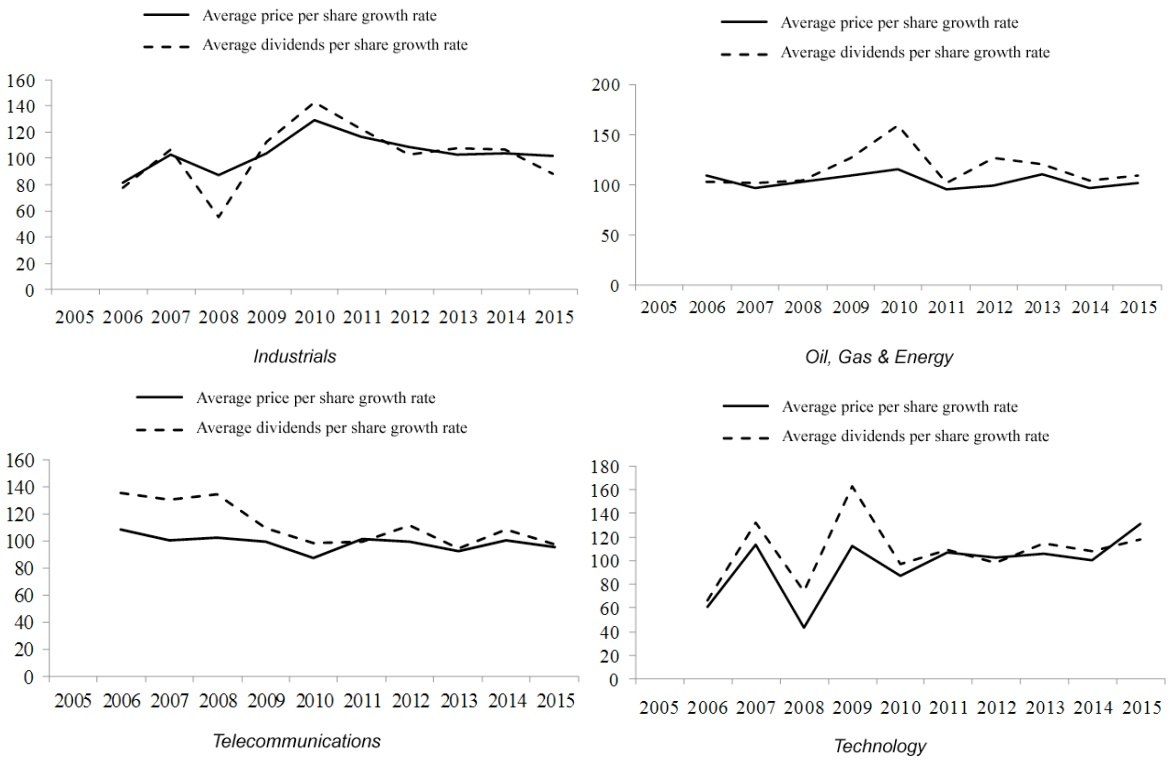


Table 2. Estimated correlation between dividends per share and market price per share growth rate broken down by industries of global economy

Industry	Countries with the developed stock market		Countries with developing stock market	
	Correlation coefficient	Strength of relationship	Correlation coefficient	Strength of relationship
Basic Materials	0.70	Noticeable	0.53	Noticeable
Consumer Products	0.72	Strong	0.65	Noticeable
Financials	0.64	Noticeable	0.51	Noticeable
Healthcare & Pharmaceuticals	0.78	Strong	0.52	Noticeable
Industrials	0.82	Strong	0.54	Noticeable
Oil, Gas & Energy	0.63	Noticeable	0.60	Noticeable
Technology	0.60	Noticeable	0.61	Noticeable
Telecommunications	0.73	Strong	0.71	Strong

Broken down by industries, the strength of the relationships in the countries with the developed stock markets fluctuates within the range of 0.63 to 0.82. The strongest relationships are observed in Industrials – 0.82, Healthcare & Pharmaceuticals – 0.78, Consumer Products – 0.72. Such results can be explained by the fact that these sectors of global economy are dominated by large companies who do not need to increase their capital and who are capable of paying generous dividends. They have been in this market for quite a long time, they occupy large share of the market and they enjoy moderate growth and stable financial indicators. Many companies need no additional capital; in case of need, they can get loans under reasonable rates; they are limited in their growth by the market capacity and by the stage of the product cycle. Dividend policy in these companies is easily predictable, and this fact directly and considerably affects their marker price per share.

Just noticeable but meaningful relationship between dividend payouts and market price per share is observed in such sectors of global economy as financials, basic materials, technology and oil, gas & energy. The lower impacts of dividend policy on market price per share in these sectors are due to the fact that these

industries are dominated by the companies belonging to "growth companies". The joint stock companies of this type allocate major part of their profits for company's development and capitalization. When their assets grow, these companies have to meet the capital adequacy requirements. Under such conditions their dividend policy is focused either on capping dividend payouts or on paying them on irregular basis, thus, reducing the effect produced by the dividend policy on the market value; nevertheless, the direct and meaningful dependency is still there.

In the countries with emerging stock markets strong dependency on dividend policy is only observed in Telecommunications which can be explained by the dominating positions occupied in this industry by mature companies focused on their reputations and on their predictable dividend policies. Other sectors of global economy in developing countries reveal meaningful and noticeable dependencies that exist between the levels of dividend payouts and market prices per share. Here, the correlation coefficient is within the range of 0.51-0.65. This is explained by the fact that under the conditions of developing financial market, the joint stock companies need to form their capitalization resources and secure financial potential for their further development. Thus, the dividends are usually paid with whatever funds remain. Dividend policy is a meaningful but not fundamental factor of changing the company's market value. In these companies the key factors predetermining the market price per share are represented by financial stability, active investment standing and market liquidity of their securities.

5. Discussion

Based on the calculated correlation coefficient testifying of the meaningful and direct dependency between the indicators, the study enables the conclusion that there is a linear dependency between dividend payouts and market price per share growth rate. Thus, it is now possible to interpret the specific features of dividend policy in global economy by way of calculating the elasticity coefficient of the market price per share affected by the dynamics of dividend payouts per share. The results of these calculations broken down by industries of global economy over 2006-2015 are represented in Table 3.

Table 3. Elasticity coefficients of market price per share affected by the dynamics of dividend payouts broken down by sectors of global economy in 2006-2015

Industry	Countries with developed stock markets		Countries with developing stock markets	
	β_1	$E(\bar{x})$	β_1	$E(\bar{x})$
Basic Materials	1.16	0.94	0.70	0.79
Consumer Products	1.94	0.94	0.39	0.40
Financials	2.30	0.98	0.74	0.81
Healthcare & Pharmaceuticals	2.54	1.00	0.55	0.61
Industrials	1.63	1.64	0.81	0.86
Oil, Gas & Energy	1.79	1.60	0.62	0.72
Technology	1.14	1.04	0.61	0.64
Telecommunications	2.07	1.82	0.83	0.85
Across all industries	1.88	1.08	0.68	0.75

The value of the elasticity coefficient higher than 1 indicates faster changes of the market price affected by the changes in the company's dividend policy. Elasticity coefficients in the countries with the developed stock markets in 2006-2015 within the specified statistical sample amounted to 1.08. That means that 1% growth of dividends per share results in the market price per share increase by 1.08%.

Not all sectors of the economy in the countries with developed stock markets are characterized by the elasticity of the market price affected by dividend policy. Under the conditions of developed stock market such sectors as Basic Materials, Consumer Products and Financials show no elasticity of the market price relative to dividend policy. That means that 1% faster dividend growth rate in these industries results in the market price per share growth rate by 0.94-0.98%. This testifies of the lesser multiplication effect produced by dividend payout level on the company's market price. That is, in these sectors of global economy the dividend policy is focused

not on the growth of dividend payouts but rather on the systemic regularity of dividend payments per share to the investors.

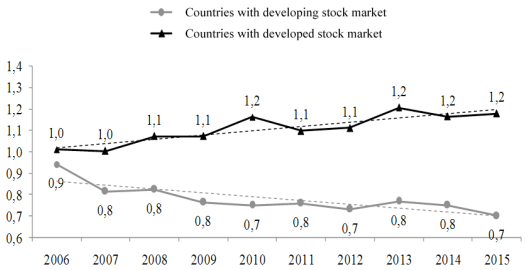
In such sectors of global economy as Healthcare & Pharmaceuticals, Industrials, Oil, Gas & Energy, Technology and Telecommunications the elasticity of the market price relative to dividend policy of the companies was observed indeed. In these industries, the market price changes faster when influenced by the dividend policies. 1% increase in dividend payouts per share in 2006-2015 resulted in market price per share growth by 1.42% on average across industries. In these sectors of economy, the implementation of the progressive dividend policy affected the companies' market price per share considerably.

In the countries with developing stock markets the market price per share over 2006-2015 was non-elastic relative to the companies' dividend policies. 1% growth of dividend payouts resulted in the market price per share growth by just 0.75% (Table 1). The same is true for all industries, *i.e.* the change of market price per share used to be slower than the affecting dividend payout growth rate. Thus, over the period covered by the investigation under the conditions of developing stock market, the market price per share was largely affected by the very fact of dividend payments and not by their growing amounts.

Thus, depending on the maturity of the stock market at both institutional and industry levels the type of the companies' dividend policy affects the intensity of changes in the market price per share in different ways. Moreover, according to the calculated annual elasticity coefficient of the market price per share relative to the companies' dividend policies in the countries with developed stock markets, the intensity of the market price changes increased over 2006-2015 affected by the changed level of dividend payments (Figure 7). At the same time, in the countries with developing stock markets the opposite trend was observed, namely, the growing trend of non-elasticity relationships. Dynamic dividend per share growth rate resulted in slower changes of the market price per share.

Thus, over the period under investigation in the countries with developed stock markets there was the growing trend for the implementation of perspective dividend policies affecting the intensity of changes in market price per share of the companies. In other words, the market prices of securities used to be affected by either increasing or decreasing levels of dividend payouts per share. Countries with developing stock markets revealed the conservative policies trend that used to decrease the intensity of changes in the market price per share affected by the intensified dynamics of dividend payouts.

Figure 7. Elasticity coefficient of market price per share relative to dividends per share payout ratio in global economy from year to year



Conclusion

Dividend policy directly and proportionally affects the company's market price per share. The power of the effect depends on the maturity of institutional environment and on the industry to which the issuer of the share belongs:

- under the developed stock market conditions, the effect produced by the level of dividend payments on market price per share is more significant than it is under the conditions of the emerging stock market.
- across the industries under the developed stock market conditions, the strongest effects of dividend payments on market price per share are observed in such sectors as Industrials, Healthcare & Pharmaceuticals and Consumer Products. Under the conditions of the emerging stock market, the market price per share is largely affected by dividend policy in Telecommunications.

- the elasticity of the market price per share relative to dividend policy also depends on the level of development of institutional environment and on the industry to which the issuer of the share belongs.
- under the conditions of the developed stock market, the market price per share is characterized by the elasticity that tends to grow sustainably. The insensitivity (non-elasticity) of the market price per share affected by the changed dividend payout rates has been discovered in the countries with developing stock markets; and the trend was on the rise.
- in such industries of global economy as Basic Materials, Consumer Products and Financials in the countries with developed stock markets the market price per share remained insensitive when affected by the changed levels of dividend payouts per share;
- under the conditions of the elasticity of the market price per share relative to the levels of dividend payouts, perspective dividend policy focused on continuous growth of dividends was found to be a key factor of successful interaction. If the market price per share is insensitive, then the desired effect can be ensured by implementing conservative dividend policy and by systemic regularity of dividend payouts to the investors.

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Measuring Efficiency of the Australian Real Estate Investment Trust based on Data Envelopment Analysis Approach

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Abstract

The paper examined the technical, pure technical and scale efficiency in Australian Real Estate Investment Trust (AREITs) to determine best practice for operations to enhance the performance of REITs. Ten Australian REITs from 2004 to 2011 are examined in terms of input and output variables in the efficiency measurement using the non-parametric approach to benchmark and determine which of the REITs are efficient. Input orientation Variable Return to Scale Data Envelopment Analysis (VRS-DEA model) is used for the entire sample using the DEAP version 2.1. Three inputs are utilized which are operating expenses, administrative expenses, and interest expenses. Meanwhile, outputs used are total assets, enterprise value. As results, of all 10 Australian REITs involved in this study, it shows that the average efficiency score 72%, which means the REITs could minimize the cost to decrease inefficiency by 28%. The result reveal that all the Australian REIT shown high efficiency score in the year from 2004 till 2007 and then the efficiency score decline dramatically until year 2011 which appeared clearly due to the global financial crises. These preliminary findings highlight the pre and post era of the Global Financial Crisis (GFC), which will examine the effects of GFC on the efficiency for Australian REITs.

Keywords: data envelopment analysis; efficiency; Real Estate Investment Trust (REITs); technical efficiency

JEL Classification: D22; D24; G21; G01; C14

Introduction

Real Estate Investment Trust (REITs) growing on a large scale in the United States, Europe and the Middle East, therefore, small investors can easily obtain shares through investment in real estate investment funds without having to buy commercial real estate investment funds. Real estate assets produce income and owned by the REITs includes, offices and shopping centers, apartments, hotels, resorts and building companies, self-storage facilities, warehouses, mortgages or loans. Australia Real Estate Investment Trusts (AREIT) one of the largest sectors on the Australian Stock Exchange. The total market capitalisation of the sector rivals the banks and resource stocks.

There are 47 Australian Real Estate Investment Trust (Listed Property Trusts). For most investors it is unfeasible to own commercial assets by itself or it would not be efficient from a portfolio diversification perspective. REITs allows individual investors to gain exposure to direct real estate assets in their portfolio. While Australian investors love invest in property. REITs is one of the most accessible means for individual investors to gain exposure to Commercial Real Estate. It is also tax efficient. REIT Distributions does not have franking credits because the income is not taxed if it's paid out to investors. The primary objective of this research is to undertake in-depth evaluation and examination of the efficiency of the AREITs, for a balanced panel data which covers 10 companies operating in Australia for the period 2004-2011, by estimating a non-parametric approach Data Envelopment Analysis. The remaining of the paper is structured as follows. The next section will discuss the previous studies of efficiency in REITs. This is followed by Section 3, where we provide a brief review on data and research methodology. Section 4, provides the results and discussion of the efficiency of Australian REITs. The study concludes in Section 5.

1. Previous studies of Real Estate Investment Trust efficiency using Data Envelopment Analisys

REITs efficiency was measured using the DEA to find the most efficient REITs. The inefficient REITs may be due to the poor utilisation of input and failure to operate at constant to scale (Anderson *et al.* 2002, Anderson and Springer 2003, Topuz *et al.* 2005). Topuz (2002) measured the allocative and technical efficiency of REITs in the USA using both SFA and DEA, suggests that the REIT has an average to low efficiency contributed by technical inefficiencies more than allocative inefficiencies.

Other researchers applying DEA for measuring REITs efficiency are Anderson and Springer (2002), Anderson, Brockman, Giannikos and Mcleod (2004) and Douglas (2006). Anderson and Springer (2003) had found portfolio of REITs constructed had superior performance in 1st, 2nd and 3rd year when using DEA technique for the 1995-1999. Another study done by Anderson, Brockman, Giannikos and Mcleod (2004) examine the performance seven Real Estate Mutual Funds (RMFs) from 1997-2001. There results reveal, that discover the superior performance along five years (1997 – 2001), seven in 1997, three in 1998, three in 1999, four in 2000 and six in 2001, operating on the efficient frontier.

Harun, Md Tahir and Zaharudin (2012) measuring efficiency of Malaysian REITs using DEA, they found that recovering Malaysian economies influence the improvement of efficiency score from 66.53% in 2007 to 74.12% in 2009. To the best knowledge, there is limited literature conducted on Australian REITs efficiency using DEA during the Global Financial Crisis (GFC) period. This study fills the gap by comparing A-REITs and their counterparts' efficiency scores for the year 2004 to 2011.

2. The estimates of technical efficiency

This study examines the technical efficiency of AREITs based on DEA approach. Technical efficiency is decomposed into the product of 'pure technical' and 'scale' efficiencies. This requires the estimation of two DEA models one with constant returns to scale (CRS) and the other with variable returns to scale (VRS). If there is a difference in the two technical efficiency scores for the one input (x) and one output (y) case. The constant returns and variable returns to scale DEA frontiers are represented by CRS and VRS, respectively. Under CRS, the input-oriented technical inefficiency of the point P is the distance PPc, while under VRS the technical inefficiency would only be PPv.

The difference between these two, PcPv, is put down to scale inefficiency. This can all be expressed in ratio efficiency measures:

$$TECRS = APC/AP \text{ (Technical Efficiency)} \quad (1)$$

$$TEVRS = APV/AP \text{ (Pure Technical Efficiency)} \quad (2)$$

$$SE = APC/APV \text{ (Scale Efficiency)} \quad (3)$$

All of these efficiency measures are bounded by zero and one. It may be noted that:

$$TECRS = TEVRS \times SE. \quad (4)$$

That is, the CRS technical efficiency measure is the product of pure technical efficiency and scale efficiency. The scale efficiency measure does not indicate whether a company is operating at increasing returns to scale (IRS) or decreasing returns to scale (DRS). This may be determined by imposing non-increasing returns to scale (NIRS) to the DEA problem. The nature of the scale inefficiencies (due to increasing or decreasing returns to scale) for a particular unit can be determined by noting whether the NIRS technical efficiency score is equal to the VRS technical efficiency score. If they are unequal (as is the case at P) then increasing returns to scale exist for that unit. If they are equal (as is the case at Q) then decreasing returns to scale apply (Coelli 1996, 18).

This research expected the return to scale to be variable. Therefore, The DEA-VRS model proposed by Banker *et al.* (1984) is used in the study. The model measures the overall technical efficiency (TE) as being managerial efficiency (PTE) multiplied by the scale efficiency (SE). SE provides information as to whether a REIT is operating at increasing return to scale (IRS) or decreasing return to scale (DRS). DEA allows the REIT

managers to identify the sources of inefficiencies, and they formulate a new strategy to ensure greater efficiency. If scale is found to be the source of inefficiency, the DEA model will also identify the reasons for these inefficiencies. For instance, if a REIT is operating at DRS, then the REIT is large in terms of scale and indicates that for every percentage increase in inputs, there will be a lower percentage than proportional increase in output.

2.1 Data sample and the choices of variables

This study examined the technical efficiency of ten Australian REITs 2004-2011 (see Table 1 for the list of A-REITs). The financial data was obtained from various annual reports, DEA program version 2.1 (Coelli 1996) is used to calculate the efficiency scores. The study excluded other REITs which was unbalance data.

Table 1. REITs in Australia 2004-2011

1	STOCKLAND
2	THAKRAL HOLDINGS GROUP
3	CFS RETAIL PR.TST.
4	ASPEN GROUP
5	BWP TRUST
6	ARDENT LEISURE GROUP
7	MIRVAC GROUP
8	INVESTA OFFICE FUND
9	ABACUS PROPERTY GROUP
10	ALE PROPERTY GROUP

Source: Annual Report of REIT

Since the empirical results based on DEA often depend or are influenced by the choice and/ or number of inputs and outputs entering into the model, we discuss below the variables that are often used in deriving the efficiency results.

Inputs and outputs

Measuring REITs by utilizing DEA are essential to have the suitable inputs in order to have an efficient output. The most common input selected by researchers is the total number of expenses, such as study done by Yusof (2009), Miller, Clauretie and Springer (2005), and, Anderson and Springer (2002). There are also other inputs utilized. This can be found in research done by Springer and Miller (2007), Miller, Clauretie and Springer (2005), and Anderson, Fok, Zumpano and Elder (1998), where price variable is selected as input variable in their study. Meanwhile, Isik and Topuz (2010) chose interest expenses and property operating expenses as input variable. On the other hand, common output selected is the total assets, where can be found in Yusof (2009), Springer and Miller (2007), and Anderson et al (2004), Anderson, Fok, Springer and Webb (2002). For other researchers, instead of using total assets as output variables, Ambrose and Pennington Cross (2000), Springer and Miller (2007), Miller, Clauretie and Springer (2005) and Anderson, Fok, Zumpano and Elder (1998) select total revenue as an output in their study.

Interest expense and property operating expense are validated as input variables while the output variable is total asset (Topuz *et al.* 2005, Topuz 2002, Anderson and Springer 2003, Lewis *et al.* 2003). The input orientation is chosen to minimise the cost or expense of REITs in order to maximise the value of REIT which is measured by the total asset.

Based on the past studies, few studies are applying DEA models with different inputs and outputs, which inputs and outputs selection are based on study's objective. Therefore, in this research, DEA models which similar to Anderson and Springer (2003), Anderson, Brockman, Giannikos and Mcleod (2004), Sham *et al.* (2009) and Douglas Nanka-Bruce (2006) are implemented to measure efficiency of REITs in Australia focusing only to

input-oriented measurement. For this paper, 10 companies were the choosing have been based on the data availability and accessibility when this research is carried out.

Table 2 represent three inputs and two outputs, respectively that are used in this study. These inputs and outputs are then utilized to measure the of AREITs efficiency. Our total expenses are used as input variables, whereby, these inputs include (i) operating expenses, (ii) administrative expenses and (iii) interest expenses. Meanwhile, two output measures are total assets and enterprise value.

Table 2. List of Inputs and Outputs

Inputs	Operating expenses (X1)
	Administrative expenses (X2)
	Interest expenses (X3)
Outputs	Total assets (Y1)
	Enterprise value (Y2)

3. Results and discussion

This study gives an overview of the efficiency of MREITs. DEA was implemented to measure the efficiency of REITs for 10 companies in Australia. DEA is useful in identifying MREITs companies that minimizes the costs to produce optimal outputs. It is observed that only three REITs companies are efficient in year ended 2004 till 2007, meanwhile, seven REITs companies are to be inefficient. The study preliminary findings from the year 2004 to 2011 for comparison of the efficiency scores see Table 3. The result reveal that all the companies shown high efficiency score in the year from 2004 till 2007 and then the efficiency score decline dramatically until year 2011 which appeared clearly due to the global financial crises. The most efficient AREIT was the company BWP TRUST which had 100% technical, pure technical and scale efficiency from 2004 - 2007. At year 2008, none of the AREITs are 100% efficient.

The results presented in Table 3 indicate that company BWP TRUST is found to be the most technically efficient with an average score of 95.2% and fully technically efficient in from 2004 till 2007, and in 2009 when it was also operating at the most productive scale size (MPSS) or optimal scale for these years. Company at MPSS maximised their outputs for inputs expended. In addition, this company found to be fully pure technical and scale efficiency in the same years. Nevertheless, the efficiency score, from 2008 to 2011 has drop, the reason may be due to the the global financial crises affected the efficiency score of AREITs negatively from 2009 to 2011.

Table 4 depicts the simplest ranking for the AREITs. This rank is able to advice investors on their investment. From this table, R5 is found to be the most efficient REITs for five years and the average was the highest with 95.2%. This is followed by R8, R10, and R3. R7 and R8 are ranked nearly similar level since the average rank of both companies is same which found to be 69%, which shows both companies possess equal potential.

Table 3. Estimates of efficiency for AREITs, 2004-2011

Company	Eff	2004	2005	2006	2007	2008	2009	2010	2011	Mean	Ranking
STOCKLAND	TE	0.714	0.755	0.762	0.775	0.623	0.622	0.943	0.881	0.752	5
	PTE	0.903	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.987	
	SE	0.791	0.755	0.762	0.775	0.623	0.622	0.943	0.881	0.762	
THAKRAL HOLDINGS GROUP	TE	0.536	0.671	0.575	0.530	0.591	0.522	0.376	0.316	0.502	9
	PTE	0.546	0.672	0.576	0.671	0.605	0.785	0.393	0.318	0.550	
	SE	0.982	0.997	0.998	0.789	0.976	0.665	0.957	0.995	0.911	
CFS RETAIL PR.TST.	TE	1.000	1.000	0.796	0.791	0.729	0.841	0.831	0.739	0.835	4
	PTE	1.000	1.000	0.932	1.000	0.981	1.000	1.000	1.000	0.989	
	SE	1.000	1.000	0.854	0.791	0.743	0.841	0.831	0.739	0.845	
ASPEN GROUP	TE	0.665	0.897	0.962	1.000	0.834	0.607	0.578	0.350	0.702	6
	PTE	1.000	1.000	1.000	1.000	0.842	0.644	0.588	0.412	0.776	
	SE	0.665	0.897	0.962	1.000	0.991	0.943	0.983	0.851	0.905	
BWP TRUST	TE	1.000	1.000	1.000	1.000	0.900	0.841	0.888	1.000	0.952	1
	PTE	1.000	1.000	1.000	1.000	0.943	0.850	0.909	1.000	0.961	
	SE	1.000	1.000	1.000	1.000	0.954	0.989	0.977	1.000	0.990	
ARDENT LEISURE GROUP	TE	0.663	1.000	0.851	0.908	0.668	0.570	0.497	0.530	0.690	7
	PTE	1.000	1.000	0.851	0.914	0.676	0.576	0.514	0.543	0.734	
	SE	0.663	1.000	0.999	0.993	0.988	0.989	0.967	0.977	0.940	
MIRVAC GROUP	TE	0.437	0.657	0.385	0.502	0.442	0.413	0.548	0.477	0.476	10
	PTE	0.545	0.747	0.561	0.848	0.658	0.517	0.723	0.650	0.648	
	SE	0.802	0.881	0.687	0.592	0.671	0.799	0.758	0.734	0.736	
INVESTA OFFICE FUN	TE	0.720	0.946	0.977	1.000	1.000	0.871	1.000	1.000	0.934	2
	PTE	0.721	0.946	1.000	1.000	1.000	0.914	1.000	1.000	0.943	
	SE	0.999	1.000	0.977	1.000	1.000	0.953	1.000	1.000	0.991	
ABACUS PROPERTY GROUP	TE	0.731	0.790	1.000	0.695	0.714	0.467	0.676	0.533	0.685	8
	PTE	0.981	0.887	1.000	0.819	0.777	0.598	1.000	0.550	0.808	
	SE	0.745	0.891	1.000	0.848	0.918	0.781	0.676	0.969	0.847	
ALE PROPERTY GROU	TE	1.000	0.723	0.531	1.000	0.948	0.769	1.000	0.892	0.841	3
	PTE	1.000	0.726	0.611	1.000	1.000	1.000	1.000	1.000	0.903	
	SE	1.000	0.996	0.869	1.000	0.948	0.769	1.000	0.892	0.931	

Source: Author's calculations. TE denotes technical efficiency, PTE pure technical efficiency and SE denotes scale efficiency

Table 4. Estimates of Efficiency for All AREITs, 2004-2011

Company	Eff	2004	2005	2006	2007	2008	2009	2010	2011	Mean
ALL	TE	0.723	0.833	0.751	0.797	0.725	0.633	0.699	0.622	0.720
	PTE	0.847	0.888	0.831	0.918	0.834	0.766	0.775	0.693	0.816
	SE	0.853	0.938	0.904	0.867	0.869	0.825	0.902	0.898	0.882

Source: Author's calculations. TE denotes technical efficiency, PTE pure technical efficiency and SE denotes scale efficiency

Conclusion

The paper examined the technical, allocative and scale efficiency of Australian REITs for 2004-2011 and determined the best practice by the efficient REITs using the non-parametric approach of DEA. This study found that REIT 5 and REIT 8 and 10 are found to be technical, allocative and scale efficient for most years before 2008. These efficient REITs are more resourceful in terms of operational and interest expense highlighting the capacity of the REIT to adopt in the difficult economic times. These efficient REITs could be used as the benchmarks or the industry leaders for the period understudy. The other AREITs should adopt the best-practice implemented by these industry leaders.

Determining the significant REIT characteristics which influence the efficiency measurement of Australian REITs will add greater variable and robustness to the existing efficiency measurement model. The Australian REIT managers will benefit substantially from the analysis having had their inefficiency determined as either technical, pure technical or scale inefficiency. This will enable them to go directly to the source of inefficiencies and make immediate improvement and adjustment in the scale (scale efficiency) or the managerial practice (pure technical efficiency).

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Enhancement of Investment Efficiency Financing based on the Mechanism of Public-Private Partnership in Russia

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Abstract

Purpose. The purpose of the research is to assess the investment projects financing based on the mechanism of public-private partnership (PPP) in Russia and to develop proposals to improve its effectiveness.

Methodology. SWOT analysis as well as regression analysis was used in the study to determine the dependence of the growth rates in the Russian economy on the volume invested in PPP projects.

Results. Within the framework of the study, an analysis of the implementation of investment projects based on the mechanism of public-private partnership in the Russian Federation was carried out. The estimate of the degree of development of public-private partnership in Russia was made regarding three main factors: the development of the institutional environment, regulatory and legal support and investment attractiveness.

Conclusions. Today's Russia is characterized by a low level of development of public-private partnership. Increasing the efficiency of financing investment projects, based on the mechanism of public-private partnership, requires the development of institutional and economic conditions for cooperation between the state and business.

Application area. The obtained results can be used in the formation of key measures by state authorities and management to improve the efficiency of investment financing grounded on public-private partnership.

Keywords: public-private partnership; financing; investment; investment project

JEL Classification: D 92; E 29; E 62; H 50

Introduction

Articulation of the problem

Over the past three decades, public-private partnerships (PPPs) have been an important tool for ensuring economic growth in virtually all countries of the world (the United States, Britain, Japan, Australia, Canada, the European Union (EU) countries. Let us note that in world practice the mechanism of public-private partnership began to be formed in the late 1980s in Western Europe and the UK, when the governments in developed countries were concerned about finding ways to attract private investment, especially in the infrastructure sector. According to the Organization for Economic Co-operation and Development, the annual investment in infrastructure is $ 2.7 million, and the need for them is about $ 3.7 trillion (Maier 2015). This problem can be

solved only by attracting private capital to finance large infrastructure investment projects. According to D. Delmon (2011), public-private partnership is the most important tool to increase investment in infrastructure facilities and improve their efficiency. Increased attention to the mechanism of public-private partnership in European countries is stipulated by the aggravation of a number of problems: low growth of innovations, deterioration of the environment, social problems (Robert-Jan 2013).

Scientific hypothesis

Public-private partnership, which provides for the consolidation of financial resources of the state and business, is the most important tool for increasing the efficiency of financing investment projects in the transition to a new industrial development.

In the next section, we summarize the main trends in the scientific literature devoted to the issues of public-private partnership.

1. Literature review

The formation of the theory of public-private partnership took place within the framework of understanding by economists of the problem of interaction between the state and the private sector of the economy. It should be noted that Keynes (1926) is the founder of economic thought in terms of interaction between the state and private business. In his work “The End of Laissez-Faire”, he wrote about the controlling functions of the state in interaction with the individual, which corresponds to current ideas about the interaction of the state and the private sector within the PPP framework.

The theoretical substantiation of the definition of “public-private partnership” was given for the first time by Weiss (1985) in the monograph "Public-Private Partnership: Financing a Common Wealth”. In scientific terms, the category “of public-private partnership” was first introduced in the UK in 1992 within the framework of the adopted state program “Private Financial Initiative”.

Despite the fact that in the modern scientific literature there is a significant amount of publications devoted to the problem of public-private partnership, there is still no generally accepted definition of this term. It is worth emphasizing that in some EU countries there are own definitions of this category. The Green Paper, published in 2004, outlines the framework rules from the perspective of Community legislation on public contracts and concessions in public-private partnership projects. The European Investment Bank believes that PPP is a general term for state and private sector cooperation in order to use the resources or expertise of the latter to create publicly significant facilities or provide public services (European Investment Bank 2004). According to Hilvert and Swindell (2013), the essence of this cooperation comes down to the fact that all parties contribute to and benefit from the relationship.

The conducted analysis of the views of different authors regarding the nature of the category of “public-private partnership” allows distinguishing two main approaches: (a) PPP as a long-term cooperation of the state and business for large-scale projects implementation (Varnavsky 2009, Yescombe 2013, Senchagov 2011); (b) PPP as a management tool enabling to reduce transaction costs and production costs of various goods and services (Van Haam and Koppenjan 2001, Klijn and Teisman 2000). Besides, it is worth noting that when researching public-private partnerships, scientists pay much attention to the estimation of factors influencing its effectiveness (Singewar and Deshmukh 2016, Chou *et al.* 2012, Fedorova *et al.* 2013).

As part of our study, public-private partnerships will be considered as a mechanism for parity interaction between the state and private business for the implementation of large-scale investment projects, which involve the allocation of risks and responsibilities between partners.

The foregoing allows us to distinguish the following main (basic) signs of public-private partnership: 1) the partners of the partnership are state organizations and institutions and private business (European Investment Bank 2004, Manko 2012); 2) the relationship of the parties is based on the principles of trust (Smith and Thomasson 2016), equality and parity; 3) the mutual relations of the parties are regulated on the basis of concluded contracts, agreements, *etc*. (Kosinova and Savchenko 2013); 4) financing of investment projects is carried out at the expense of private investments and financial resources of the state (Kireyev *et al.* 2012); 5)

distribution of responsibilities between partners: the state sets the project objectives, determines the cost and quality parameters and monitors its implementation, and private business takes on operational activities at different stages of the project: development, financing, construction and operation, management, provision of services to consumers (Varnavsky 2009); 6) the distribution of risks between the participants on the basis of the corresponding agreements between the parties (Nikitaeva 2013).

In recent years, public-private partnerships have become increasingly widespread in developed economies, as a tool for financing investment projects, supporting and financing public and quasi-public amenities in such sectors as transport (roads and railways, bridges, tunnels, ports, airports), social Infrastructure (hospitals, schools, social housing), utilities (water supply, wastewater treatment, waste management) and public institutions. At present, in developed economies, public-private partnership is a key instrument of state investment policy.

The issues of development of public-private partnership as a tool for stimulating investment are very relevant for modern Russia. The current state of the Russian economy, characterized by the predominance of the export and raw materials sector in the GDP structure, de-industrialization of the productive forces, the high dependence of the base sectors on imports, a significant technological gap with the developed economies of the world, does not meet new challenges (high share of science-intensive products in GDP, increasing the role of human and intellectual capital assets, responsiveness and effective functioning of the national innovation system in developed countries, increased costs for R&D, carried out by business entities, *etc*.), and makes it imperative to pursue a policy of high-tech industrialization. The transition to a new progressive – neo-industrial – paradigm of economic development determines the special significance of the activation of investment processes in the Russian Federation, without which economic growth is impossible. Today, one of the most important mechanisms for stimulating the development of investment processes in the country is public-private partnership.

The following objectives of using the public-private partnership mechanism can be distinguished: a) in the public sector, efficiency enhancing and qualitative service provision is essential, as well as accelerated implementation of large-scale infrastructure projects (Oshima 2016); b) the introduction of new technologies and mechanisms in the management of the economy and the sphere of public services (Schomaker 2017); c) mobilizing investment for innovative production renewal and development of related branches of the economic system with the participation of the state and private business in the implementation of large long-term investment projects (Yuryeva 2016, Nizhegorodtsev *et al.* 2012, Nikitaeva 2013); d) attraction of external sources of financing a real sector of the economy, for which the state and private business must be responsible together (Zaharioaie 2012, Manko 2012).

Public-private partnership is a fairly promising mechanism for attracting long-term investment resources for infrastructure development, modernization of the national economy and ensuring the country's innovative development. The expediency of consolidation of financial resources of the state and business within the framework of PPP is determined by a number of factors: a) lack of financial resources do not allow the state to successfully solve the problems of the development of infrastructure and industrial sectors without the participation of private capital; b) more effective management and high adaptability to the changing conditions of private business in comparison with government institutions; c) the instability of the economic situation targeting the private business to find objects for stable guaranteed investments; d) high riskiness of investment projects, which necessitates risks distribution among partners.

It is worth emphasizing that consolidation of state and business resources contributes to achieving a synergetic effect and increasing the efficiency of using the potential at the public's disposal based on the distribution of rights, risks and spheres of economic responsibility between the state and business. Today PPP is one of the conditions for increasing investment and innovation activity (Yemelyanov 2013, Kormishkina *et al.* 2016), growth of the country's competitiveness, incentive for the development of industrial and social infrastructures (Deng *et al.* 2016).

2. Methodology and case studies

The main research methods are regression analysis and SWOT analysis.

Regression analysis. Numerous studies have shown (Draper and Smith 1998, Armstrong 2012) that regression analysis is the optimal method for identifying the main factors influencing the level and dynamics of the investment process development. The main task of regression analysis is to construct an econometric model that allows estimating the values of the dependent variable based on the values of independent indicators. At present, regression analysis is the main means of investigating the dependencies between economic variables.

SWOT analysis. In the research, the authors used SWOT analysis to reveal strengths and weaknesses, as well as the opportunities and threats to the implementation of PPP projects in Russia.

In the next section, based on the reported data of the Ministry of Economic Development of the Russian Federation, the results of the analysis of the level of development and efficiency of investment financing based on the the mechanism of public-private partnership in Russia are presented.

Case studies

Consider the statistical data of the Ministry of Economic Development of the Russian Federation on the implementation of PPP projects in the country. For the period of 2010-2016, the number of PPP projects implemented in Russia has increased more than 15 times, and their total cost has grown by almost 10.5 times (Table 1). During the period under study, the share of public-private partnership in financing investments in fixed assets increased significantly. So, in 2016 in Russia, grounded on the mechanism of public-private partnership, 3.7% of the total volume of investments in fixed assets in the country was realized. It is worth emphasizing that in 2011 the least amount of investments in PPP projects is observed. This is attributed to the fact that in the specified period no projects in the transport sector were implemented.

Table 1. Dynamics of investment financing based on the mechanism of public-private partnership in Russia

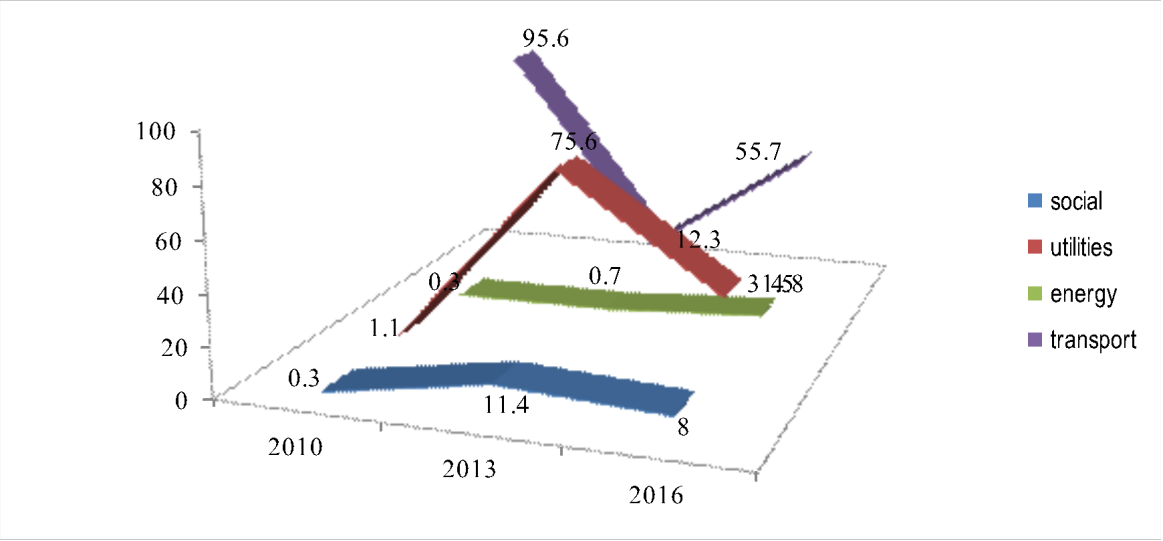
Year	Number of PPP projects, units	Investments in PPP projects, billion Rubles	Share in total investment in fixed assets,%
2010	35	52.3	0.60
2011	28	3.7	0.03
2012	50	237.7	1.90
2013	80	147.7	1.10
2014	129	351.3	2.50
2015	300	348.3	2.50
2016	536	546.3	3.70

Note: Compiled according to the Unified Information System of Public-Private Partnership in the Russian Federation data. Available at: http://www.pppi.ru

According to the Ministry of Economic Development of the Russian Federation, total investments mobilized within the framework of PPP projects in 2015 amounted to RUB 640.3 bn. Today the ratio of private investments in PPP projects to Russian GDP makes just 0.9% and is insufficient to secure the innovative development of Russian economy. The authors believe that to secure the balanced development of PPPs as project-funding mechanisms, the amount of private investments should make 4-5% of GDP.

In Russia, the principal sectors, where PPP projects are implemented, are transport, public utilities, social sector and energy (Figure 1).

Figure 1. Sectoral structure of investments into public-private projects in Russia, %



It should be noted that the principal form of PPP in Russia is represented by concession agreements (they account for almost 85% of all awarded PPP projects), which has been largely stipulated by the well-developed legislation in this particular area. Concession agreements gained wide application within the framework of the investment projects implemented in healthcare and education.

"Pulkovo Airport development" in Saint Petersburg is one of the largest investment projects in the Russian Federation in transport sector. It aims to reconstruct the airport in line with the international standards including new centralized terminal building construction and the revamps at existing Pulkovo-1 terminal and other airport infrastructure. The public-private agreement awarded for the purposes of this project implementation will be valid for thirty years (2009-2039). Total amount of the investments is estimated at EURO 1.2 bn (the first stage of the construction). The parties in this public-private agreement are represented by the Government of Saint Petersburg, JSC Pulkovo Airport and Northern Capital Gateway LLC.

Another project, Western Rapid Diameter, implemented by the Government of Saint Petersburg should not go unnoticed. The highway constructed within the framework of this project will enhance the street traffic network capacity and improve the road speed, will redistribute the Ring Motorway and the city internal traffic. All road sections accomplished, the forecasted daily average performance is estimated at 70-80 thousand cars. Western Rapid Diameter project has been launched by Saint Petersburg city administration in 1997 and is implemented together with PJC "Western Rapid Diameter" (PJSC "WRD"), the company established by the authorities with the principal functions to design, to construct and to operate the highway. In fact, PJSC "WRD" acts as an agent. Total investments into the construction amount to RUB 212.7 bn, including the RF federal budget funds of RUB 50.7 bn, and the city budget funds of RUB 54.1 bn. The project is implemented based on the concession principle.

One of the examples of the concession model mechanisms used in healthcare is represented by the construction and operation of a standalone building of Extracorporeal Blood Correction and Transfusion Medicine Center in the Samara Region under the concession agreement concluded on June, 5, 2014 for 15 years. This concession agreement implies the construction of a standalone building of the Center at the area of the state-owned healthcare institution "The Samara Region Clinic named after M.I. Kalinin" as well as its equipment in order to make hemodialysis procedures more accessible.

It has to be noted that public-private partnership in Russia is rather underdeveloped (Table 2). Unfortunately, this country still belongs to those that are at the initial stages of public-private partnership development (Closing the Infrastructure Gap 2006).

Table 2. Classification of the countries based on PPP development rates

Level	Features	Countries
Low (initial)	Formation of baseline PPP terms: developing economic policy priorities, laws and regulations	China, India, Slovakia, Hungary, the Czech Republic, Bulgaria, Croatia, Belgium, Mexico, Finland, Brazil, Denmark, Latvia, Russia.
Medium	Specification of PPP models, emerging hybrid PPP forms, PPP market development, establishing specialized structures, engaging financial market institutions into PPP projects implementation.	France, Spain, Italy, Germany, Greece, USA, Canada, Japan, the Netherlands, Portugal, New Zealand.
High	Improving the existing PPP forms, emerging complex PPP programs, sophisticated risk distribution patterns in PPP projects, wider range of PPP project stakeholders.	Great Britain, Australia.

According to the Ministry of Economic Development of the Russian Federation, the average index of PPP development in 2015 in Russia was 24.4%. It has to be noted that since 2014 the Ministry of Economic Development has been rating the subjects of the Russian Federation according to their public-private partnership development levels. This rating is based on calculating the complex indicator that takes into account three factors: development of institutional environment; law and regulations support; investment attractiveness. In 2016, this methodology was improved: the experience in PPP projects implementation was taken into account instead of "investment attractiveness". In line with this methodology, the regions are split in five groups (Table 3).

Table 3. Classification of the subjects of the RF based on PPP development rates

Region	PPP development index	Number of subjects of the RF	
		2014	2015
Leaders	60-75%	6	1
Regions with highly developed PPP	45-60%	17	7
Regions featuring medium PPP development	35-45%	16	9
Regions featuring low PPP development	25-35%	28	22
Regions featuring very low PPP development	0-25%	18	46

Compiled based on: Study: Public-private partnership development in Russia over 2015–2016. Rating of the regions in terms of PPP development. Association "PPP Development Center", Ministry of Economic Development of the Russian Federation. Moscow, "PPP Development Center" Association, 2016. In 2015, Moscow was the leading region in terms of PPP development. The regions with highly developed PPP are Saint Petersburg, the Samara, the Novosibirsk, the Nizhniy Novgorod, the Sverdlovsk, the Leningrad and the Moscow Regions. It should be noted that the Novosibirsk and the Nizhniy Novgorod Regions are the most successful subjects of the Russian Federation in terms of the implementation of the concession agreements; however, the PPP laws and regulations in these subjects are not sufficiently developed and their investment attractiveness is rather poor.

The group of the regions featuring very low PPP development in 2015 covered 46 Ssubjects of the Russian Federation accounting for 54% of their total number. Thereat, in a number of regions: Republic of Altai, the Chukotka Autonomous District, the Zabaikalsky Krai, the Tyumen Region and North Ossetia there are no any practices of applying PPP mechanisms whatsoever, the institutional environment has not been developed and the indicators of investment attractiveness are low.

SWOT - analysis of public-private partnership in Russia, undertaken by the authors of this study, shows that there are both positive and negative aspects to the development of this institution (Table 4).

Table 4. SWOT- analysis of public-private partnership in Russia

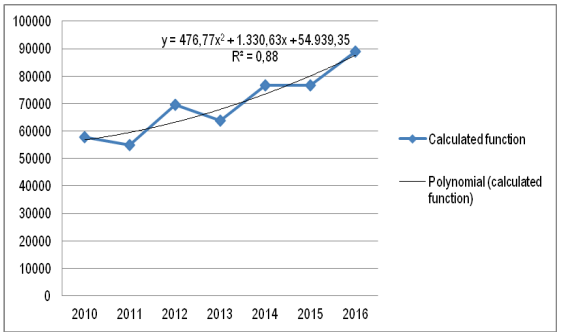
Strengths	Weaknesses
▪ Growing need for the investments to implement infrastructure projects. ▪ High demand for innovative products and technologies. ▪ There is the Federal Law that regulates relations within PPP. ▪ There are educational institutions and training centers capable of teaching the experts in PPP. ▪ There are institutions to support and promote entrepreneurship. ▪ Positive experience in PPP projects implementation.	▪ International investment ratings are rather low. ▪ Insufficient investment capabilities of the RF budget. ▪ Insufficiently developed laws and regulations. In some subjects of the RF there is no relevant regional legislation. ▪ Lack of qualified PPP project managers and experts. ▪ Sophisticated competition to enter PPP market. ▪ High risks.
Opportunities	**Threats**
▪ Development of transport, social and public utility infrastructure. ▪ Increased ratio of science-intensive products in GDP. ▪ Implementation of neo-industrial modernization in the country.	▪ Decreased investment attractiveness of Russian economy. ▪ Dependency of Russian economy on external economic situation. ▪ Complicated macroeconomic situation due to the aftermaths of the world financial crisis of 2008-2010.

In order to estimate the efficiency of the investments into PPP projects in Russia, the authors of this study have developed the regression equation based on the empirical data over 2010-2016. GDP in country (Y) was taken as the resulting indicator and the variable factors were represented by the investments in PPP projects (X). The resulting regression equation shall be represented as follows:

$$Y = 54599.79052 + 63.04893401X$$

The correlation coefficient equal to 0.88 testifies of the fact that, according to the Chaddock scale, the dependency between GDP and the investments based on PPP mechanism is high. The determination mechanism proves that the rates of economic growth in the country depend on PPP investments by 77.9%. In line with the obtained regression equation, the increase in PPP investments by RUB 1 bn will generate RUB 63 bn of GDP. The calculated function is polynomial and the correlation is shown in Figure 2. The analysis of the investments based on public-private partnership mechanisms undertaken by the authors shows that the cooperation of state and business is usually established in the sectors that are of great importance for national economic development and that are socially important for the community, but that are, at the same time, regarded as insufficiently profitable for private capital due to capital intensity and due to the long payback periods. Presently, the rate of economic growth in Russia by 80% depends on PPP project investments. The negative trend in developing the investment processes in Russia is represented by the lack of interest revealed by the private investors toward the long-term investments in the projects implemented based on the public-private partnership mechanism.

Figure 2. GDP dynamics in Russia, RUB bn



The authors believe that in order to improve the efficiency of the investments in PPP projects, the institutional and economic conditions should be developed introducing the following measures: a) creating favorable investment climate to attract private investments into the economy (Kormishkina and al. 2015), b) enhancing the practices of interstate PPP investment projects implementation; c) improving laws and regulations in the subjects of the RF; d) developing financial models for private investor risk management (Ameyaw and Chan, 2013). Improvement of the funding efficiency of the investment projects based on PPP mechanism and further development of the interaction between state and business in the investment projects will only be possible under the conditions that support the strengths (advantages) of PPP.

Conclusion

In conclusion, it should be noted that the partnership between the state and business in most cases positively affects the economic growth and leads to the structural changes in productive activities; it promotes innovative projects and state-of the-art technologies. This interaction makes it possible to engage extra funds into infrastructure projects, into industrial sector, healthcare, education, public utility, telecommunications, *etc*. The institution of public-private partnership ensures the development of productive, social and innovative infrastructure taking into account the interests of business and engaging the business: it improves the efficiency of the employed state property and state funds, it encourages the private sector to develop entrepreneurial activities in the areas that possess the highest potential for economic growth. The authors of this study believe that the establishment and the implementation of partnership between state and business should be the dominants of the innovative growth of Russia resulting in improved investment activity and better performance of the investment sector of the economy decreasing the unnecessary costs in the budgets at all levels while implementing socially important investment projects and programs. Undoubtedly, to solve the issue of modernizing Russian economy, higher efficiency of the investments based on public-private partnership mechanisms would be prerequisite.

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Measuring Corporate Social Responsability Disclosure and the Financial Crisis in Italy. Comparison of the Two Years Prior to the Crisis (2006) and the Two Years since the Onset of the Crisis (2010)

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Abstract

This study is aimed at searching for a tool capable of measuring the performance of CSR disclosure of companies in 2006 (pre-crisis) and 2010 (crisis). All this in order to verify whether: H0: CSR disclosure does not change during a time of financial crisis; H1: CSR disclosure changes significantly during periods of financial crisis.

The object of study concerns the content of the sustainability report drawn up in accordance with GRI criteria by companies listed on the FTSE-MIB that have been using this standard at least since 2006. If we take a look at previous studies, which follow the logic of content analysis, we identify and find keywords (environmental and social ones derived from the GRI framework) in the sustainability report. In order to be considered valid, the keywords must meet a set of predetermined rules. These on a whole configure a scoring system. The scores reported are used to verify the hypothesis of the study, to determine to what extent CSR disclosure has suffered, like all the other indicators, of the financial and economic crisis.

Keywords: corporate social responsability; content analysis; GRE; social responsibility report; disclosure

JEL Classification: M14; M41; M42

Introduction

Corporate Social Responsibility (CSR) is a current topic that is much debated in academic circles. Scholars are faced with two types of issues, primarily the lack of a commonly accepted definition of CSR and secondly the issue of being able to measure it. This study agrees with the definition of CSR by Edward Freeman and the stakeholder theory that in literature is "opposed" to shareholder theory.

To measure the performance of CSR disclosure, our study starts from the GRI standard most in use today, at least in the sample considered, and from the sustainability and social responsibility reports and financial statements, and applies the tool of content analysis.

Previous studies regarding the measurement of CSR performance in a context of crisis have translated the judgment on the level of application of the GRI standard (expressed by a letter) into a numerical system. This study, while recognising the validity and value of previous studies and following the approach based on content analysis, examines what companies claim to do (through the analysis of "social" responsibility reports). The choice of the content analysis tool, as well as being supported by academic articles that preceded this study, is supported by the fact that the economic, social and environmental information contained in the sustainability report is not always present and/or comparable in time and space. This problem is overcome by analysing the

single word that framed in a default rule system ensures that our study has the required objectivity and comparability over time and space.

Everything is analysed in context before the crisis (2006) and during the crisis (2010). The economic crisis offers a unique opportunity, allowing us to make comparisons between the current situation and the one prior to the crisis. The context of this study is the financial and economic crisis that started in 2008 in the U.S.A. following the subprime mortgage bubble burst (Morselli 2011). This crisis, unlike the previous ones, calls into question the entire global economic system, forcing governments and businesses to identify a new path of development. A path where values, trust and corporate social responsibility become essential.

The choice of linking CSR performance and the economic crisis is not accidental, because it is believed that the crisis of 2008 is not only economic but also, and especially, concerns the values that underlie the whole economic system.

The study is aimed at verifying the hypothesis supported by the data analysis of the sample corresponding to the requirements identified. The data is analysed using open source R statistical software and statistical tests (Shapirowik, T Test and where the T test cannot be used, using the WilcoxonRank Sum and SignedRankTests), which are highly recurrent in literature, precisely as a means to verify the assumptions previously postulated.

1. A look at the research methods

CSR is a current and broad phenomenon (it includes economic, social and environmental information). The largest extent of the phenomenon of CSR is the lack of a commonly accepted definition internationally. This deficiency affects the studies that analyse the phenomenon of CSR and its results, because each study measures CSR performance differently. There are studies that in order to analyse the performance of CSR examine the environmental and economic performance (Dragomir 2010). This author in his work asks himself the question as to whether the environment represents a stakeholder and if there is a business case that can be taken as a model.

These questions form the basis for drawing a tripartite relationship involving environmental disclosure and environmental and financial performance in the European context. The sample consists of 60 of the largest industrial groups in the European Union (by number of employees and assets) taken from the FTS EuroFirst 300. The GRI standard is used as parameter for environmental disclosure. All this forms the basis for a content analysis of sustainability reports published by the companies before the end of 2008.

The rating system for environmental disclosure provides a system of values between 0 (if performance data are missing), 1 (if performance information is available only for the current period), 2 (if the report and the information it contains can be compared to a basic year), 3 (if the criteria and data measurement techniques can be replicated with similar results) and 4 (if through the criteria mentioned earlier, the company's performance can be compared with the appropriate benchmarks). The economic performance was analysed through the monitoring of Tobin's Q, EPS, ROE, Leverange and ROACHG. Environmental performance is measured through direct and indirect energy consumption (Gwh) per hour, together with the given greenhouse gas emissions in Kilotons of CO_2. The study found a significant relationship between the environmental performance of the most highly pollutant companies and their environmental disclosure. Instead, we found no relationship between environmental performance and financial performance, and between environmental disclosure and corporate performance. There are those who convert the application level of the GRI system into a scoring system (Sutantoputra 2009), which based on Clarkson's study *et al.* (2006), through an approach to content analysis, has translated the GRI guidelines of 2002 in a disclosure-rating system.

The system distinguishes between GRI hard indicators (objectively verifiable) and GRI soft indicators (not objectively verifiable). The scale of values attributable to hard indicators ranges from 0 (absent) to 1 (present), 2 (including also the indicator referred to the previous period) and 3 (if both the indicator for the previous period and the target for the following year are present). The scale of values for soft indicators is between 0 (absent) and 1 (present). The minimum score ranges from 0 to a maximum of 83 (67 being the maximum score for the hard indicators and 16 for the soft indicators). Some study the performance of CSR, associating it with economic performance (Oeyono *et al.* 2011).

These authors, through their work, want to verify the level of CSR based on the GRI standard of Indonesian businesses and verify the existence of a relationship between CSR and profitability. The sample consists of 48 publicly traded companies in Indonesia to examine the relationship between CSR and profitability, while to verify the level of CSR reached, the standard drops to 45 companies. Profitability is monitored through the performance of EBITDA and EPS over the five years 2003-2007. The results show that CSR companies that publish six GRI indicators are 5, those that publish five indicators are 10, those with four indicators are 16 and those with three indicators are 12, with one and two indicators for 1 company each. The survey also showed that there is a positive relationship (albeit weak) between profitability (18% EBITDA and 16% EPS) and CSR. There are those who approach CSR posing precise questions about it and about sustainability reports (Everaert *et al.* 2009).

They create a framework in two dimensions based on the GRI standard to answer the following questions: what topics are described in the CSR report? What is the scope of communications on CSR? What types of communications are made? With the first dimension of the framework (divided into areas and sub areas), we analyse the content and scope of the communication. The second dimension divides the first one even further, separating the quantitative aspect (which is measured by GRI performance indicators) framed in turn in this architecture, and the qualitative aspect. The qualitative aspect will be measured according to an approach based on content analysis of the text and treated with appropriate statistical software Atlas.ti. The unit of measure counted is the single word and not the sentence. The sample consists of 108 Belgian companies listed on the Euronext Brussels representing 84% of all listed companies (as of April 2007). The object of analysis is the annual report posted on the website of the companies. Some scholars with their studies take a snapshot of the state-of-the-art of CSR in national situations (Hedberg and Von Malborg 2003) in Sweden, (Birth *et al.* 2008) in Switzerland and (Roberts and Koeplin 2009) in Portugal. Swedish scholars are asking why Swedish companies have chosen the GRI guidelines and how this has affected the management of CSR.

Through interviews with businesses, they realised that the same companies prepare the CSR report mainly to appear legitimate to society. The use of GRI guidelines on the one hand serves to increase the credibility of the report, while on the other hand the GRI guidelines provide a useful model to facilitate the preparation of the document. The same scholars have noticed how the CSR report according to GRI guidelines (for the stage of development it has reached) improves internal communication of the company compared to external communication, function for which the report originated in the first place. G. Birth *et al.* 2008 offer an overview of CSR in Switzerland in their study.

The sample consists 300 companies listed on PME Magazine of 2004 through a questionnaire of 25 questions submitted to the same companies based on previous studies. The scholars pose the question as to whether and how the Swiss context favours this type of communication. The survey results show that the communication of CSR is a common practice among Top companies in Switzerland and that the Swiss context, in its uniqueness, promotes social communication which, however, could be further implemented. The situation of companies in Portugal that prepare a sustainability report according to the GRI standard is shown in the study of Roberts and Koeplin 2009.

The sample consists of only 5 Portuguese companies that follow the GRI standard; the small sample allows only a descriptive analysis. The analysis is developed through content analysis and the sustainability report is split into two parts (qualitative and quantitative). The qualitative part is measured using a rating system from 1 to 7 depending on the difficulty in making the measurement. The quantitative part is measured by the number of images, graphs and lists in the report. The analysis also identifies the number of pages in the report, distinguishing between textual and non-textual pages for the three main GRI categories (economic, social and environmental).

There are some who, taking advantage of the opportunity presented by the unfavourable economic situation, aim to measure the progress of CSR performance before and during the crisis (Karaibrahimoglu 2010, Njoroge 2009, Charitoudi *et al.* 2011, Calderon Huerta 2012, Giannarakis and Theotokas 2011, Karaibrahimoglu 2010) and examines the effects that the latest economic and financial crisis has had on the number and scope of CSR projects. Their studies randomly select 100 Fortune 500 companies between 2007 and 2008 and comes up

with 2 indexes for each company so as to record any change between 2007 and 2008. The data for the indexes are taken from the webpages and reports of the companies available on the websites. The data were obtained by applying the method of content analysis, where the absence or presence of information becomes a 0 (absent) and a 1 (if present).

The CSR information of companies analysed are linked to stakeholders, since Karaibrahimoglu 2010 follows the logic of the social contract of Sunder (1997), and are summarised in 29 indexes. The data is processed through the equal weight index, so as to give the same weight to the companies. The data is analysed using SPSS 16.0. The T test is used to see if there is a difference between the two indexes in the CSR projects and whether it is statistically significant. The results show that the projects will decrease due to the crisis and that the decline was greater in the US than in Europe and the rest of the world. However, there are some limitations, such as the subjective evaluation of CSR reports.

Njoroge (2009) in his study focuses on how the crisis has changed compliance with labour standards and CSR investments of multinationals present in Kenya. For the study (Njoroge 2009) used phone interviews first, followed by a questionnaire sent to the companies by email and subsequently analysed data from the Covalence database. The results show that the crisis has a minimal effect on investments relating to workers' rights and that it has a negative effect on the funding of social projects, which are in sharp decline. The decline in funding of social projects by multinationals is linked to the fact that they are leaving Kenya.

Calderon Huerta 2012 poses three questions: do companies decrease the CSR report during the crisis? how does the CSR report signal the changing behaviour of companies? How is participation in the framework on CSR affected by the crisis? To answer these questions, the study identifies a sample consisting of the companies included in the GRI Report list 1999-2011. Specifically, we are dealing with 2790 companies that have published the CSR report in the period 2007-2011. The companies are classified into three categories: Type of report (not GRI GRI referenced and framework used), Level of application of the standard (from A+ to not stated) and Status of the report (self declared or certified by third parties). The data thus classified were treated through the ANOVA test, which showed that the transparency and quality of reports decreased drastically during 2007, 2008 and 2011, deeply marked by the economic crisis.

Giannarakis and Theotokas (2011) want to assess the impact of the economic crisis on the CSR performance of companies. Their analysis covers a period that goes from 2007 (pre-crisis year) to 2010. They use the GRI guidelines as benchmark and focus on the scale that expresses the level of application of the standard, which goes from A+ (maximum level) to C (minimum level). The judgment that expresses the GRI application level is converted into a numerical scale ranging from 6 for A+ to 5 for A, 4 for B+, 3 for B, 2 for C+ and 1 for C, to better analyse changes in the level of performance. The sample consists of 112 companies belonging to 27 different industries. At the end of each year, the Kolmogrov-Smirnov test is applied to see if the data obtained in this way have a normal distribution. As a result of the test's negative outcome, scholars have applied the Wilcoxonsigned-rank test. The Wilcoxon signed rank test is a non-parametric test, equivalent to the T test applicable to non-normal distributions. The test results show that during the period between 2007 and 2008, CSR performance increased. As for the period 2009 and 2010, there is insufficient evidence to conclude that there is a significant difference between the performances of CSR in the two-year period under consideration.

In this study, we have chosen to analyse CSR performance through the content analysis of keywords drawn from the GRI guidelines. This choice is not entirely new, as shown in the study by Gamerschlag *et al.* (2011). In fact, in this study, the three scholars argue that, through the drafting of a social report and its disclosure thereof, companies reduce political costs tied to their activities. To prove this thesis, they make 4 assumptions and build a CSR disclosure index based on GRI. The assumptions are that: CSR disclosure is positively correlated with the visibility of the company; CSR disclosure is positively correlated with profitability; CSR disclosure is positively correlated with a more dispersive structure of shareholders; CSR disclosure is positively correlated with the company's relationships with U.S. stakeholders. The scholars use as sample of 130 companies listed on the German market between DAX, MDAX and SDAX. Observations were made from 2005 to 2008, but the planned 520 observations were reduced to 470. The disclosure index (called CSRTOT) is obtained through the content analysis of environmental and social keywords derived from the GRI standard. The results of

this study claim that, consistent with the theory of political costs, the disclosure of all German companies is affected by their visibility, the ownership structure and the relationship with U.S. stakeholders. Moreover, the increased profitability is associated with greater environmental disclosure. Finally, size and type of industry influence the amount of information on the CSR disclosed. The assumptions that the study wants to verify are:

H0: CSR disclosure does not change during a time of financial crisis

H1: CSR disclosure changes significantly during periods of financial crisis.

The choice of analysing the performance of CSR disclosure is not accidental because, after a careful analysis, we found that the economic, environmental and social information are not always present or comparable over the years in the reports prepared by the companies. The (total) or (partial) lack makes it difficult or impossible to compare the information in time and space. The total or partial lack of information is due to the fact that there is no legal or judicial constraint that forces companies to provide this sort of information. Businesses exploit this gap by providing the information that is more favourable to them. The analysis of CSR disclosure overcomes all these limits. In fact, analysing the contents of the report and counting the frequency of keywords (taken from the GRI guidelines) framed in a system of rules guarantees an objectivity and comparability to the study (in time and space) that is hardly reached by previous studies. Drawing from the studies described above, which measure CSR performance differently in a context of crisis and using the logic of content analysis developed in the work of Gamerschlag *et al.* (2011) (although for other reasons), the following study aims to measure the total disclosure of CSR of companies in the context of crisis.

The keywords used for content analysis are derived from the GRI framework (in the Italian version) and more precisely refer to the environmental and the social aspects. Deriving the keywords from the GRI standard to then conduct the content analysis is not an absolute novelty in the academic world, as shown by the work of Guthrie and Farneti (2008) and Holder-Webb *et al.* 2009. Of all the types of existing content analysis, we use the simplest form that involves counting the frequencies of environmental and social keywords which, when added together, will result in TOT CSR. The keywords that were considered are listed in Table 1.

Table 1. Environmental and social keywords

Environmental keywords (CSRENV)	Social keywords (CSRSOC)	
Recycled	Project(s)	Workforce
Energy consumption(s)	Employee turnover	Forced Labour
Biodiversity	Collective Bargaining	Community
Emission(s)	Collective agreement(s)	Corruption
Effluent(s)	Health at work	Public Policy
Waste(s)	Safety at work	Obedience
Spillage/spills	Training	Fine(s)
Environmental impact(s)	Diversity	Sanction(s)
	Equal opportunities	Product responsibility
	Human Rights	Consumer health
	Discrimination	Consumer safety
	Freedom of association	Child Labour

CSRTOT = CSRENV + CSRSOC

Rules followed to come up with the score:

- the documents were downloaded in pdf format from the Sustainability or equivalent sections of websites of the companies considered.
- to count the frequencies of words, we used the counter included in the pdf reader Adobe Reader™. The counter was used through the Adobe Reader™ function "open full search" with the option "whole words only" enabled.

- in noting the page numbers in which the word is highlighted, we used this option and not the number of the page that appears when opening the documents.
- we globally considered the singular and plural forms as distinct words, but summed together for scoring purposes.
- the titles of paragraphs and tables and their legends are not included in the count.
- the word must be divided by a period or otherwise is considered only once.
- synonyms are not considered.
- the term "financial community" is not considered.
- the term "emission" was considered with reference to environmental issues, including with reference to issuing securities purchased for pollutants.
- words in brackets are also included in the count.
- bullet point lists count as a new period.
- text in legends, figures and tables was not considered.
- the index was not considered.
- questions are included.
- single words included in drawings were not considered.
- the semicolon is considered as another phrase.
- notes are included.
- the GRI table does not count because it lists the indicators and the pages where to find them.
- the generic term has been considered valid for the purposes of the count, with all the possible words that refer to environmental and social aspects.
- in the English version of the reports, we considered the terms in the double singular and plural versions (Energy consumption/s, Emission/s, Effluent/s, Waste/s, Spills/spillage, Environmental impacts/t, Employnets/t), while the other terms were considered in the singular version.
- the symbol * does not mean that the term is absent but that it doesn't match the requirements.
- the frequencies shown are only those that meet the above requirements.
- the final score TOTSDISC is obtained as the sum of TOT ENV + TOT SOCIAL.

References to individual sustainability reports:

- in the analysis of Enel S.p.A., we analysed the CSR report for 2006 in the (Italian/English) version, since the Italian version was not available.
- the Intesa Sanpaolo Group was established in 2007; before this date the sustainability reports were individual.
- impregilo, while preparing the 2002 environmental reports, was excluded due to the fact that it has been applying the GRI guidelines only since 2009 and not since 2006.
- in the analysis of UNICREDITGROUP S.p.A. for the year 2006, we analysed the document Human resources and CSR, while for the year 2010 we referred to the Sustainability report 2010 without analysing the 2010 supplement.
- in the analysis of Stmicroelettronics S.p.A. and Saipem S.p.A., we analysed the English version of the the CSR because there is no Italian version.
- in the analysis of UBI Banca S.p.A., we analysed the document UBI Banca – CSR Report 2010, while for the year 2006 we analysed the document BPU Banca – CSR Report 2006.
- the company Fiat S.p.A. since 1 January 2011 has been undergoing a corporate reorganisation plan that by demerger led to the birth of Fiat Industrial S.p.A. and Fiat S.p.A, but for the year 2010 we were able to analyse the last report before the reorganisation.
- in the analysis of Pirelli & C S.p.A. we analysed for the year 2010 the document Sustainability Report 2010 Volume 3. In the graph on the performance of TOTDISC in the period 2006-2010, the 0 value attributed to the year 2008 is due to the fact that the sustainability report for that period is not available on the website.

2. Definition of sample analysed

The starting sample consists of the 40 largest companies listed on the FTSE MIB INDEX of the Milan Stock Exchange. This sample, though not particularly large, allows us to easily find the sustainability reports on the corporate websites and to analyse carefully the contents while at the same time maintaining the sample's homogeneity in terms of size, turnover, number of employees, standards followed, controls to which the companies included in the sample are subject. The criteria based on which we proceeded to the sample's selection refer to a given timeframe and the other to the standard followed for the preparation of the sustainability report. As regards the timeframe, we considered the years 2006 and 2010 as valid, because they correspond in the Italian context to the two-year period (2006) that preceded the outbreak of the economic and financial crisis, and the two years (2010) that followed the outbreak of the financial and economic crisis. The standard identified (GRI) is not accidental, since it has already been used by several international studies, and within the sample represents the most used standard (although not mandatory). Combining these two factors we obtain the sample to be analysed, which is therefore formed by the companies listed on the Ftse Mib, which publish the sustainability report (or equivalent) in pdf format, according to the GRI guidelines, at least from 2006 or earlier (Table 2).

Table 2. Companies and their sustainability report

Ftse Mib 2012 structure	Sustainability report or equivalent	
	Present	Absent
A2A	Since 2008	
Ansaldo Sts	Since 2010	
Atlantia (Autostrade per l'Italia)	Since 2005	
Autogrill	Since 2004	
Azimut Holding		X
Banca Mps	Since 2002	
Banca Popolare Emilia Romagna		X
Banca Popolare Milano	Since 2003 GBS	
Banca Popolare	Since 2007	
Buzzi Unicem	Since 2001	
Campari		X
DiaSorin		X
Enel	Since 2002	
Enel Green Power	Established in 2008	
Eni	Since 2006	
Exor	Holding company of the Fiat Group	
Fiat	Since 2004	
Fiat Industrial	Since 2011	
Finmeccanica	Since 2010, but since 2007 Finmeccanica Report	
Generali	Since 2004	
Impregilo	Since 2002 Sustainability reports	
Intesa Sanpaolo	Since 2007	
Lottomatica	Since 2007	
Luxottica		X
Mediaset		X
Mediobanca		X
Mediobanca	Since 2006 GBS	
Parmalat		X
Pirelli & C	Since 2005	
Prysmian		X
Saipem	Since 2006	

Ftse Mib 2012 structure	Sustainability report or equivalent	
Salvatore Ferragamo		X
Snam	Since 2006	
Stmicroelettronics	Since 1998	
Telecom Italia	Since 2000	
Tenaris		X
Terna	Since 2005	
Tod'S		X
Ubi Banca	Since 2003 with old name	
Unicredit	Since 2000 Social and Environmental Report	
Total	26	14
Total since 2006	17	23

3. Why the sustainability report

We chose to analyse the sustainability report downloaded from the websites of the companies (see external links) as it represents the document with which the company informs its stakeholders about its economic, social and environmental performance. The information it contains is considered valid despite it not being a mandatory document, because it is unaudited and is accompanied by its certification letters. The certification letter does not certify only the degree to which the companies followed the GRI guidelines, but it also lists a whole series of auditing procedures (interviews, report analyses, sampling of documents that are critical to drafting the report) that the auditing firm applied to ensure the accuracy of the information contained therein. The choice of relying on the internet, besides being a necessity, is validated also by scholars like Holder-Webb *et al.* (2009), who claim that the best way to measure the CSR projects of companies is to obtain data from their webpages and that the web is the most popular and effective method of communication for organisations.

4. Analytical instruments used

The data, once collected (see Table 3), were processed using the open source R statistical software and were entered as numeric vectors through the command vector name = scan (). We calculated the mean using the mean command (vector name), the median using the median command (vector name) and the standard deviation using the sd command (vector name). We then proceeded with a special test (Shapiro-Wilk) checking the normality of the distribution of values by using the shapiro test command (vector name) for both vectors. Having had confirmation of the normality of the distribution of vectors TOTDISC2006 and TOTDISC2010, we used the T test to test the hypotheses previously established, using the command T.test (TOTDISCsocietà2006, TOTDISCsocietà2010, var. equal = TRUE, paired = FALSE).

In addition to a pooled analysis, we also analysed (always for the same timeframe) the individual frequency of keywords related to the same companies. In this case, we found a lack of normality of the distribution, and therefore replaced the T test with the Wilcoxon Rank Sum and Signed Rank Tests calculated with the wilcoxon test command (vector name 2006 and vector name 2010).

This test is widely used in the field of CSR to evaluate the difference in CSR projects between two samples, as shown by the work of Haniffa and Cooke (2005) and Branco and Rodrigues (2008).

Table 3. Data for analytical analyse

Company	TOT ENV 2006	TOT SOCIAL 2006	TOT DISC 2006	TOT ENV 2010	TOT SOCIAL 2010	TOT DISC 2010
Autostrade per l'Italia	31	63	94	53	119	172
Autogrill	17	81	98	53	149	202
Banca Mps	20	96	116	76	145	221
Buzzi	38	124	162	98	162	260
Enel	82	83	165	215	371	586

Company	TOT ENV 2006	TOT SOCIAL 2006	TOT DISC 2006	TOT ENV 2010	TOT SOCIAL 2010	TOT DISC 2010
Eni	120	171	291	59	77	136
Fiat	105	190	295	218	306	524
Generali	40	202	242	92	318	410
Pirelli	52	191	243	66	196	262
Saipem	150	265	415	64	268	332
Snam	135	148	283	70	143	213
Stmicroelettronics	73	120	193	134	155	289
Telecom Italia	71	110	181	105	205	310
Terna	81	150	231	138	301	439
Ubi banca	8	116	124	18	93	111
Unicredit	6	42	48	39	168	207

5. Hypothesis testing

Comparing TOTDISC 20016 with TOTDISC 2010, we found using the Shapiro test that the two samples have a normal distribution P = 0.7857 for sample TOTDISC 2006 and P = 0.2176 for sample TOTDISC2010. We then calculated the T test, which resulted in P = 0.03205. Because P is < 0.05, we reject the hypothesis H0 and therefore accept hypothesis H1 (Table 4). The same analysis was conducted for each individual company by comparing the individual values that when combined result in the TOTDISC 2006 and TOTDISC 2010. In view of the lack of the required normality of distribution, confirmed by the Shapiro Test, we calculated the Wilcoxon Rank Sum and Signed Rank Test, which yielded the results shown in Tables 5.

Table 4. Shapiro Test

TOT DISC 2006	Mean	Median	SD	Shapiro Test	
	198.8125	187	95.08818	W= 0.9669	p- Value= 0.7857
TOT DISC 2010	Mean	Median	SD	Shapiro Test	
	292.195	261	136.0769	W= 0.9269	P-Value = 0.2176
T Test					
T= -2,2484			P Value = 0.03205		

Table 5. Shapiro test for each company listed

TOT DISC Autostrade 2006	Mean	Median	SD	Shapiro Test	
	2.9375	0	6.824706	W=0.4992,	p-value =2.524e-09
TOT DISC Autostrade 2010	Mean	Median	SD	Shapiro Test	
	5.375	1.5	12.58968	W=0.4523	p-value = 8.142e-10
Wilcoxon Rank Sum and Signed Rank Tests					
W = 395.5			p-value = 0.09096		
TOT DISC Autogrill 2006	Mean	Median	SD	Shapiro Test	
	3.0625	1	7.102646	W=0.4647	p-value =1.09e-09
TOT DISC Autogrill 2010	Mean	Median	SD	Shapiro Test	
	6.3125	1	12.41601	W=0.5757	p-value =1.883e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 456			p-value = 0.433		
TOT DISC Banca MPS 2006	Mean	Median	SD	Shapiro Test	
	3.625	1	7.259032	W=0.5656	p-value= 1.426e-08
TOT DISC Banca MPS 2010	Mean	Median	SD	Shapiro Test	

	6.90625	1	13.09853	W=0.5848	p-value =2.432e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 426.5			p-value = 0.2341		
TOT DISC Buzzi 2006	Mean	Median	SD		Shapiro Test
	5.0625	1	9.625026	W=0.5566	p-value =1.117e-08
TOT DISC Buzzi 2010	Mean	Median	SD		Shapiro Test
	8.125	2	13.67538	W=0.6442	p-value = 1.405e-07
Wilcoxon Rank Sum and Signed Rank Tests					
W = 460			p-value = 0.4802		
TOT DISC Enel 2006	Mean	Median	SD		Shapiro Test
	5.15625	1	9.432645	W=0.5945	p-value =3.201e-08
TOT DISC Enel 2010	Mean	Median	SD		Shapiro Test
	18.3125	5	31.8924	W=0.6051	p-value = 4.339e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 378.5			p-value = 0.06983		
TOT DISC Eni 2006	Mean	Median	SD		Shapiro Test
	9.09375	1.5	16.5029	W=0.6117	p-value = 5.263e-08
TOT DISC Eni 2010	Mean	Median	SD		Shapiro Test
	4.25	1	7.963627	W=0.589	p-value = 2.741e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 564.5			p-value = 0.4652		
TOT DISC Fiat 2006	Mean	Median	SD		Shapiro Test
	9.21875	0.5	19.57077	W=0.5447	p-value = 8.125e-09
TOT DISC Fiat 2010	Mean	Median	SD		Shapiro Test
	16.375	3.5	35.18499	W=0.5026	p-value = 2.748e-09
Wilcoxon Rank Sum and Signed Rank Tests					
W = 389.5,			p-value = 0.09093		
TOT DISC Generali 2006	Mean	Median	SD		Shapiro Test
	7.5625	1	16.88469	W=0.5011	p-value = 2.647e-09
TOT DISC Generali 2010	Mean	Median	SD		Shapiro Test
	12.8125	3	25.1876	W=0.5527	p-value = 1.006e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 411.5			p-value = 0.1673		
TOT DISC Pirelli 2006	Mean	Median	SD		Shapiro Test
	7.59375	1	14.83861	W=0.5802	p-value = 2.138e-08
TOT DISC Pirelli 2010	Mean	Median	SD		Shapiro Test
	8.1875	1.5	14.82029	W=0.6068	p-value = 4.558e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 443			p-value = 0.3435		
TOT DISC Saipem 2006	Mean	Median	SD		Shapiro Test
	12.96875	3	27.08348	W=0.5232	p-value = 4.641e-09
TOT DISC Saipem 2010	Mean	Median	SD		Shapiro Test
	10.375	1.5	24.36649	W=0.4648	p-value = 1.093e-09
Wilcoxon Rank Sum and Signed Rank Tests					
W = 548			p-value = 0.6251		
TOT DISC Snam 2006	Mean	Median	SD		Shapiro Test
	8.84375	1	19.51692	W=0.5157	p-value = 3.828e-09
TOT DISC Snam 2010	Mean	Median	SD		Shapiro Test
	6.65625	1	14.31356	W=0.5261	p-value = 4.998e-09
Wilcoxon Rank Sum and Signed Rank Tests					
W = 515.5			p-value = 0.9664		

TOT DISC Stm 2006	Mean	Median	SD	Shapiro Test	
	6.03125	1	10.97059	W=0.6106	p-value = 5.093e-08
TOT DISC Stm 2010	Mean	Median	SD	Shapiro Test	
	9.03125	1	15.70799	W=0.644	p-value = 1.395e-07
Wilcoxon Rank Sum and Signed Rank Tests					
W = 495			p-value = 0.8195		
TOT DISC Telecom 2006	Mean	Median	SD	Shapiro Test	
	5.65625	0.5	11.68569	W=0.5462	p-value = 8.458e-09
TOT DISC Telecom 2010	Mean	Median	SD	Shapiro Test	
	9.6875	1.5	19.54059	W=0.555	p-value = 1.072e-08
Wilcoxon Rank Sum and Signed Rank Tests					
W = 427			p-value = 0.2387		
TOT DISC Terna 2006	Mean	Median	SD	Shapiro Test	
	7.21875	2	12.06096	W=0.6556	p-value = 2.006e-07
TOT DISC Terma 2010	Mean	Median	SD	Shapiro Test	
	13.71875	2	28.59307	W=0.5325	p-value = 5.893e-09
Wilcoxon Rank Sum and Signed Rank Tests					
W = 460.5,			p-value = 0.4813		
TOT DISC UBI 2006	Mean	Median	SD	Shapiro Test	
	3.875	0.5	8.921702	W=0.4843	p-value = 1.749e-09
TOT DISC UBI 2010	Mean	Median	SD	Shapiro Test	
	3.46875	1	8.296849	W=0.4572	p-value = 9.117e-10
Wilcoxon Rank Sum and Signed Rank Tests					
W = 499			p-value = 0.8579		
TOT DISC Unicredit 2006	Mean	Median	SD	Shapiro Test	
	1.5	0	3.75886	W=0.4621	p-value = 1.025e-09
TOT DISC Unicredit 2010	Mean	Median	SD	Shapiro Test	
	6.46875	0	15.3181	W=0.4931	p-value = 2.171e-09
Wilcoxon Rank Sum and Signed Rank Tests					
W = 442.5			p-value = 0.2801		

Conclusions

The cause of the crisis we are experiencing is not only due to economic and social aspects, but, above all, to issues related to values.

Although the recession that started in Italy in 2008 is still not over, we can say that society did not give much importance to the warning signs of the crisis of values that we are experiencing (see among all the Enron case). Values have been set aside because absolute priority was given to profits without thinking of anything else but how to increase them.

The rediscovery of the key importance of values in the economic relations and the rebuilding of trust between stakeholders in social relations are the only tool that will allow us, albeit in the long term, to rebuild a better society that is economically and socially sustainable, to which future generations will be able to give their contribution.

This is the logic behind our study, which was presented and with which we want to highlight that companies, because they are businesses formed and governed by men, are bearers not only well-being and development, but also of values. Values are therefore central and are reflected in all actions and decisions that the companyand its governance take daily. The values of which they are bearers find representation in sustainability reports, which explains why we analysed them.

In a context of crisis, businesses are led to reduce CSR activities immediately, and the analysis conducted here also shows how the disclosure of CSR changes significantly when comparing 2006 (pre-crisis year) with 2010 (year of crisis).

The result shown here is one of many truths, as there are cases of companies mentioned in this study that even in a context of crisis continued to invest in CSR and in the values that it represents. When looking at the available figures, these firms have suffered from the financial and economic crisis of 2006 less than their competitors (see primarily Whole Foods Market). This study can be further developed by updating the research data, extending the period of analysis and analysing the data from other countries.

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The Mediating Effect of Inflation on the Effect of Tradeliberalization and Government Spending towards Welfare

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Abstract:

The purpose of this study is to find the effect of trade liberalization and government spending on welfare, both directly and indirectly, through the mediation of the inflation rate.The research method used in this research is the Library Research, as a form of research that utilizes the available literature in the form of books, journals, data and other empirical studies. These materials can be obtained from the library directly or Internet. The data used in this research is secondary data from multiple data sources, such as the International Financial Statistics of the IMF, World Bank, Bank Indonesia report, Central Bureau of Statistics (BPS) and other sources. All of the data used in this study are the annual data for each research variable from 1986 to 2015.The result show that there is significant influence between the variables Liberalism trade and government spending to the inflation rate. Similar results were found on the influence of trade liberalism and the level of inflation on welfare having significant influence. But unlike the effect of government spending on welfare who has no direct influence. However, it was found that the rate of inflation mediating variables influence trade liberalism and government spending on welfare.

Keywords: trade liberalization; government spending; welfare; inflation

JEL Classification: B4; D6; E2; E5; E6; I3; N3

Introduction

In the globalization era, today, there are many issues related to the trade liberalization dominate the commodity trading in international market, as occurred in Indonesia. It is occurred to face the trade and investment liberalization in 2020 for the developing countries and in 2010 for the developed countries. In general, the trading sector has a considerable contribution in the economy of every country, especially for Indonesia, it is the second largest sector, after the household consumption, towards the Gross Domestic Product (GDP). Nonetheless, in general, the developing countries, including Indonesia, admit that the policy in trade restriction using tariff is not only to protect the domestic import substitution industry but also to increase the government revenue. It is worried that the domestic import substitution industry is not able to compete with the similar industry in International market due to the relatively low competitiveness. The low competitiveness can be due to the relatively low efficiency and productivity.

Furthermore, in recent years, the trade liberalization is increasingly promoted as one of the best mechanisms to reduce the poverty rate in the world that is recently increasing (Weisbrot, Rosnick and Baker 2002). Therefore, the effect of trade liberalization on the domestic exchange rate, tax revenue and future welfare is a very important issue in practice. Accordingly, this research tries to observe and analyze these relations, especially in Indonesia, with a purpose to find the effect of trade liberalization and government spending on welfare, both directly and indirectly, through the mediation of the inflation rate.

1. Literature review

According to Salvatore (2004) in Nongsina and Hutabarat (2007), the theoretical backgrounds of international trade that become the background of the trade liberalization are, among others, comparative advantage theory and factor endowments theory. David Ricardo makes perfection on the absolute advantage theory by Adam Smith by expressing the comparative advantage theory. The comparative advantage theory states that under the

conditions of free trade, even if one of the countries is absolutely less efficient than other countries in producing both goods, while another country, in fact, has an absolute advantage in producing both goods, but these two countries are still possible to conduct trade and gains from trade can still be received by both parties.

The first country (absolute disadvantage country) should specializes in producing and exporting commodities which have the least absolute disadvantage (these commodities are called as the comparative advantage) and imports the commodities which have the most absolute disadvantage (these commodities as the comparative disadvantage). Conversely, the second country (absolute advantage country) will specialize in producing and exporting of the commodities which have the most absolute advantage (these commodities are called as the comparative advantage) and importing the commodities which have least absolute advantage (these commodities are called as the comparative disadvantage).

Therefore, according to Salvatore, in the international trade, this Ricardian model illustrates that the benefits of the trade would promote international specialties. Each country will shift its resources from the inefficient sector or industry to the relatively more efficient sector or industry. The Ricardian Model also emphasizes that it is not only all of the the participating countries that will benefit from this trade, but all individuals will be better because, according to Ricardian, international trade does not affect the distribution of income.

Many economists believe that the international trade theory (*Ricardian theory and Heckscher_Ohlin model*) has failed to provide a complete definition concerning the structure of world trade (Chacholiades 1978). In general, it said that the data of world trade consists of several empirical rules that seem to be inconsistent with the traditional trade theory, that rises a variety of alternative theories.

The things that cause the inconsistency are, first, the fact shows that more than half of the world trade occurs between countries that have similarities in the factor of abundant production in their respective countries (*trade among similar economies*). Second, most of the world trade, especially for the trade between the developed countries, have the exchange of the relatively similar goods or is also called as inter-industry trade. Third, the current world trade indicates an increasingly liberal way.

Boediono (2001) states that there are five benefits of the opening of trade liberalization. First, the market access will be broader, so that it allows to gain efficiency since trade liberalization tends to create new production centers as the locations for interrelated and mutually supporting industrial activities, so that the production costs can be reduced. Second, the business climate has become more competitive, thereby reducing the activities which are 'rent seeking' and encouraging employers to increase productivity and efficiency, not how to expect to get facilities from the government. Third, the more liberal trade and investment flows facilitate the technology transfer process to increase productivity and efficiency. Fourth, the more liberal trade provides the correct price signal, so that it increases the efficiency of investment. Fifth, the more liberal trade increases consumers' welfare because it opens several new options. However, in order to run the trade liberalization smoothly, a competitive market needs a support of legislation governing the fair competition and prohibiting the monopolistic practices.

The result of a comparative study estimates the acquisition of benefits between the scenarios of trade liberalization process. Feridhanusetyawan and Pangestu (2003) states that the implementation of liberalization commitments through the Uruguay Round (WTO) that is followed by the unilateral liberalization policy, internally, would be beneficial for Indonesia compared with the implementation of the Uruguay Round as a single implementation. Meanwhile, the establishment of AFTA is estimated only to provide relatively small additional benefit for Indonesia or other ASEAN member countries, since the ASEAN region and market are also relatively small. In addition, the trade of ASEAN countries is more conducted with the non-ASEAN countries, whereas the tariff reduction agreement applies only to the ASEAN member countries. Consequently, the tariff reduction through AFTA agreement becomes ineffective.

Government spending

Under a closed economic condition, government policies are only directed at only one balance, namely the internal balance, in which the policies are only directed at internal purposes only, such as inflation and unemployment rates, and the expected economic growth rate. However, in an open economic condition, it

becomes more complex, since any policy made should always considers its impact on both balances, internal and external balances.

The main instrument used in macro-economic policy is the fiscal policy instrument (government spending and taxation) and monetary policy instrument (central bank controls the money supply). Both policies are used to achieve the macro-economic balance that requires balances in three key sectors in the economy, they are:

- *Balance in the output market*: the amount of goods and services offered is similar the amount of goods and services demanded, that is usually illustrated in IS curve.
- *Balance in the money market:* the amount of goods offered is similar to the amount of money demanded, that it is usually illustrated in LM curve.
- *Balance in the balance of payment*: the amount of the deficit (surplus) of the transaction runs similar to the surplus (deficit) of the capital transaction, or that the balance of payment is balanced or has its formulation equals to 0 (zero), and it can be illustrated in BP curve.

The macro-economic balance is achieved if the balance on those three balances are also achieved, and if it is drawn on a diagram, the macroeconomic balance is achieved if those three curves (IS, LM, and BP curves) intersect. The subsequent effect on the balance of payments (*external balance*) creates uncertainty, since the increase in government spending has two opposite effects, first, the increase in national income as a result of the increase in government spending will increase demand for imports which will, in turn, reduce the trade balance; second, the increase in the interest rate as the impact of the increase in government spending will increase the capital inflow and, in turn, will increase the capital transactions in the balance of payment. Both effects are opposite to each other, so that the ultimate effect of fiscal policy on the balance of payment depends on the strength of these two effects. If the effects on the trade balance is greater than the effect on capital transactions, the balance of payment will be reduced, and vice versa if the capital transactions have a greater effect. It really depends not only on how great capital in- and out-flows, but also on the elasticity of the comparison of the interest rate on money demand and the capital flow.

On the other hand, the increase in government spending will result in the increased domestic demand, while in the short-term, the increase in demand can not be responded quickly by the national production, so that the price of goods will increase, which means that the inflation rate increases (*demand pull inflation*). As it is known that the increase in government spending has a multiplier effect that will encourage the domestic aggregate demand, both for agricultural products and the manufactured goods, and ultimately, the economic growth will be greater, as well as to the tax revenue and income distribution that will, in turn, improve the welfare of the society.

Previous research

A study on the effects of international trade liberalization on domestic prices in Korea conducted by Yang (1999) had estimated the effects of competition from trade liberalization on the behavior of domestic prices of the manufacturing industry in Korea by using the panel data from 18 manufacturing industries from 1983 to 1995. The theoretical framework used was based on the oligopolistic model from the price determination in open economy. The results showed the negative effects and avoided the import competition in domestic prices in Korea. The implementation of the policy showed that the trade policy should be described as a viable policy option to improve the domestic competition.

There are two groups of empirical studies on the impact of trade liberalization on domestic prices in developing countries. The first group consists of four research funded by the World Bank led and reported by Tybout (1992) and are also mentioned by Rodrik (1995). These studies, which generally used the cross-section data, have studied each other and find some supporting answers that trade liberalization can reduce the price-cost margins. They showed that it is as an indirect evidence of the impact of the competition of trade liberalization on the domestic price level. However, the weakness of the studies is that the use of cross-section data in the middle of 1980s, which was still the early stage of trade liberalization in the developing countries, that trade liberalization in developing countries was just beginning to be more serious in the middle of 1980s and was

continued until the middle of 1990, and at the same time, there were only limited countries included, they were Turkey, Cote d'Ivoire, and Mexico. The second group of the studies are slightly different, they are Yang and Hwang (1998). By using the time series data, they studied and found a positive reaction on the domestic price level to the external changes or to the price of imported goods during the period of trade liberalization with case studies on manufactured goods. However, the studies also have a weakness that is the difficulty in controlling other factors before and after the period of trade liberalization that could also affect the domestic price level that made it difficult to determine exactly whether the change in the domestic price level was almost certainly the impact of the competition of trade liberalization.

Tovar (2004) studied the effect of welfare of trade liberalization through the exchange rate by using a case study from the car industry in Columbia. He found that trade liberalization is characterized by the decreasing import duties on cars for an average of 38% that reduce the price-cost margins about 23% for cars in the country as a result of the increased competition in the country and reduction in production costs due to the increased efficiency level, however, the market structure has not changed. Furthermore, it led to the improved consumer welfare because the monetary gains can by utilized by consumers as a result of the reduced domestic price level and the increasing variety of goods that can be consumed.

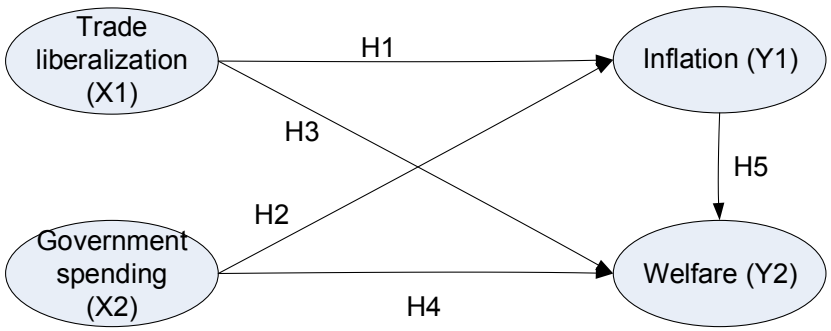
Ilham (2003) states that liberalization as the use of the more intensive price mechanism so as to reduce the anti-export bias of the trade regime. He also stated that the liberalization also tends the more reduction in market intervention, so that the liberalization can describe the situation of the increasing open domestic market for foreign products. The accelerating development of market liberalization occurs because of the support of the revolution in technology, telecommunications, and transportation that overcome the space and time contraints (Kariyasa 2003).

2. Methodology

The research method used in this research is the Library Research, as a form of research that utilizes the available literature in the form of books, journals, data and other empirical studies. These materials can be obtained from the library directly or Internet. The data used in this research is secondary data from multiple data sources, such as the International Financial Statistics of the IMF, World Bank, Bank Indonesia report, Central Bureau of Statistics (BPS) and other sources. All of the data used in this study are the annual data for each research variable from 1986 to 2015.

For estimation models used in this study is a model of simultaneous equations (Simultaneous Equation Model) to see the effects of direct and indirect effects of trade liberalization and government spending on domestic inflation rate and the level of well-being with the hypothesis that illustrated in the conceptual figure below:

Figure 1. Conceptual Framework



3. Case studies/experiments/demonstrations/application functionality

3.1. Analysis Result

Testing Assumptions

The assumption that must be met prior to SEM analysis is the assumption of normality, absence of outliers, and linearity. The multivariate normality assumption was tested with the help of software AMOS 6. normality test results obtained critical value ratio of 0.975 to the critical value for Z-score with α 5% is equal to 1.96. Because the absolute value of CR for multivariate amounted to 0.975 <1.96 then the multivariate normality assumptions are met.

To test whether there is an outlier, it can be seen with mahalanobis distance (Md). Mahalanobis distance is evaluated using a value of 58.268. Mahalanobis distance with the most distant observation point is the value Md = 38.948 respondents. When compared with the value of 58.268 then the value Md furthest <58.268, there is no indication of multivariate outlier. Testing was conducted by the assumption of linearity Curve Fit. Linearity test results shows all significant linear model for the Sig <0.05 so it was concluded that the assumption of linearity have been met.

Goodness of Fit

Results of testing the overall goodness of Fit models, according to the results of the SEM analysis, to determine if a hypothetical model supported by empirical data, are given in Table 2 below:

Table 1. Results of Testing Goodness of Fit Overall Model

Criteria	Cut-of value	Result Model	Information
Chi Square	Small	80.784	Good
p-value	≥ 0.05	0.298	
CMIN/DF	≤ 2.00	1,268	Good
RMSEA	≤ 0.08	0.046	Good
GFI	≥ 0.90	0.936	Good
AGFI	≥ 0.90	0.928	Good
TLI	≥ 0.95	0,979	Good
CFI	≥ 0.95	0.997	Good

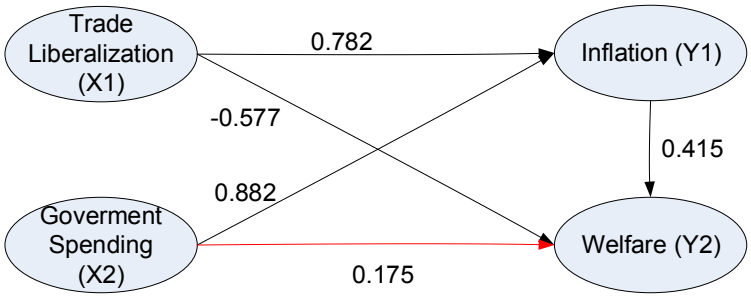
The test results based on the Goodness of Fit Overall Table 1 shows that all the criteria indicate a good model. The best criteria are used as an indication of the good of the model is the value of Chi Square / DF is less than 2, and RMSEA were under 0.08. In this study, the value of CMIN / DF and RMSEA has met the cut-off value. Therefore, the model SEM in this study fit and unfit for use, so do the interpretation for further discussion.

Structural Model

Table 2. Model Path: Direct Effect

No	Correlation	Coefficient	P-value	Conclussion
1	X1 betweenY1	0.782	0.010	Significant
2	X2 between Y1	0.882	0.005	Significant
3	X1betweenY2	-0.577	0.031	Significant
4	X2 between Y2	0.175	0.413	Non Significant
5	Y1 betweenY2	0.415	0.007	Significant

Figure 2. SEM Structural Models: Direct Effect



Based on Table 2 and Figure 2 can be presented structural model test results as follows:

- Effect of Trade Liberalization (X1) on Inflation (Y1), structural coefficient obtained for 0.782, and a P-value of 0.010. Because the P-value <0.05, and the coefficient is positive, indicating that there is significant and positive between Trade Liberalization (X1) on Inflation (Y1).
- The effect of government spending (X2) on Inflation (Y1), structural coefficient obtained for 0.882, and a P-value of 0.005. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between government spending (X2) on Inflation (Y1).
- Effect of Trade Liberalization (X) to Welfare (Y2), structural coefficient obtained at -0.577, and a P-value of 0.031. Because the P-value of <0.05, and the coefficients are negative, indicating that there is significant and inversely between Trade Liberalization (X) to Welfare (Y2).
- The effect of government spending (X2) The Welfare (Y2), structural coefficient of 0.175, and P-value 0.413. Because the P-value> 0.05 indicates that there is no significant influence of government spending (X2) The Welfare (Y2).
- Effect of Inflation (Y1) The Welfare (Y2), structural coefficient obtained for 0.415, and a P-value of 0.007. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between inflation (Y1) The Welfare (Y2).

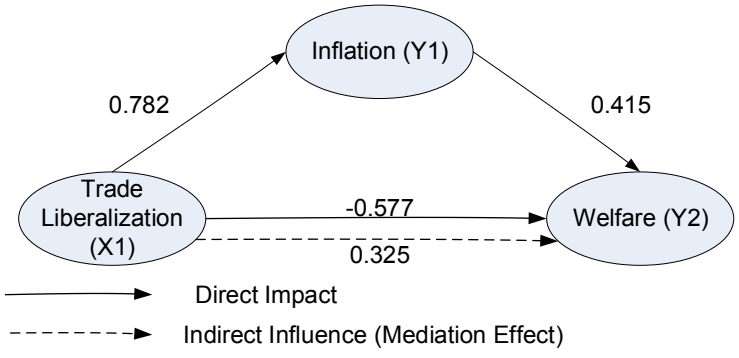
Testing mediation obtained from several study directly influence the form of mediation. Here is presented the test results of mediation by using Sobel test:

Table 3. Effect of Path Model Mediation

Mediation	Influence Tested	Coeffisient	CR	*P-value*
Y1	X1 betweenY2	0.325	2.009	0.045
Y1	X2 between Y2	0.366	2.209	0.030

Figure 3. Mediation Inflation Effects on the Welfare Effects of Trade Liberalization

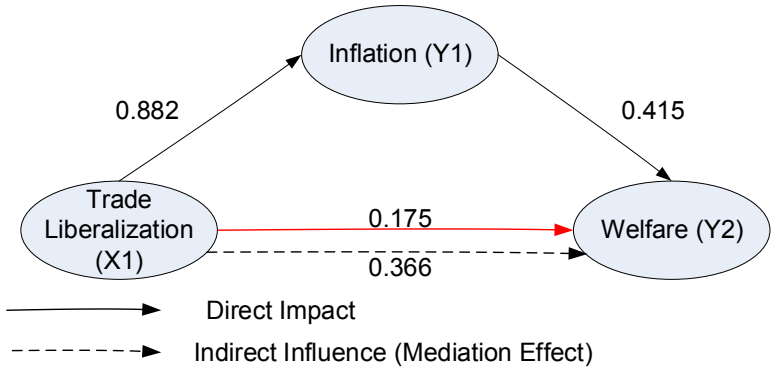
A. Mediation Inflation Effects on the Welfare Effects of Trade Liberalization



Sobel Test Results in Table 3 and Figure 3 shows that the coefficient of Indirect Influence by 0.325, and the value of CR for 2.009> 1.96 and P-value of 0.045< 0.05 indicates that inflation (Y1) mediates the effect of trade liberalization on Welfare (Y2). Given the marked positive coefficient indicates that the higher the Trade Liberalisation will result in the higher Welfare (Y2), if mediated Inflation (Y1) were also higher. Thus, inflation (Y1) as a variable as mediation the relationship between trade liberalization Welfare (Y2).

Figure 4. Mediation Inflation Effects On the Welfare Effects of Government spending

B. Effects of Inflation Mediation in the Welfare Effects of Government spending



Sobel Test Results in Table 3 and Figure 4 shows that the coefficient of Indirect Influence by 0.366, and the value of CR for 2.209> 1.96 and P-value of 0.030< 0.05 indicates that inflation (Y1) mediates the effect of government spending on welfare (Y2). Given the marked positive coefficient indicates that higher government spending will result in the higher Welfare (Y2), if mediated Inflation (Y1) were also higher. Therefore, inflation (Y1) as a variable as mediation relationship between government spending on welfare (Y2).

3.2 Discussion

The results showed that trade liberalization has positive and significant effect directly on domestic inflation. Although it is significant, but the form of the effect is not consistent with the hypothesis (theoretical basis). It is hypothesized that the effect of trade liberalization on domestic inflation is negative, and the results of the analysis indicate that trade liberalization has positive and significant effect on domestic inflation. Theoretically, the increased import as the result of the eliminated or reduced import tariffs, which describes the higher degree of economic openness, will encourage the increase in domestic competition in the country that will ultimately lead to reduce the domestic prices. The reduction shows that the domestic inflation rate is also decreased. Empirically, it is possible if the exchange rate is measured by changes in the exchange rate itself in the structural equation. However, if the exchange rate is measured by the nominal exchange rate itself, empirically, in this study, it was found that trade liberalization resulted in the increased domestic inflation rate.As mentioned earlier, that the higher the degree of trade liberalization which results in reduction in the domestic prices of imported goods has a response to high domestic demand to the relatively cheap imported goods (the price elasticity on the domestic import demand is very elastic), so that it rises the effect of demand substitution from the domestic goods to the imported goods, while the domestic production of import substitution is decreasing because some production are not able to compete with similar imported products. This has led to excess demand in the domestic market which, in turn, will increase the domestic inflation rate. This phenomenon is called as *demand pull inflation*.

In addition, another thing that causes the increased domestic inflation is the high cost economy in Indonesia that has not been reduced yet. The high cost economy includes the convoluted bureaucracy, levies and corruption, all of which will have an impact on the more increasing cost of production and finally on the increasing price of goods or called as *cost-push inflation*. It is also found that government spending has a direct significant and positive effect on domestic inflation rate. It describes that government spending is still dominated

by the expenditure on apparatus (formerly recurrent expenditure), while the proportion of government spending on capital expenditure is relatively small, although it is realized that the multiplier effect of government spending is greater if it is allocated to the relative capital expenditure instead of the expenditure on apparatus. The increased government spending will lead to the increase in domestic aggregate demand which, in turn, will increase the domestic inflation rate.

Furthermore, the analysis shows that trade liberalization has a significant negative effect on the welfare of the society, both directly and indirectly. It is hypothesized that the effect of trade liberalization on the welfare of society is positive, which is indicated by the reduction on the unequal distribution of income, but the analysis shows that the trade liberalization has a significant negative effect on the welfare of society which is proxied/substituted with unequal distribution of income, which means that the lower the unequal distribution of income, the happier and the more prosperous the society.Theoretically, and supported by some of the results of earlier findings, the higher the degree of trade liberalization of a country will encourage the domestic competition that will, in turn, drive every industry to improve its efficiency by reallocating its resources to the sectors based on their comparative advantage, so that the cost of inefficiency results in low welfare can be eliminated.

According to Davis (1996), the trade liberalization policy for developing countries is implemented in order to gain the two promising benefits. First, that the trade liberalization policy will increase the aggregate income of the country. Second, the trade liberalization policy promises the consequence of internally income distribution to be more equitable.However, this study found the opposite, where the trade liberalization policy simultaneously will cause the higher unequal distribution of income, resulting in the decrease in economic welfare of the society.This finding is in line with the result of the study conducted by Amang and Sawit (1997), which warned that the impact of free trade is quite serious for Indonesia, not only in the economic but also in the non-economic fields. The rapid and excessive movement of the factors of production such as labor, land, capital, within a relatively short period of agriculture and service sectors to the manufacturing sector as a result of trade liberalization policy, which would create new problems that are more difficult and expensive to handle. It is almost impossible to build urban infrastructures that are adequate to accommodate rapid urbanization, so that it will raise the squalor and poverty problems in the city, urban density, insufficiency in settlements, parks, and clean water (quality and quantity), the deterioration of the environment and the increase in criminal actions. In addition, the distribution of income of the society will be more unequal.

In addition, Acharya and Cohen (2008) have conducted a research on some of the latest findings by using a general equilibrium model that measures the impact of trade liberalization on household welfare. They made some modifications in the standard neo-classical model and applied it to the characteristics of the rural economy in the South Asian region where there was still only a few research conducted on policy models. Furthermore, they concluded that a combination of liberalization of imports and exports would have an impact on high economic growth, but the pattern of income distribution remains and is not pro to the poor people. The analysis showed that government spending does not significantly affect the welfare, but is indirectly significant in increasing the unequal income distribution. It indicates that the increase in government spending is less directly in contact with the public but more in improving the welfare of a few people, or in other words that government spending is more on improving the economic growth rather than redistributing the income. It can be seen in the increase in government spending from 2006 to 2008, in which the expenditure on apparatus was increased by 55.45% while the capital expenditure was only increased by 2.05% and spending on goods was increased by 2.55%. In addition, about 17.5% of the increase in government spending was in the form of indirect expenditure (apparatus) and was only 0.57% of the increase in government spending in the form of capital expenditure. The increase in government spending was dominated by the increase in fuel subsidy about 63.16%, which is only enjoyed directly by the upper-middle class income people. The impact is the increasing inequality in the distribution of income.

Conclusions

Based on the results of analysis show that there is significant influence between the variables Liberalism trade and government spending to the inflation rate. Similar results were found on the influence of trade liberalism and the level of inflation on welfare having significant influence. But unlike the effect of government spending on welfare who has no direct influence. However, it was found that the rate of inflation mediating variables influence trade liberalism and government spending on welfare.

In connection with the positive impact of trade liberalization on domestic inflation, the government should take the domestic price stabilization policy in order to have no impact on economic growth decreases. The rising level of domestic inflation as a result of trade liberalization is because the concentration of the domestic market by way of several industry mergers so that the greater economies of scale. On the one hand this can lead to a policy of price levels and profit margins are increasing and on the other hand can reduce costs through economies of scale these factors. For further research with the topic of trade liberalization can use the *cross-section* data with data panel in order to review and compare the effect of trade liberalization in each country or each region in Indonesia. It is also expected that the future researcher can add some other relevant variables, such as the impact of liberalization on the environment.

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Public-Private Partnership Development Specifies in Kazakhstan

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Abstract

The relevance of the study is determined by a need to implement new forms of cooperation between the state and the private sector, viz. public-private partnership mechanisms (hereinafter referred to as PPP) due to the limited the state financial capacity to carry out long-term projects in modern conditions. The purpose of this research is to study special aspects of mutually beneficial and effective government and business partnership development in Kazakhstan. As part of this study, an analysis of the current PPP development status in the Republic of Kazakhstan has been carried out; institutional and legislative framework of PPP has been defined. This study reveals that it is necessary to provide a set of measures that will contribute to forming a ready PPP market in Kazakhstan, attractive for both domestic and foreign investors.

Keywords: energy sector; public-private partnership; legal framework; infrastructure facilities

JEL Classification: H420; H440; L330

Introduction

In recent years there has been a growing interest on the part of the government to the private sector in terms of using its potential for financing, creating, and implementing projects aimed at infrastructure development. Studies

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have shown that as of today, a considerable experience in the implementation of PPP projects in various industries has been obtained, particularly in the fields of industrial infrastructure, innovation sector, transportation, the social sphere, and in the sphere of public services. The use of PPP mechanisms confers a number of advantages, both for the state and for business development. For the private sector, new investment opportunities and, therefore, new sources of income are offered, as well as the opportunity to participate in major projects. On the other hand, PPP involves the private sector resource and intellectual potential utilization in the areas of traditional government liability. However, despite these facts, the mechanism has not been properly developed in Kazakhstan.

Public-private partnership projects in various forms are actively gaining popularity in many countries as a tool for creating new infrastructure facilities and providing services for public works. Despite the fact that, over the last decades, this phenomenon has been presented as a kind of invention, PPP has a long-standing tradition in many countries of the world.

At the present stage, there is a special increase in infrastructure investment using PPP mechanisms in the developing economies of Southeast Asia; thus, China accounts for up to 90% of such transactions. As for Europe and the United States, an uneven use of PPP is observed: due to intensive processes of the infrastructure sectorrestructuring and application of the relevant legislation, the UK, France, and Spain are the leaders of applying PPP mechanisms in Europe.

It is no coincidence that in the framework of the Message of President of the Republic of Kazakhstan – Leader of the Nation Nursultan Nazarbayev (2012) to the people of Kazakhstan 'Strategy' Kazakhstan-2050': a new policy of the established state', a comprehensive support for entrepreneurship as the driving force of the national economy is provided, including creation of a new PPP model 'Strong business – strong state'.

In accordance with the state program of industrial-innovative development for 2015-2019, the industrial development of the country is defined as a basic condition for the national economy growth, its stability and balance (RK SPIID 2014). A successful realization of industrial-innovative development of the national economy should primarily be based on mutually effective partnership of government and business, particularly in the priority sectors of its development, leveraging the experience of public-private partnership (PPP) of highly developed countries.

In Kazakhstan, under the conditions of growingsocial needs for infrastructure facilities and quality of their services, the government financial resource insufficiency for renovation and creation of infrastructure facilities, the use of PPP mechanisms can provide fulfillment of a number of tasks in the fields of the traditional government liability, will allow realizing and developing the potential of private investors and raising funds of institutional investors.

The use of PPP mechanisms in Kazakhstan will not only increase the supply of resources for infrastructure projectsreducing the budgetary expenditures at the same time, but also give an opportunity to provide better services. The private sector, given the opportunity to participate in major projects, will discover both new investment opportunities and new sources of revenue. It is important to note that PPP is an important anti-crisis tool to overcome the crisis through the mechanism of business and economic recovery stimulation.

It should be noted that there is much concern about the issue of infrastructure development in both developed and developing countries. According to the OECD and McKinsey & Co estimates, needs for infrastructure investment globally till 2030 amount to 57-67 and 75 billion USD, respectively (OECD 2007, Dobbs *et al.* 2013). In this regard, many countries are increasingly turning to public-private partnerships as a meaningful alternative to building and reconstruction of the required infrastructure and provision of public services. Also, it is worth noting that PPP is seen not only as a tool to attract investments in infrastructure, but also as a tool to improve the efficiency and quality of public services.

1. Materials and methods

The methodological basis of the study is a variety of approaches and methods that are widely used in modern science. In course of studying the issue, the methods of analysis and synthesis were used. Analysis allowed resolving the issue under consideration into its elements, and synthesis made it possible to compound the

elements obtained while analyzing into a single whole. In this study, these methods will be made use of most actively because all the work will be based on studying international experience of cooperation between the government and business, identifying problems and elaborating new approaches in the development of public-private partnership in Kazakhstan. The methods of induction and deduction, the methods of generalizing indicators and statistical analysis have allowed revealing a trend in the development of PPPs. Currently, in economic statistics, there are different ways to study socio-economic phenomena, to determine the relationship and interdependence between various factors and their utilization efficiency. To find the internal and external factors that exert a favorable or a negative impact on PPP development, SWOT-analysis has been carried out.

As part of the study, a theoretical overview of the existing research has been provided, including foreign authors, an analysis of the current situation on the implementation of PPP projects in priority sectors of the industrial innovative development.

Thus, the use of these methods has allowed for development of modern approaches to the formation of public-private partnership mechanisms in the priority sectors of industrial innovative development in Kazakhstan.

2. Literature review

The history of public-private partnership dates back several centuries, so that the first concession project in France was executed as early as the middle of the XVI century, whereas in the UK – in the XVII century. It should be noted that before the First World War, railways, highways, and other facilities were built at the expense of private investors in exchange for an expected return on the investment, including facilities such as the Suez Canal, the Trans-Siberian Railway.

Subsequently, however, the governmental investment became the main financial instrument due to the fact that the European infrastructure restoration destroyed during the Second World War was impossible to carry out with private investment. It was in the 80s of XX century when due to the global economic recession the fiscal capacity of states was reduced, on the one hand, and the amount of underutilized capacities of the private sector increased, on the other hand, when there were objective conditions for private sector involvement in infrastructure development on project financing principles.

The issues of public-private partnership are considered in works of such scholars as Varnavsky, Klimenko, and Korolyov (2010), Solovyov (2012), Delmon (2010), Sazonov (2012), Knaus (2008), Yescombe (2008), Rubinstein (2008), Foster *et al.* (2009), Gassner (2009), and a number of analytical summaries (ECE/CECI/4 2008, Standard & Poor's 2005, 2007).

The theoretical basis of public-private partnership problems has been formed by the works of Abdymanapov (2015a, 2015b), Abdymanapov and Abiesov (2014), Abdymanapov and Abiesov (2014), Abdymanapov, Toxanova and Galiyeva (2016), Toxanova, Galiyeva and Abildina (2015), Mataev (2011), as well as by laws and regulations governing the state and private business financial cooperation in the implementation of investment projects (SPAIID 2010, PDPPP 2011, Resolution of the RK Government No.21, 2005; Concession agreement 2005, RK Law No.373-II 2003, RK Law No. 167-III 2006, RK Law No. 131-V 2013, RK Law No. 379-V 2015, Regulations for submission, examination and selection of concession projects 2010)

At present, there are several approaches to defining a public-private partnership. Thus, Jeffrey Delmon (2010) defines it as 'any contractual or legal relationship between public and private entities in order to improve and/or expand infrastructure services, except contracts for government order (government procurement)'.

Varnavsky (2010) argues that 'PPP is a legally arranged (usually for a fixed term), implying co-investment and risk sharing, system of relations between the government and municipalities on the one hand, and citizens and legal entities on the other hand, the subject of which are objects of government and/or municipal property, as well as services provided and delivered by the state and municipal authorities, organizations, institutions, and enterprises'. PPP emerged as a legal form of cooperation, which can prevent failures of both the market and the government, and combine the best qualities of both parties in such a way as to obtain a synergistic positive effect (Rubinstein 2008). Given the existing definitions of the 'public-private partnership' term, it can be defined as follows: a public-private partnership is a form of interaction between the public and private sectors, whereby

certain obligations, rights, risks, and responsibilities for providing certain public services are transferred to private business (Abdymanapov and Abiesov 2014).

To date, the world has accumulated a considerable experience in implementation of PPP projects in various sectors. In general, the international experience in the PPP field should be grouped on two grounds: the countries where the development of PPP mechanism has had a long history and is based on the experience of specific projects, and the countries where PPP is implemented by creating an appropriate legislative framework.

The first group includes some of the most developed Western European countries. PPP is the most actively developing in the UK, France, and Spain because it is in these countries where the processes of infrastructure sector restructuring have been the most intensive, and the legislation has been substantially amended for these policy objectives.

The most typical experience for countries implementing PPP through legislative changes (the second group nominally) should be considered the experience of South Korea, which introduced a program of public-private partnerships with the adoption of a law channeling private capital into social capital investment in 1994.

Despite a large amount of research in the PPP field, including assessing the economic efficiency of projects, there has been no research in the field of PPP development specifities identification in the Republic of Kazakhstan, identification of the problems faced by the PPP in the Republic of Kazakhstan, sectoral and regional specificities.

3. Results

Following independence in 1991, the Republic of Kazakhstan had large reserves of natural resources and energy, industrial and transport potential, while public-private partnership was seen mainly as an element of managing state assets.

The main legal acts regulating these relations were the Civil Code of the Republic of Kazakhstan, Laws of the Republic of Kazakhstan 'On Privatization', 'On Joint Stock Companies', 'On Public Procurement' (RK Law No. 2721, 1995; RK Law No. 415-II, 2003; RK Law No. 303-III, 2007).

The first legal framework regulating public-private partnership in Kazakhstan offered investors a single instrument, *i.e.* concession. For this purpose, the First Law of the Republic of Kazakhstan 'On concessions' was adopted, which was repealed in 1993. It regulated the organizational, economic, and legal conditions of granting facilitiesinto concession only to foreign investors in the territory of the Republic of Kazakhstan (RK Law No. 161-V, 2014).

At present, various state propertiesare leased (lease of non-housing stock, equipment, land) or are in trust on the basis of concluded contracts.

'Pioneers' of contracts where the 'concession'term was used were the projects of Kazakhstan's gas transportation system management transfer to JSC 'Intergas Central Asia' and granting Shulbinsk, Ust-Kamenogorsk, and Bukhtarma hydroelectric power plants (HPPs) into concession. Later on, concession was used for project implementation in the transportation and power infrastructure: the construction of railway line 'Shar – Ust-Kamenogorsk' and power line 'North Kazakhstan – Aktobe region'.

A new Law of the Republic of Kazakhstan 'On Concessions' was adopted on July 7, 2006. This was an important step in creating the legal framework for implementing the country's concession mechanism, i.e. one of the PPP types.

The adoption of the Law established the legal framework for implementation of investment projects using the concession mechanism. In addition, the concession legislation has been improving taking into account international best practices. Thus, in 2008 and 2010, several amendments were made to the Law on concession in terms of procedures for facilities transfer into concession, the expansion of government support measures, increasing the attractiveness of concession projects, abolition of the mandatory issuance of infrastructure bonds with the provision of certain government support measures.

As originally framed, concession was regarded as a lease of rental property, land, natural resources to a foreign legal entity or individual – the concessionaire. In other words, concession was defined through the prism of a lease (property rental) agreement, but there could also be elements of construction or insurance contracts,

employment agreements present in concession relations. To date, mechanisms for implementing concession have been formalized in legislation; it is to be applicable to the most complex and capital-intensive projects in the field of social infrastructure and essential services. The implementation practice has shown that traditional concessions in Kazakhstan are either not requited or require charging a very high price for the population, which is unacceptable. Also, the global economic crisis has corrected the PPP development plans in the country, as a shortage of long-term and project debt financing impedes the implementation of such projects.

In 2013-2014, a number of amendments were adopted, which laid the basis for rapid PPP development in Kazakhstan, including an introduction of financial and legal mechanisms to increase the attractiveness of PPP projects. A more detailed look at these changes is provided below.

Thus, the Law of the Republic of Kazakhstan 'On amendments and additions to some enactments of Kazakhstan on introducing new types of public-private partnerships and expanding their areas of application' was signed. The issues resolved within the law are the following: strengthening the attractiveness of PPP projects; introducing new types of contracts; extension of the PPP scope; innovations for a PPP concessionaire (RK Law No. 131-V, 2013). It should be expressly indicated that in the law framework, new types of contracts were introduced.

It should also be noted that in the framework of these changes, a protection mechanism for state concession obligations against sequestration has been implemented through a separate budget program on state concession obligations. The next step was signing the Act of the Republic of Kazakhstan 'On amendments and additions to some legislative acts of the Republic of Kazakhstan on the issues of governance'. Novels of the Act were:

- *A concept of 'concession projects of particular importance' was adopted.* The list and criteria for determining the concession projects of particular importance are determined by the Government of the Republic of Kazakhstan.
- *A concept of 'direct agreement',* which is defined as a written agreement concluded between the grantor, the concessionaire, and the concessionaire's creditors to implement the concession projects of particular importance.
- *A foreign exchange risk balancing mechanism* in the implementation of concession projects of particular importance.
- *Access to international arbitration* (in the event that the concessionaire-resident of Kazakhstan is established by non-residents).
- *New approaches to planning and selection of local concession projects* (Resolution of the RK Government No.1633, 2013).

It should be noted that the future PPP prospects in Kazakhstan can be associated with the adoption of public-private partnership law (RK Law No. 379-V, 2015), as well as the PPP Development Program (PDPPP 2011).

Thus, as a result of the large-scale work to improve the legislation, the most severe restrictions have been lifted, and the necessary tools and mechanisms have been implemented allowing developers to structure the investment-attractive PPP projects. A necessary condition for PPP development is its institutional development, which is characterized by an intention to build a system that would work on the 'one-stop shop'basis in order to create conditions aimed at a thorough and fast-track preparation of PPP projects and their effective implementation. The essence of the 'one-stop shop' principle is preparing and monitoring all PPP projects at the request of public agencies in a one-stop service center, as well as in rendering counseling assistance on PPP projects to investors by providing centralized services and information on possible projects.

Thus, the institutional framework formed by now in Kazakhstan is a complex of government and quasi-government organizations at the national and regional level.

Firstly, at the moment there are consultative and advisory bodies in the national institutional PPP system. Thus, by a decree of the Government of the Republic of Kazakhstan, PPP Coordination Council under the chairmanship of the Prime Minister has been established in order to promptly address the issues of PPP

development in the republic (Resolution of the RK Government No.1633, 2013). In addition, according to the Law of the Republic of Kazakhstan 'On concessions', respective commissions on concession are set up and operate under the Government and akimats (local administrations).

Secondly, the distinctive feature of the PPP institutional framework in any country is the existence of specialized organizations, *i.e.* PPP operators. The main operator of PPP issues at the national level is Kazakhstan PPP Centre (KPPPC), incorporated as a joint stock company under the Ministry of National Economy of the Republic of Kazakhstan. What falls within the competence of this center is to carry out economic examination at all stages of preparing a concession project to the value of over 4 million MCI, as well as elaborating recommendations for improving the legal and institutional PPP framework.

Also, in March 2014, with the participation of JSC 'NMH' Baiterek' and the KPPPC, Kazakhstan Project Preparation Fund (KPPF) was set up. In addition, up to date, a regional network of specialized PPP organizations has been formed, which enables implementation of a common policy in the development and standardization of PPP projects. Also, in order to address the issue of financing concession projects, Infrastructure Projects Fund (IPF) is created under the auspices of JSC 'Kazyna Capital Management', with the joint participation of local and foreign institutional investors, such as McQuarie, IFC, EBRD, ADB, and others.

Taking the above into consideration, the existing institutional PPP system in the Republic of Kazakhstan is as follows (Figure 1). Thus, in the framework of the PPP Development Program as a whole, an institutional framework for further development of the domestic PPP market has been formed.

In recent years, a sustainable economic development and improving competitiveness have been Kazakhstan's top priorities. As a result, there has been growing interest on the part of the government to the private sector in terms of utilizing its potential for financing, development, and implementation of PPP projects. At present, a considerable experience in the PPP projects implementation in various sectors has been gathered, especially in the fields of industrial infrastructure, innovative sphere, transportation, social sphere, and in the sphere of public services (Abdymanapov 2015a, Abdymanapov and Abiesov 2014).

Figure 1. Institutional PPP scheme in the Republic of Kazakhstan

<table>
<tr><th colspan="6">PPP project</th></tr>
<tr><th></th><th>Public policy</th><th>Initiating agencies</th><th>Monitoring, counseling</th><th>Expert operation in all phases</th><th>Financial backing instruments</th></tr>
<tr><td rowspan="2">National level (+4 million MCI)</td><td rowspan="3">Ministry of National Economy of the Republic of Kazakhstan, KPPPC</td><td rowspan="2">Central executive authorities, local executive authorities</td><td>KPPF</td><td>KPPPC</td><td rowspan="3">JSC 'NMH' Baiterek'</td></tr>
<tr><td colspan="2" rowspan="2">The 'one-stop shop' principle, protection of the national interests</td></tr>
<tr><td>Local level (- 4 million MCI)</td><td>Local executive authorities</td></tr>
<tr><td></td><td></td><td>Legal entities on local PPP project advisory support</td><td>Legal entities on local PPP project evaluation, local authorized agency on state planning</td><td></td></tr>
</table>

Within the framework of the approved governmental program of Kazakhstan's industrial-innovative development for 2015-2019, a public-private partnership is defined as one of the rapid industrialization mechanisms in creating projects and developing infrastructure (RK SPIID, 2014).

Today, there are 42 current projects with the use of PPP mechanism in Kazakhstan, 5 of which are projects of national significance, and 37 are local projects. These projects are at various stages (planning, tendering, repeated tendering procedures, etc.) in accordance with the project schedules. The priority sectors of these projects include: the transportation infrastructure, the social and urban infrastructure development (Table 1).

Table 1. Projects sectoral breakdown with PPP mechanisms

Sector name	Implementation levels	
	National	Local
Production		1
Transportation and power industry	2	13
Education		8
Health care	2	14
Sports		1
Correctional discipline	1	
TOTAL	5	37

It should be noted though that the city of Astana and East Kazakhstan region take the most active part in creating public-private partnership projects. However, zero activity is present in a number of regions: Akmola, Aktobe, Atyrau, Kostanay, and Pavlodar regions. It should be noted that the PPP projects initiators are the Investment and Development Ministry of the Republic of Kazakhstan, the Ministry of Health of the Republic of Kazakhstan, the Ministry of Education and Science of the Republic of Kazakhstan, the Ministry of Internal Affairs of the Republic of Kazakhstan, the Ministry of Culture and Sports of the Republic of Kazakhstan, as well as regional and municipal akimats.

In the modern development conditions, as well as in the economic globalization context, the government ability to ensure appropriate infrastructure and to provide quality public services plays an important role in the country's economic growth and its economic competitiveness in the international arena. A lack of resources and investment to meet the infrastructure needs is a major challenge to achieve accelerated economic growth rates. In this regard, the issue of infrastructure development is acute in both developed and developing countries.

In this regard, many countries are increasingly turning to public-private partnerships as a viable alternative for building and reconstruction of the required infrastructure and rendering public services. Thus, according to the World Bank, PPPs are used by more than 134 developing countries, providing 15 - 20% of additional investment in the infrastructure (IEG 2014). That is, PPP is considered not only as a tool to attract investment in infrastructure, but also as a tool to improve the efficiency and quality of public services.

The share of the infrastructure sector in the GDP of the Republic of Kazakhstan amounts to 17% (more than 35 billion USD), *i.e.* is inferior to the trade and extractive industries (McKinsey & Company 2013, EIB 2013).

However, the infrastructure sector importance is not only in its contribution to the GDP, as infrastructure is a prerequisite for realization of investment projects in other priority sectors of the economy, such as production and construction sectors, extraction and processing of commercial minerals. Moreover, infrastructure is a decisive factor for human development, through providing the population with clean water, quality medical and educational services, maintaining favorable environmental conditions.

According to an analysis by the European Investment Bank, the annual average level of Kazakhstan's investment in the infrastructure during the years 2003-2015 amounted to 2.7 - 3.2% of gross domestic product (GDP), while the recommended level of annual investment in the infrastructure in developing economies should be at the level of 5 - 6% of GDP.

This lack of investment in the infrastructure for a long time has led to a situation where the depreciation of fixed assets in the most important sectors of the economy has reached a critical state. Thus, the electric power industry condition is characterized by a significant deterioration of generating and network equipment, which, as

of January 1, 2014, runs at 68% in the power generation segment and 57% in electrical networks, whereas the electricity transmission and distribution losses reach 18.6%.

The significant equipment deterioration leads to high thermal energy transmission losses through heating networks. Only 75% of the generated thermal power reaches the ultimate customer. The depreciation of railway tracks runs at 70%, and only 20% of roads are in good technical condition. A major concern is also caused by the ecological situation in main population centers due to the increased volume of solid domestic waste (hereinafter referred to as SDW). Currently, only 5-10% of SDW in the country undergoes recovery or incineration, while with a growth in prosperity, the SDW volume growth is expected to rise by more than 50% by 2025.

In the area of early childhood education, the pre-school coverage ratio was 74.2% in 2014, while the program for providing children with pre-school education and fostering 'Balapan' for 2010 - 2020 sets the objective to raise this figure to 100%. In the field of secondary education as of January 1, 2015, the shortage of places reached 73.1 thousand; 189 schools were in a critical condition, in 92 schools classes were conducted on three-shift basis.

In health care, 63% of hospitals are located in buildings constructed more than 30 years ago, about 50% of in-patient facilities are located in non-standard buildings, 25% of hospitals have a low bed capacity (from 50 to 100 beds), 1/3 of hospitals are not fully provided with necessary equipment. This leads to inefficient use of funding for the operation of obsolete buildings, hospital administration costs, a low rate of modern technologies adoption; furthermore, medical care provision to the population is not at an adequate level.

According to experts of the Asian Development Bank, in the period of 2016 - 2025, the investment needs solely in such areas as transportation, power, and municipal infrastructure (water supply and disposal, SDW, municipal transport) will amount to about 72 billion USD, which is almost one third of Kazakhstan's GDP.

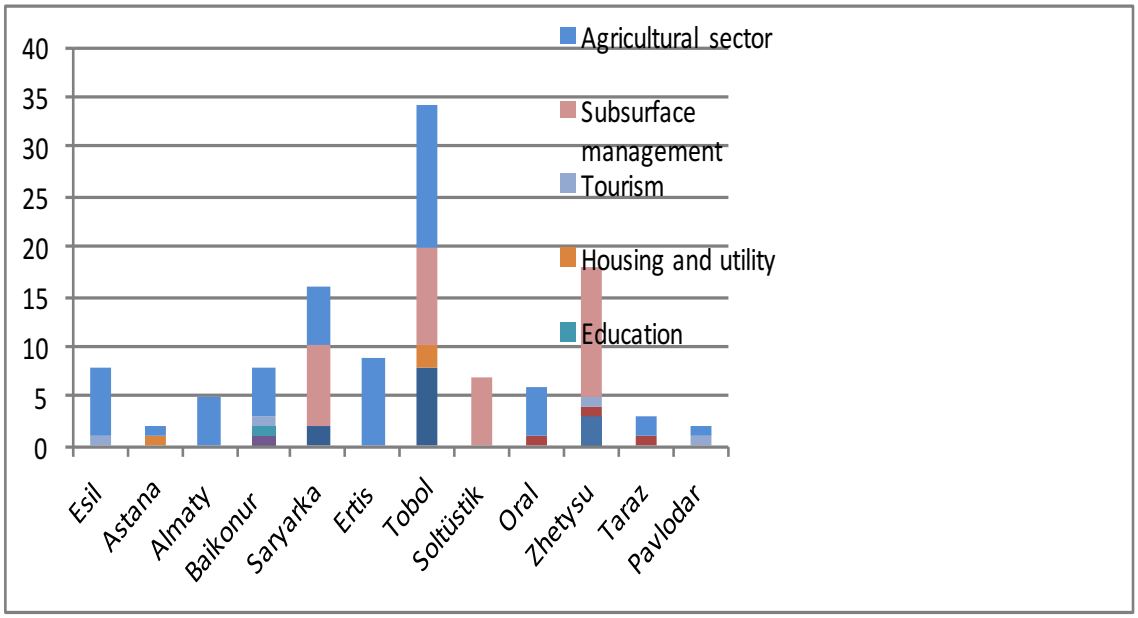
The growing demand for quantity and quality of social infrastructure and sustenance facilities fairly cannot be met through budgetary resources alone because of their limitedness. In this regard, PPP is the basis for future enhancement of the public investment efficiency, which allows attracting private domestic and foreign capital in areas traditionally funded only through the budgetary funds.

Despite the fact that in 2006 only one PPP type, a concession, was codified, the interaction of the government and business is not limited to this mechanism. Thus, the analysis has shown that the government seeks to develop cooperation with the private sector in the following ways:

- the current policy documents of some government agencies contain information about the need for PPP mechanisms application;
- many national companies, development institutions, and socio-entrepreneurship corporations (SECs) have the objectives set to consolidate the public and private sectors to encourage economic development.

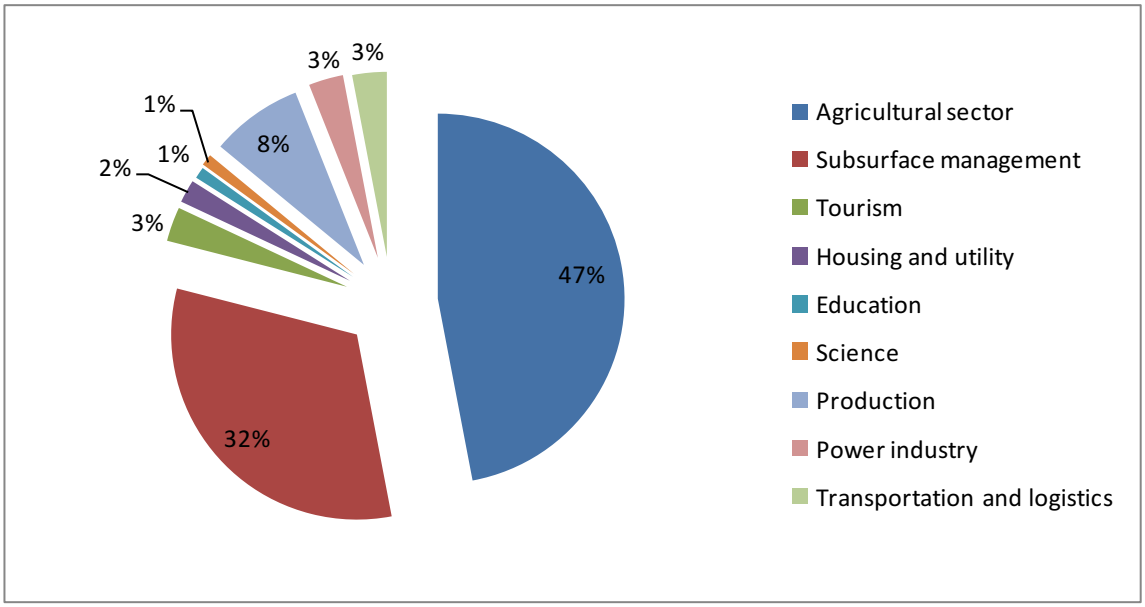
In addition, it should be noted that so far in the framework of SEC operation on a nationwide scale, 118 projects have been implemented jointly with private businesses. The most active SECs are 'Tobol', 'Zhetysu', and 'Saryarka' (Figure 2).

Figure 2. The implementation of SEC investment projects



In general, this project analysis shows that SECs mainly cooperate with businesses in sectors such as agriculture (47%, or 55 projects) and subsurface management (32%, or 38 projects), see Figure 3.

Figure 3. Investment SEC projects with a breakdown by industry



To identify PPP priority guidelines, SWOT-analysis of its long-term development in the Republic of Kazakhstan has been conducted (Table 2).

Table 2. SWOT-analysis of PPP development in the Republic of Kazakhstan

STRENGHS	WEAKNESSES
▪ The PPP legislation adapted to modern requirements and constantly improved. ▪ Political support for PPPs. ▪ Well-formed institutional PPP system (specialized organizations on PPPs established at the national and regional level, the principle of 'one-stop shop' implemented, the local executive authority extended, *etc.*). ▪ A comprehensive system of measures of government support and recovery tools for the private partners' expenses, which would provide commercial attractiveness of PPP projects. ▪ Experience in implementing PPP projects in the transportation and power industries. ▪ Some 30 national and regional projects are at various development phases.	▪ Lack of law enforcement practice with regard to PPPs. ▪ Most of the government support measures and concessionaire expenses recovery mechanisms have not been tested in practical terms. ▪ Having a negative experience with the pilot PPP projects implementation. ▪ More complex and lengthy planning procedures, compared with budget investment. ▪ Lack of qualified personnel in both the public and private sector dealing with PPPs. ▪ Distrust of the private sector to government agencies. ▪ Distrust of second-tier banks and financial institutions to PPP projects and potential concessionaires. ▪ Low activity of sectoral and local government agencies. 9) Lack of financial resources from the private sector, acceptable in terms of cost and time. ▪ High currency risks. ▪ Presence of regulatory restrictions in sectors (Construction Norms and Regulations, Sanitary Regulations and Standards, rates, *etc.*).
OPPORTUNITIES	**THREATS**
▪ Support on the part of international organizations. 2) Implementation of long-term national development programs. ▪ Development of small and medium-sized businesses. ▪ Creation of Kazakhstan PPP market attractive for foreign and domestic investors by ensuring a stable flow of projects. ▪ Reducing the load on the government budget. ▪ Employment generation. ▪ Development of 'paraproject' infrastructure. ▪ Increase in the public infrastructure efficiency and service level. ▪ Increase of the private sector partnership share in the economy. ▪ Attracting direct foreign investment into the economy through PPP projects. ▪ The domestic stock market development. ▪ Implementation of international standards, models, methods, and others. ▪ Increasing public investment transparency and accountability.	▪ Inadequate financial burden (for users in terms of rates, for the government in terms of concessionaire expenses recovery). ▪ Lack of support for the idea of PPP implementation on the part of public officers, entrepreneurs, and population (resulting from the lack of awareness about PPP benefits. ▪ Lack of technical, human, and financial capacities of local businesses for implementing PPP projects. ▪ Limited capacity of domestic second-tier banks to finance PPP projects. ▪ Deterioration of the country's financial performance due to the dependence on mineral prices and rise in inflation. ▪ Erosion of confidence and interest in PPPs from both the public and private sector in the case of an unsuccessful implementation of the planned projects. ▪ The private sector indifference to long-term projects due to a high level of uncertainty in the economy.

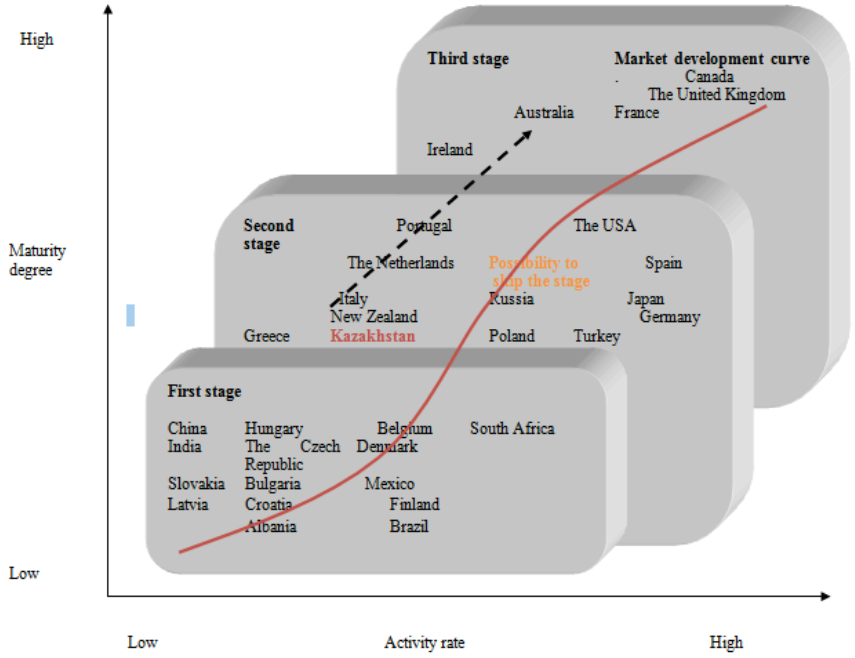
As can be seen from Table 2, there is a myriad of factors that can both positively and negatively affect the PPP development in Kazakhstan. The analysis allows for an accurate determination of the steps to be taken to ensure PPP full-fledged development and define problems requiring special attention. The analysis of the current PPP condition has shown that the necessary legislative and institutional environment for the PPP market development and implementation of new projects in Kazakhstan has been formed and continues to improve.

According to a study by the UNECE, PPP development worldwide takes place in three stages, which can be roughly described as the stage of preparation, implementation, and improvement (ECE/CECI/4, 2008). When defining the condition and level of PPP development in Kazakhstan according to the procedure proposed by the UNECE, at the moment it can be argued that the preparatory stage in Kazakhstan has been passed in full and the second stage of PPP implementation process is nearing completion.

Thus, it is necessary to provide for a comprehensive set of measures that will allow forming a ready PPP market in Kazakhstan, attractive for both domestic and foreign investors.

In this regard, alongside with promoting PPP projects implementation of a package plan is required to achieve the criteria for the third stage of the PPP market 'readiness curve' (Figure 4).

Figure 4. PPP market 'readiness curve' steps



In this study, the authors would like to particularly focus on contractual PPP development. The practice of elaboration and implementation of PPP projects in Kazakhstan has shown a tendency of this mechanism developing mainly in major projects. So, the first pilot PPP projects are implemented in the transportation and power sectors, which are classic for PPPs in many countries and require large capital investments. The concession projects under development currently also require substantial investment.

However, PPPs are not only a mechanism for the implementation of major infrastructure projects, but also of small ones. Thus, in due course, international PPP experts recommended that Kazakhstan should implement mini PPP projects (Tilebaldinov 2011).

The world practice shows that based on PPPs, not only large-scale entities, but also small ones can be built and operated, thus giving an impetus to the development of small and medium-sized businesses. Analysis of the international experience shows that currently, small PPP forms are mainly developing in the water sector in developing countries. At the same time, the governments of developed countries also pay attention to the development of small PPP forms. Thus, the Government of the State of Victoria, which is a leader in the implementation and development of PPPs in Australia, has announced an introduction of new approaches to PPPs; in particular, development of a new PPP model with simplified procedures has been declared, more suitable for implementation of small projects (Partnerships Victoria Requirements 2013).

In the UK, out of more than 700 implemented PPP projects, in 261 projects the capital cost does not exceed 10 million GBP, and in 158 projects it does not exceed 4 million GBP (Koch and Jensen 2009, Juričić

2013). At present, Croatia is addressing the issues of regulating small PPP projects to the value of less than 5 million EUR (Kapital Business Information Center 2014).

The development of small PPP forms in Kazakhstan can also have a positive impact on the PPP development in those segments where significant investors are usually reluctant to enter. This mechanism could solve both the local infrastructure problems for the local executive authorities (LEA) and give an opportunity to representatives of small and medium-sized businesses to participate in PPP projects.

Mini PPP projects are of interest to large foreign investors. Small PPP forms, developed as a pilot project under which a test facility is created, can reduce the government loss and risks while implementing major infrastructure projects in various sectors. Experts note that there is a demand from potential investors for such projects in Kazakhstan. In particular, representatives of investment companies, while negotiating major projects, also take interest in small PPP projects. This interest, in the experts' opinion, is primarily inspired byapossibility to test the national legislation and to calculate all possible risks in PPP small forms projects. To do this, investors usually look for partners in Kazakhstan among domestic small and medium-sized enterprises (World Bank 2011).

According to the experts, Kazakhstan, due to the nature of its economy and the demographic situation, is rather in need of small PPP forms than of large ones. Herewith, small PPP forms can be used in such sectors as education and health care. At the same time, the world experience analysis shows the possibility of small PPP forms development also in the water supply and agricultural sectors, as well as in the sector of construction and maintenance of transport infrastructure of local significance (RK Agency for Statistics 2016).

For active implementation of projects in the framework of small PPP forms, Kazakhstan needs to address a number of problematic issues, including simplification of legislative procedures for these projects, as well as reducing time and cost expenditure required for their development through the standard documentation elaboration and implementation.

According to the Agency of the Republic of Kazakhstan on Statistics (presently MNE RK), about 45% of Kazakhstan's population live in rural areas, where there is an urgent need for high-quality and timely services (medical clinics, kindergartens, schools, roads of regional and district significance, veterinary stations, etc.) (RK Agency for Statistics 2016).

In addition, development of rural territories is one of the objectives of the 'Development of Regions' Program (2011). Thus, according to this program, the performance targets are to be achieved both through the development of regional centers, core rural-type settlements (CRTS), the centers of rural districts, localities, villages, and other rural settlements with high and medium development potential, as well as by increasing the human capacity of rural areas. Within these focus areas, the program envisages (inter alia) providing conditions for sustainable agricultural and industrial production, increase in the earnings of rural population. At the same time, problem solving in terms of this component is to be carried out also through the development of small and medium-sized businesses. The RTS social and engineering infrastructure development component is generally aimed at improving the quality of life of the population living in rural areas through implementation of infrastructure projects.

Such infrastructure projects under the program include:

- construction, overhaul, medium and current repairs of housing and utility infrastructure facilities (water supply facilities, sewerage, gas, heating, electrical power supply systems);
- construction, overhaul, medium and regular maintenance of social and cultural facilities (education, health care, social welfare, culture, sports, leisure and recreation facilities);
- construction, overhaul, medium and current repairs of utility and transportation infrastructure (village and rural roads, access roads, dams, levees, and bridges);
- construction and total renovation of housing, demolition of dilapidated housing;
- community redevelopment (lighting and landscaping of streets, parks, public gardens, demolition of derelict sites, arrangement of solid domestic waste dumping grounds, outdoor amenities, fences, children's playgrounds, and athletic fields). The area of focus on rural workforce capacity development envisages government support to the employees, who arrive to work and live in rural areas, in the form of installation allowance payment and provision of housing.

In accordance with the program, the implementation of the above initiatives is planned to carry out both within the framework of the activities envisaged as part of governmental and sectoral programs, as well as of regional territorial development programs, and with the help of private investments through PPP mechanisms. Thus, through the implementation of small PPP forms, regions will also form a frame of reference to planning and development, taking into accounts the available budgetary and private sector resources. Another advantage of PPP small forms introduction throughout the country is that it is through the example of the small forms where new types of contracts and forms of cooperation would be proven, with minimum loss in case of a failure. In addition, with the help of small forms, the issue of specialist training can be resolved. For active introduction of small PPP forms in the legislation, it is necessary to significantly simplify the preparation procedures for such projects by means of elaborating and approving of a standard documentation package, as well as to minimize the number of expert reviews carried out thereon.

Conclusions

If defining the condition and the development level of PPP in Kazakhstan according to a procedure proposed by the UNECE, at the moment it can be argued that the preparatory phase in Kazakhstan has been passed in full, and the second phase of the PPP implementation process is nearing completion.

In course of the study, the following results have been obtained:

- In the current economic environment, it is obvious that in the government budget, there is a shortage of funds for a continuous provision of replacement and extended reproduction in all branch enterprises; therefore, there is a need for an assignment for temporary medium- and long-term use of public property to the private sector with the government's right reserved to regulate and control its operation.
- In comparison with the countries where PPP has a wide experience and is consistently applied by the government as an alternative during the implementation of infrastructure projects, the experience of Kazakhstan is not yet vast enough. At the same time, the high demand for infrastructure projects contributes to focusing on creating the necessary legal and investment environment for the PPP development in this country.
- Public-private partnership has become an indispensable tool for the infrastructure economic sector development of the Republic of Kazakhstan. The mechanisms of project financing through PPP allows the government to transfer a substantial share of the investment burden into the hands of business, while still retaining control of the overall infrastructure development strategy.
- The results of the study will allow creating conditions for improving the quality of preparation and implementation of concession projects, the use of new types of PPP contracts in various sectors of the economy, as well as providing an effective selection of the most optimal scheme of implementing concession projects out of the variety of PPP forms. Well-structured and properly implemented PPPs may well result in an efficiency increase during the infrastructure facilities construction and the provision of infrastructure services, and, therefore, reduce the public expenditure to ensure the availability of these services. If a decision is taken in favor of PPP, it is important to make sure that the drafting process is still aimed at achieving economic efficiency and ensuring acceptability in budgetary terms.
- The study has revealed the following specificities of the PPP development in the Republic of Kazakhstan: while beginning with infrastructure projects, yet, in the sectoral structure there has been an inclination towards social projects, including health care and education; in the regional structure of PPP projects, the city of Astana and East Kazakhstan region take the most active part in the creation of public-private partnership projects. At the same time, low activity is observed in a number of regions: Akmola, Aktobe, Atyrau, Kostanay, and Pavlodar regions. In terms of legislation, the following amendments have been introduced: deregulation in terms of PPP application sectors (all sectors of the economy); new contract types introduced (service contracts, life cycle contracts, innovation contracts); the pool of PPP participants expanded (including national companies and holding companies, state-owned enterprises and financial institutions). Regarding local PPP projects (to the value of up to 4 million MCI = 7.9 billion tenges), implemented on the basis of standard documentation, tendering procedures are carried out without expert examination and preliminary assessment (on the basis of the National Chamber of Entrepreneurs register).

Thus, further PPP development in the Republic of Kazakhstan will be an important factor in the economic interaction between the public authorities and the private sector for the purpose of development, planning, financing, construction, and operation not only of production facilities, but also the social infrastructure. Therefore, partnership between the government and the private sector should be characterized as a long-term cooperation in order to attract additional sources of funding and as an effective symbiosis of corporate management practices and government control.

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Model of Multi-Criteria Selection of Traditional Suppliers

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Abstract

Efficient supply chain management is based on the strategic cooperation of many companies (suppliers and consumers), which involves long-term interaction with business partners. To ensure a reliable supply, most of the modern companies simultaneously interact with multiple suppliers of identical products, distributing the orders between them depending on many factors characterising suppliers, their products, and supply processes in previous periods. Under these conditions, the solution of the problem of multi-criteria selection of traditional suppliers is carried out by optimising purchase amounts of different product types in accordance with the needs of the consumer company based on many criteria. The main selection criteria are supply reliability and logistics costs of the purchase and product delivery. The generalised criterion for the assessment of supply reliability reflects the results of the interaction with suppliers in previous periods and includes assessment of completeness, package contents, timeliness of supply, and quality of supplied products. The logistics costs criterion shows the rejection of product prices offered by traditional suppliers and delivery costs from the minimum values of these indicators in the markets at the time of making procurement decisions. The paper contains the developed linear programming model, which allows optimising the procurement of different types of products from several traditional suppliers under the objective function, combining the evaluation criteria of supply reliability and logistics costs. The list of suppliers for each type of product is determined by the optimisation results. The method for selection of traditional suppliers is based on the proposed mathematical model and has a numerical example illustrating its application.

Keywords: traditional supplier; multi-criteria selection; supply reliability; logistics costs; linear programming model; procurement optimization

JEL Classification: C61; M21

Introduction

The efficient and regular functioning of supply chains depends on the organisation of supply of the necessary materials or goods to their member companies, which requires competent management of their procurement and supply. Against the backdrop of a growing number of suppliers of identical products, with different opportunities, parameters of the offered products, and the organisation of the supply process, one of the most important procurement tasks is to choose the most profitable suppliers, from the point of view of the consumer company.

The formed supply chains create a stable range of traditional suppliers, which leads to certain peculiarities of solving the problem of their choice. When selecting suppliers with whom one has already established business relationships and interacted, one typically uses quantitative criteria characterising the suppliers and processes of the previous supplies. Based on the business objectives of companies in the field of supply, the main criteria for the selection of traditional suppliers include their production capacities, supply reliability, quality of service and products supplied, costs of the purchase and product supply, which determines the multi-criteria tasks for the selection of suppliers (Aguezzoul 2012, Ávila *et al.* 2015, Cheraghi *et al.* 2004, Ha and Krishnan 2008). The number of suppliers, with whom the company or the consumer is cooperating at the same time, is important in supply management (Ford 1993, Lysons and Farrington 2006). Interaction with a single supplier makes the consumer or the company more vulnerable and dependent on the performance of supplier's work. Therefore, many companies have multiple sources

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of product supply, which reduces the probability of failures in their work with suppliers, increases the flexibility of supply by varying orders in case of emerging issues or changing demands.

Given the multivariance of solving the problem of selecting traditional suppliers under various criteria, the most attractive option is its optimisation arrangement that allows not only to select the best suppliers, but also to determine the best quantity of the product orders for each of them. However, in the context of diversity of purchased products, different dimensions, and interconnectedness of indicators characterising suppliers and the supply process, the rigorous solution to this issue is a complex problem that requires the development of optimisation models of procurement from multiple suppliers, based on the joint use of different economic and mathematical methods.

1. Literature review

The strategic importance of addressing the issue of supplier selection for many companies explains its active research by many scientists. Analytical reviews on this issue show a large number of scientific articles on its characteristics, approaches, methods and mathematical instruments of its solution (Aissaoui *et al.* 2007, Agarwal *et al.* 2011, Boer *et al.* 2001, Chai *et al.* 2013, Ho *et al.* 2010, Pal *et al.* 2013, Setak *et al.* 2012, Tahriri *et al.* 2008a, Ware *et al.* 2012).

Given the specific task of multicriteria selection of traditional suppliers, analytical methods and models take the most important place when finding the solution to this problem: data envelopment analysis (DEA) method, elimination and choice expressing the reality (ELECTRE) method, technique for order preference by similarity to ideal solution (TOPSIS) method, statistical models and mathematical programming models. Though, only the latter allows optimising the procurement of products from multiple suppliers in the context of multi-criteria selection, taking into account various factors.

Weber and Current (1993) minimized the total purchase price, late deliveries and rejected units using multi-objective mixed integer programming. Ghodsypour and O'Brien (2001) suggested mixed integer non-liner programming model to solve supplier's problem with multiple criteria and suppliers' capacity. Karpak *et al.* (2001) proposed a goal programming model to evaluate the suppliers using quality, cost and delivery efficiency as the three identified objectives. Talluri and Narasimhan (2005) developed a linear programming (LP) model based on quantitative measures to select potential suppliers considering the strengths of existing suppliers and to eliminate underperforming suppliers. Hong *et al.* (2005) proposed a model based on linear programming with mixed integers to select a provider that maximizes the revenue and satisfaction of the customer's needs. Narasimhan *et al.* (2006), Wadhwa and Ravindran (2007) developed a multi-objective programming models to solve supplier selection problem and compare the solutions. Amid *et al.* (2009) formulated a mixed integer model to consider simultaneously the imprecision of information, and determine the quantities to each supplier based on price breaks. Rajan *et al.* (2010) proposed a supplier selection model for multiproduct, multi-vendor environment based on an integer LP model. Esfandiari and Seifbarghy (2013) presented a multiobjective LP model in which the total scores from the supplier selection procedure is maximised while purchasing cost, rejected units, and delayed delivered units were minimised.

Many researchers have proposed comprehensive approaches to effectively address the problem of multi-criteria selection of suppliers using other methods together with mathematical programming models. These are mainly methods that allow the calculation of the weight (importance) of supplier selection criteria: ranking method, scoring method, analytic hierarchy process (AHP), analytic network processes (ANP) and other methods of expert evaluation (Bruno *et al.* 2012, Tahriri *et al.* 2008b, Weber *et al.* 1991).

Ghodsypour and O'Brien (1998) suggested an integration of AHP and LP to consider both tangible and intangible factors in choosing the best suppliers and placing the optimum order quantities among them. Weber *et al.* (1998) combined mathematical programming model and the DEA method to provide buyers with a tool for negotiations with vendors that were not selected right away as well as to evaluate different numbers of suppliers to use (Weber *et al.* 2000). Çebi and Bayraktar (2003) structured the supplier selection problem as an integrated lexicographic goal programming and AHP including both quantitative and qualitative conflicting factors. Ng (2008) proposed a weighted LP model for the multi-criteria supplier selection problem, using the ranking the relativity of

importance of criteria and mathematical approach to maximize the supplier score. Ustun and Demirtash (2008) used the integrated approach of the ANP and multi-purpose mixed integer LP to consider both tangible and intangible factors in choosing the best suppliers and define optimal orders among the selected suppliers to minimize the total cost and total defect rate and to balance the total cost among periods. Sanayei *et al.* (2008) proposed an integrated approach of multi-attribute utility theory and LP for rating and choosing the best suppliers and defining the optimum order quantities among selected ones in order to maximize total additive utility. Shahroudi *et al.* (2011) introduced an integrated model for supplier's selection and order allocation combining the integrated AHP-TOPSIS method and multi-purpose LP.

The above analysis shows that mathematical programming models are ideal for solving the supplier selection problem because they can optimize results using either single or multiple objective models.

2. Methodology and modeling of the choice of traditional suppliers

The problem of selecting suppliers under normal or modified re-procurement can be solved by analysing the results of interaction with them in previous periods in order to determine the advisability of further cooperation. There are two reasons for the relevance of this problem: first – the availability of quantitative information on the already-known (traditional) suppliers, their products and the organisation of their supply process, and second – difficulties in attracting new suppliers, information on whom is limited and has mainly qualitative meaning for the client and, therefore, requires the involvement of experts to evaluate suppliers or to acquire methods of forecasting possible consequences of cooperation with them in terms of existing risks.

The main criteria for selecting traditional suppliers are the logistics costs for the supply of purchased products and supply reliability. If cost indicators (product price, transportation costs) are determined at the time of the procurement, the supply reliability is calculated according to the results of the previous evaluation of completed procurements. The reliability of supply is an integrated indicator that assesses the timely, regular and complete supply of quality products to customers, which characterise suppliers as reliable partners.

In general, the problem of selecting traditional suppliers based on the results of previous cooperation is to select those that reliably provide the consumer company with quality products of given types in the required quantities with the lowest purchase and delivery costs, that is, it is the task of optimising the management of procurement of products from many suppliers under multiple selection criteria.

Let us define the basic parameters of the model: number of traditional suppliers of necessary products – I; number of product types purchased by the consumer company - S; number of time periods during which the reliability of previous supplies is evaluated – T; funds allocated for purchase of products - C^{alloc}; amount of product of type s, which was to be supplied by supplier i under the contract during the period t - $V_{ist}^{contr}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; amount of product of type s that was actually supplied by supplier i during the period t – $V_{ist}^{act}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; amount of product of type s supplied by supplier i in the incomplete set during the period t – $V_{ist}^{incset}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; amount of product of type s of insufficient quality supplied by supplier i during the period t – $V_{ist}^{insq}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; supply time of product of type s by supplier i under the contract during the period t – $T_{ist}^{contr}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; actual supply time of product of type s by supplier i during the period t – $T_{ist}^{act}, i = 1,...,I; s = 1,...,S; t = 1,...,T$; time of reaching the stock critical level of product of type s in the consumer company's warehouse in case of supply deadlines violation by supplier i during the period t – $T_{ist}^{stcrl}, i = 1,...,I; s = 1,...,S; t = 1,...,T$;

- the matrix of volumes of different product types offered by different suppliers at the time of procurement:

$$Q = \begin{bmatrix} Q_{11} & \cdots & Q_{i1} & \cdots & Q_{I1} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ Q_{1s} & \cdots & Q_{is} & \cdots & Q_{Is} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ Q_{1S} & \cdots & Q_{iS} & \cdots & Q_{IS} \end{bmatrix}, \quad (1)$$

where $Q_{is}^{\text{n}}, i = 1,...,I; s = 1,...,S$ – amount of product of type *s* available in the supplier *i*;

- the matrix of the cost of different product types in different suppliers at the time of procurement:

$$C^{\text{pr}} = \begin{bmatrix} c_{11}^{\text{pr}} & \cdots & c_{i1}^{\text{pr}} & \cdots & c_{I1}^{\text{pr}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ c_{1s}^{\text{pr}} & \cdots & c_{is}^{\text{pr}} & \cdots & c_{Is}^{\text{pr}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ c_{1S}^{\text{pr}} & \cdots & c_{iS}^{\text{pr}} & \cdots & c_{IS}^{\text{pr}} \end{bmatrix}, \quad (2)$$

where $c_{is}^{\text{pr}}, i = 1,...,I; s = 1,...,S$ – unit price of product of type *s* from supplier *i*;

- the matrix of transportation tariffs for delivery of a unit of different product types from different suppliers at the time of procurement:

$$C^{\text{trt}} = \begin{bmatrix} c_{11}^{\text{trt}} & \cdots & c_{i1}^{\text{trt}} & \cdots & c_{I1}^{\text{trt}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ c_{1s}^{\text{trt}} & \cdots & c_{is}^{\text{trt}} & \cdots & c_{Is}^{\text{trt}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ c_{1S}^{\text{trt}} & \cdots & c_{iS}^{\text{trt}} & \cdots & c_{IS}^{\text{trt}} \end{bmatrix}, \quad (3)$$

where $c_{is}^{\text{trt}}, i = 1,...,I; s = 1,...,S$ – transport tariff for delivery of product of type *s* from supplier *i*;

- the column vector of demand of the consumer company for different product types:

$$A = \begin{bmatrix} a_1 \\ \vdots \\ a_s \\ \vdots \\ a_S \end{bmatrix}, \quad (4)$$

where $a_s, s = 1,...,S$ – amount of product of type *s* required to meet the demand of the consumer company;

- the column vector of the minimum prices for a unit of different product types in the sales market at the time of making procurement decision:

$$C^{\min pr} = \begin{bmatrix} c_1^{\min pr} \\ \vdots \\ c_s^{\min pr} \\ \vdots \\ c_S^{\min pr} \end{bmatrix}, \quad (5)$$

where $c_s^{\min pr}, s = 1,...,S$ – minimum wholesale price per unit of product type *s* in the sales market;

▪ the column vector of minimum transportation tariffs for the delivery of a unit of different product types at the time of making procurement decision:

$$C^{\min trt} = \begin{bmatrix} c_1^{\min trt} \\ \vdots \\ c_s^{\min trt} \\ \vdots \\ c_S^{\min trt} \end{bmatrix}, \quad (6)$$

where $c_s^{\min trt}, s = 1,...,S$ – minimum transport tariff for the delivery of a unit of product of type *s*;

▪ the column vector of distances from traditional suppliers to the warehouse of the consumer company:

$$D = \begin{bmatrix} d_1 \\ \vdots \\ d_i \\ \vdots \\ d_I \end{bmatrix}, \quad (7)$$

where $d_i, i = 1,...,I$ – distance from the supplier *i* to the warehouse of the consumer company.

The controlled variable in this model is the amount of products of type *s* purchased by the consumer company from the supplier *i* – x_{is}, $i = 1,...,I; s = 1,...,S$.

The key complex criterion for evaluating traditional suppliers is the reliability of supplies, which reflects such important characteristics as completeness and timeliness of supply, package contents and quality of products supplied. Let us imagine indicators that assess these characteristics, using the corresponding coefficients for assessing supply reliability, which can be calculated according to the results of the retrospective analysis of cooperation with each supplier for several previous time periods (month, quarter, or year):

1) the coefficient assessing the completeness of supplies of products of type *s* by the supplier *i* during the previous *T* time periods:

$$K_{isT}^{compl} = \frac{\sum_{t=1}^{T} V_{ist}^{act}}{\sum_{t=1}^{T} V_{ist}^{contr}}; i = 1,...,I; s = 1,...,S; \quad (8)$$

2) the coefficient assessing the package contents of products of type *s* supplied by supplier *i* during the previous *T* time periods:

$$K_{isT}^{\text{set}} = \frac{\sum_{t=1}^{T}(V_{ist}^{\text{act}} - V_{ist}^{\text{incset}})}{\sum_{t=1}^{T} V_{ist}^{\text{act}}}; i = 1,..., I; s = 1,..., S; \quad (9)$$

3) the coefficient assessing the quality of products of type *s* supplied by supplier *i* during the previous *T* time periods:

$$K_{isT}^{\text{qual}} = \frac{\sum_{t=1}^{T}(V_{ist}^{\text{act}} - V_{ist}^{\text{insq}})}{\sum_{t=1}^{T} V_{ist}^{\text{act}}}; i = 1,..., I; s = 1,..., S; \quad (10)$$

4) the coefficient assessing the timeliness of the supply of products of type *s* by the supplier *i* during the previous *T* time periods is a comprehensive indicator, the method for determining which is given below.

The timeliness of product supply is considered to be a probabilistic characteristic. Its evaluation is based on the retrospective analysis of the company's interaction with each supplier by fixing the frequency of frequency of supply deadlines violation and the duration of the time interval between the contracted and the actual supply dates for the analysed time periods.

The relative excess value of the actual supply time of products of type *s* by supplier *i* of the contractual supply term can be presented as follows:

$$\Delta t_{is} = \frac{T_{is}^{\text{act}} - T_{is}^{\text{contr}}}{T_{is}^{\text{act}}}; i = 1,..., I; s = 1,..., S. \quad (11)$$

In this case, the value Δt_{is} is the average excess of supply time of products of type *s* by supplier *i* for the period under review, that is, T_{is}^{act} and T_{is}^{contr} are the average values actual supply and the contracted term for this period, namely:

$$T_{ist}^{\text{act}} = \frac{\sum_{m=1}^{M_{ist}} T_{istm}^{\text{act}}}{M_{ist}}; T_{ist}^{\text{contr}} = \frac{\sum_{m=1}^{M_{ist}} T_{istm}^{\text{contr}}}{M_{ist}}; i = 1,..., I;\ s = 1,..., S;\ t = 1,..., T, \quad (12)$$

where M_{ist} – total number of supplies of products of type *s* by supplier *i* for the period *t*.

In the case of $T_{is}^{\text{act}} < T_{is}^{\text{contr}}$, we will assume that $T_{is}^{\text{act}} = T_{is}^{\text{contr}}$. Then, the probability of timely supply of products of type *s* by supplier *i* is calculated as the proportion of time intervals, during which supplies were carried out without delays, in the total number of time intervals of actual supplies, taking into account (11), will be:

$$P_{is}^{\text{tml1}} = 1 - \Delta t_{is} = \frac{T_{is}^{\text{contr}}}{T_{is}^{\text{act}}}; i = 1,..., I; s = 1,..., S. \quad (13)$$

Thus, the probability of timely supply of products of type *s* by supplier *i* during the previous *T* time periods is defined as:

$$P_{isT}^{\text{tml1}} = \frac{\sum_{t=1}^{T} T_{ist}^{\text{contr}}}{\sum_{t=1}^{T} T_{ist}^{\text{act}}}; i = 1,..., I; s = 1,..., S. \quad (14)$$

The indicator of timeliness is also affected by the frequency of supply deadlines violation for the analysed period. This frequency is considered to be the proportion of timely supplies in the total number of supplies for a certain time period and is the second component in the assessment of the supply timeliness of products of type *s* by supplier *I* during the period *t*:

$$F_{ist}^{\text{tml2}} = \frac{M_{ist}^{\text{tml}}}{M_{ist}}; i = 1,..., I; s = 1,..., S; t = 1,..., T, \quad (15)$$

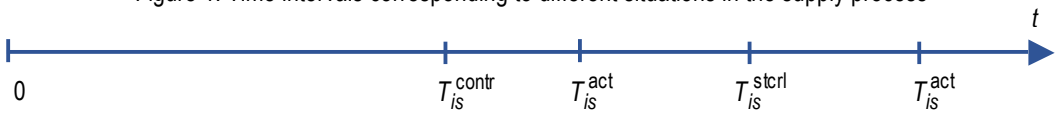
where M_{ist}^{tml} – the number of timely supplies of products of type *s* by supplier *i* for the period *t*.

Thus the frequency of supply deadlines violation of products of type *s* by supplier *i* during the previous *T* time periods is calculated as:

$$F_{isT}^{\text{tml2}} = \frac{\sum_{t=1}^{T} M_{ist}^{\text{tml}}}{\sum_{t=1}^{T} M_{ist}}; i = 1,..., I; s = 1,..., S. \quad (16)$$

The third component of supplier assessment, in terms of timeliness product supply, is to determine the impact of supply deadlines violation on stock management processes. This indicator reflects the relation between actual supply dates and time intervals that determine the supply term under the contract and the time of reaching the stock critical level of products type *s* in the consumer company's warehouse in case of supply deadlines violation by supplier *i* (Figure 1).

Figure 1. Time intervals corresponding to different situations in the supply process



Source: Elaborated by the author.

The assessment coefficient of the impact of supply deadlines violation of products type *s* by supplier *i* on stock management processes is recorded the following way:

$$K_{is}^{\text{tml3}} = \begin{cases} 1, & \text{if } T_{is}^{\text{act}} \le T_{is}^{\text{stcrl}}; \\ \dfrac{T_{is}^{\text{stcrl}} - T_{is}^{\text{contr}}}{T_{is}^{\text{act}} - T_{is}^{\text{contr}}}, & \text{if } T_{is}^{\text{act}} > T_{is}^{\text{stcrl}}; \end{cases} i = 1,..., I; s = 1,..., S \quad (17)$$

As is evident, for the case $T_{is}^{\text{act}} > T_{is}^{\text{stcrl}}$, the coefficient K_{is}^{tml3} characterizes the decline in the assessment of supplier *i* in proportion to excess value of the actual supply time of products type *s* relatively of time envisaged in the agreement, taking into account the deadline for supply, which is determined by the time of reaching the stock critical level of products type *s* in the consumer company's warehouse.

Thus, the assessment coefficient of the impact of supply deadlines violation of products type *s* by supplier *i* on stock management processes during the previous *T* time periods is defined as:

$$K_{isT}^{\text{tml3}} = \frac{\sum_{t=1}^{T} K_{ist}^{\text{tml3}}}{T}; i = 1,..., I; s = 1,..., S \quad (18)$$

Based on the fact that proposed local indicators evaluate various components of timeliness product supply for any time period, it is advisable to present the coefficient estimating the timeliness supply of products type *s* by supplier *i* during the previous T time periods in the form of multiplicative indicator, which allows using relative changes in the meanings of its individual components:

$$K_{isT}^{\text{tml}} = P_{isT}^{\text{tml1}} F_{isT}^{\text{tml2}} K_{isT}^{\text{tml3}}; i = 1,..., I; s = 1,..., S \quad (19)$$

Following proposed local indicators assessing supply reliability, we shall form the generalised criterion of its assessment so that it shall best reflect the goals of supply management from the standpoint of the consumer company and compare the levels of compliance with supply obligations of different suppliers in previous time periods under review. Taking into consideration that analysed components of product supply reliability, depending on the nature of the activity and supply situations of the company, have varying degrees of importance, it is expedient to provide the generalised criterion of supply reliability in the form of multiplicative convolution of local indicators, taking into account their weighting coefficients:

$$K_{isT}^{\text{rel}} = (K_{isT}^{\text{compl}})^{w_1} (K_{isT}^{\text{set}})^{w_2} (K_{isT}^{\text{qual}})^{w_3} (K_{isT}^{\text{tml}})^{w_4}; i = 1,..., I; s = 1,..., S, \quad (20)$$

where $w_j, j = 1,2,3,4$ – weighting coefficients of local indicators assessing supply reliability, at that

$$w_j \geq 0; \sum_{j=1}^{4} w_j = 1.$$

Weighting coefficients of local indicators assessing supply reliability can be calculated using different methods of expert evaluation with due regard to the consequences of any breaches of supply discipline, as well as the nature and duration of business partners' actions to address them. It should be noted that the variation of numerical values of weighting coefficients do not fundamentally change the essence of the problem, but merely reflect the change in priorities of the consumer company in supply management, which allows making decisions based on circumstances that develop within a specific time period.

Given that the task of multi-criteria selection of traditional suppliers, in addition to their direct selection, involves the distribution of orders between them, the purpose of modelling is to determine the optimal procurement plan of different product types, based on the assessment of supply reliability, according to the results of cooperation with suppliers in previous time periods, as well as the ratio of proposed product prices and delivery costs to their minimum values in the markets at the time of making procurement decision under existing supplier proposals and consumer company demands

In the context of the limited procurement budget, it is necessary to consider the importance of different product types for the activity of the consumer company, which leads to the introduction of appropriate weighting coefficients – $\beta_s, s = 1,..., S$, at that $\sum_{s=1}^{S} \beta_s = 1$. The model of multi-criteria selection of traditional suppliers is a linear programming model. The model is based on the optimisation method by the convolution of multiple selection criteria in one objective function. The mathematical model is as follows:

Objective function:

$$F(x) = \sum_{i=1}^{I} \sum_{s=1}^{S} \beta_s \left(1 - \frac{(c_{is}^{\text{pr}} + c_{is}^{\text{trt}} d_i) - (c_s^{\min \text{pr}} + c_s^{\min \text{trt}} d_i)}{(c_{is}^{\text{pr}} + c_{is}^{\text{trt}} d_i) + (c_s^{\min \text{pr}} + c_s^{\min \text{trt}} d_i)}\right) K_{is}^{\text{rel}} x_{is} \rightarrow \max, \quad (21)$$

The multiplier $(1-\frac{(c_{si}^{pr}+c_{si}^{trt}d_i)-(c_s^{min\,pr}+c_s^{min\,trt}d_i)}{(c_{si}^{pr}+c_{si}^{trt}d_i)+(c_s^{min\,pr}+c_s^{min\,trt}d_i)})$ takes a value in the range [0,1]. Its maximum value is achieved at coincidence of the sum of values of unit price of product type *s* by supplier *i* and logistics costs for its delivery with the sum of the minimum values of the market unit price of this product and the cost of its transport at the time of making procurement decision;

with limitations:

- for supplied amount of product type *s*, taking into account demand of consumer company:

$$\sum_{i=1}^{I} x_{is} \le a_s; s = 1,...,S;$$

- for purchased amounts of product type *s*, taking into account capacity of supplier *i*:

$$x_{is} \le Q_{is}; i = 1,...,I; s = 1,...,S;$$

- direct limitations on the controlled variables:

$$x_{is} \ge 0; i = 1,...,I; s = 1,...,S;$$

- for the total cost of the purchase and delivery of all types of products from different suppliers, taking into account the procurement budget of consumer company:

$$\sum_{i=1}^{I}\sum_{s=1}^{S}(c_{is}^{pr}+c_{is}^{trt}d_i)x_{is} \le C^{alloc};$$

- weighting coefficients of product types:

$$\beta_s \ge 0; \sum_{s=1}^{S}\beta_s = 1.$$

The result of solving this task is a plan for optimal procurement of product $\left\|x_{is}^{*}\right\|; i = 1,...,I; s = 1,...,S$, which ensures the maximisation of the objective function $F(x)$. Based on the procurement plan received, the consumer company decides on selection of suppliers of each product type.

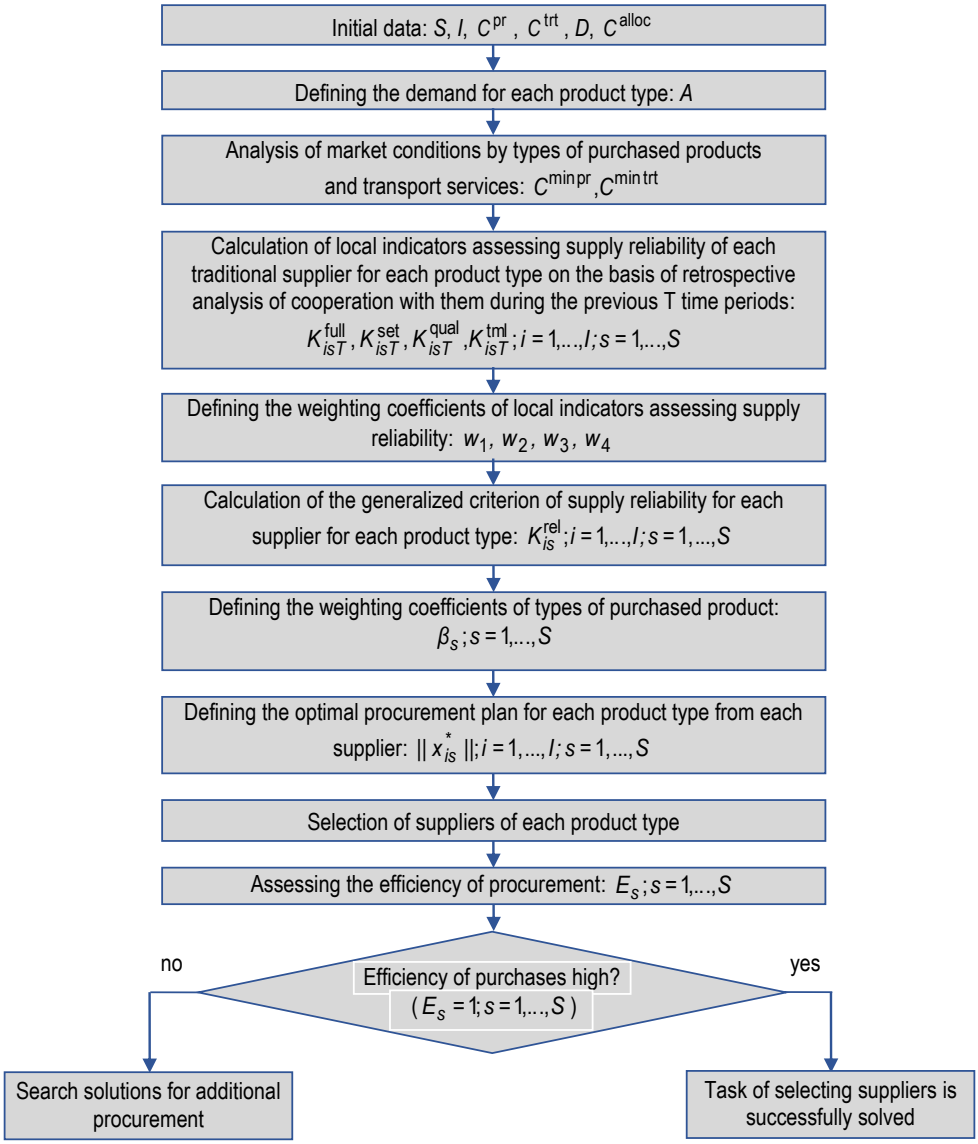
To assess the effectiveness of the implemented procurement, we use the indicator reflecting the level of demand satisfaction of the consumer company for each product type separately:

$$E_s = \frac{\sum_{i=1}^{I} x_{is}^{*}}{a_s}, \text{ at that } 0 \le E_s \le 1. \quad (22)$$

In the event of low efficiency of procurement ($0 \le E_s \le 1$), the management of the consumer company should seek new solutions for additional procurement based on available resources (temporary, financial, material, and image). Possible solutions include the requirement for traditional suppliers to provide discounts on the product price and transportation cost for permanent customers or for large purchase amounts, reduction of stock of purchased products, search for new suppliers and carriers, increasing procurement budget, etc.

The proposed model can be the basis for the development of the method of multi-criteria selection of traditional suppliers and procurement optimisation of various types of products (Figure 2).

Figure 2. The steps of the method of multi-criteria selection traditional suppliers



Source: Elaborated by the author

3. An example of application of the model

The solution to the problem of multi-criteria selection of suppliers is carried out on the example of purchasing four product types (P1÷P4) from three suppliers (S1÷S3) according to the results of cooperation with them over the last four quarters (I÷IV). The purchase budget of the company consumer is 3.5 million euro. The characteristics of suppliers at the time of making procurement decision are given in Table 1.

Table 1. Supplier's characteristics

Suppliers	Capacity of supplier, units				Price per unit of product, Euro				The transport tariff, Euro / km * unit			
	Types of products											
	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
S1	400	60	3200	9000	270	360	117	42	3.1	4.5	1.8	1.3
S2	500	70	4500	8000	290	392	114	45	3.2	4.6	2.2	1.1
S3	300	40	2400	7000	292	384	122	49	3.4	4.2	2.3	1.2

The minimum prices per unit of different product types in the market and minimum transport tariffs for their delivery at the time of making procurement decision are shown in Table 2.

Table 2. Minimum prices and transportation tariffs, Euro

Indicators	Types of products			
	P1	P2	P3	P4
Minimum price	265	360	110	40
Minimum transport tariff	3.0	4.2	1.8	1.0

The demand of the consumer company for different types of products at the time of the decision to purchase is given in Table 3.

Table 3. Demand for a product, units

Demand	Types of products			
	P1	P2	P3	P4
Quantity demanded	600	70	4800	15000

The distances from the suppliers of products to the warehouse of the consumer company are given in Table 4.

Table 4. Distances from suppliers to the warehouse of the consumer company, km

Distances	Suppliers		
	S1	S2	S3
Warehouse of the consumer company	120	90	65

Indicators of supply amounts of purchased products according to the results of cooperation with suppliers for the previous four quarters are shown in Table 5.

Table 5. Supply amounts of purchased products, units

Indicators of supply amounts	Suppliers											
	S1				S2				S3			
Periods of time, qr.	I	II	III	IV	I	II	III	IV	I	II	III	IV
P1												
Under the contract	100	150	200	150	300	300	200	250	200	150	200	200
In fact	100	150	194	146	300	285	200	246	190	150	200	196
Products with an incomplete set in the package	2	5	4	8	14	15	11	8	6	4	8	5
Products of inadequate quality	7	6	9	8	15	18	10	11	13	9	14	12
P2												
Under the contract	35	35	30	30	30	25	25	25	15	20	25	25
In fact	35	32	29	28	28	25	24	24	15	20	24	23
Products with an incomplete set in the package	1	2	2	2	2	1	1	2	1	1	2	1
Products of inadequate quality	2	-	2	2	3	1	2	1	1	-	1	1

P3												
Under the contract	2200	2300	2300	2400	1400	1400	1200	1200	1400	1300	1500	1400
In fact	2185	2278	2290	2376	1395	1380	1194	1192	1386	1299	1478	1388
Products with an incomplete set in the package	18	25	17	20	20	16	14	12	22	8	16	11
Products of inadequate quality	20	24	30	27	32	18	21	25	29	23	32	24
P4												
Under the contract	7000	7000	6000	5000	5000	4000	4000	5000	4000	5000	5000	6000
In fact	6980	6940	5920	4960	4920	3970	3980	4960	3980	4970	4980	5970
Products with an incomplete set in the package	85	90	70	60	100	85	60	110	70	75	80	100
Products of inadequate quality	145	170	130	110	125	100	115	105	95	120	110	150

Indicators of timely supply of purchased products according to the results of cooperation with suppliers for the previous four quarters are shown in Table 6.

Table 6. Timeliness of supply of purchased products

Indicators of timely supply	Suppliers											
	S1				S2				S3			
Periods of time, qr.	I	II	III	IV	I	II	III	IV	I	II	III	IV
P1												
Under the contract, days	9	9	9	9	9	9	9	9	9	9	9	9
In fact, days	10	12	11	13	11	12	10	12	12	9	13	9
Quantity of deliveries	10	10	10	10	10	10	10	10	10	10	10	10
Quantity of timely deliveries	8	8	8	9	10	8	9	8	8	10	8	10
Time of reaching the stock critical level, days	11	11	11	11	11	11	11	11	11	11	11	11
P2												
Under the contract, days	45	45	45	45	45	45	45	45	45	45	45	45
In fact, days	45	50	55	45	60	45	45	45	45	50	55	45
Quantity of deliveries	2	2	2	2	2	2	2	2	2	2	2	2
Quantity of timely deliveries	2	1	1	2	1	2	2	2	2	1	1	2
Time of reaching the stock critical level, days	50	50	50	50	50	50	50	50	50	50	50	50
P3												
Under the contract, days	30	30	30	30	30	30	30	30	30	30	30	30
In fact, days	30	40	35	30	45	40	30	30	30	30	40	30
Quantity of deliveries	3	3	3	3	3	3	3	3	3	3	3	3
Quantity of timely deliveries	3	2	2	3	2	2	3	3	3	3	2	3
Time of reaching the stock critical level, days	35	35	35	35	35	35	35	35	35	35	35	35
P4												
Under the contract, days	90	90	90	90	90	90	90	90	90	90	90	90
In fact, days	90	90	110	90	120	105	90	90	100	90	90	90
Quantity of deliveries	1	1	1	1	1	1	1	1	1	1	1	1
Quantity of timely deliveries	1	1	-	1	-	-	1	1	-	1	1	1
Time of reaching the stock critical level, days	100	100	100	100	100	100	100	100	100	100	100	100

Weighting coefficients, used in the model, are defined by the scoring method and are given in Table 7.

Table 7. Values of weighting coefficients

Indicators of supply reliability	Weighting coefficients	Types of products	Weighting coefficients
Coefficient assessing the completeness of supplies	0.43	P1	0.34
Coefficient assessing the package contents	0.11	P2	0.39
Coefficient assessing the quality of products	0.29	P3	0.17
Coefficient assessing the timeliness of the supply	0.17	P4	0.1

The results of optimising procurement management of products in traditional suppliers:

- indicators assessing supply reliability of different product types from different suppliers are given in Table 8:

Table 8. Valuation indicators of reliability of supply

Indicators of reliability of supply	Suppliers											
	S1				S2				S3			
Types of products	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
Coefficient assessing the completeness of supplies	0.983	0.954	0.992	0.992	0.982	0.962	0.993	0,991	0.981	0.965	0.991	0.995
Coefficient assessing the package contents	0.968	0.944	0.991	0.988	0.953	0.941	0.988	0,98	0.969	0.939	0.99	0.984
Coefficient assessing the quality of products	0.949	0.952	0.989	0.978	0.948	0.931	0.981	0,975	0.935	0.963	0.981	0.976
Coefficient assessing the timeliness of the supply	0.511	0.606	0.648	0.622	0.583	0.673	0.489	0,333	0.597	0.606	0.74	0.73
Generalised criterion of supply reliability	0.869	0.882	0.922	0.912	0.887	0.895	0.877	0,818	0.888	0.888	0.940	0.938

- the plan for optimal procurement of different product types from different suppliers, taking into account the generalised criterion for assessing supply reliability according to the results of cooperation with them in previous time periods and deviation of price indicators, proposed products and their delivery, from minimum values these indicators in the sales markets at the time of making procurement decision, is given in Table 9:

Table 9. Optimal procurement plan, units

Types of products	Suppliers		
	S1	S2	S3
P1	0	300	300
P2	0	0	40
P3	1663	0	2400
P4	0	8000	7000

Source: The author using Solver module of MS Excel 2010 obtained the results

Thus, the best suppliers of product type P1 are suppliers S2 and S3, product type P2 – supplier S3, product type P3 – suppliers S1 and S3, and product type P4 – suppliers S2 and S3. Indicators for evaluating the procurement efficiency of products obtained by the results of the simulation are shown in Table 10:

Table 10. Procurement efficiency

Indicator	Types of products			
	P1	P2	P3	P4
Indicator of procurement effectiveness	1.0	0.571	0.846	1.0

As can be seen, the procurement of product types P2 and P3 were not effective enough, which requires making decisions for additional procurement of these product types.

Conclusions

Efficient management of supply chains is based on mutually beneficial and long-term cooperation in each pair "supplier – consumer". In the context of market economy, most companies have several suppliers of the same product to ensure reliable supply, to use their competition for reduce prices of products supplied, and to more easily meet the changing demand of the range of products. Interaction with several traditional (permanent) suppliers does not remove from the agenda the task of selecting the best of them from the standpoint of the consumer company with each new procurement. In this case, the task is formulated as a task of optimal allocation of orders among suppliers based on many factors characterising suppliers, their products and supply processes in previous time periods. Supply reliability and logistics costs of product purchase and delivery are offered as the main criteria for selecting traditional suppliers. The generalised criterion for the assessment of supply reliability reflects the results of the interaction with suppliers in previous periods and presented in the form of multiplicative convolution of local indicators assessing the completeness, package contents, and timeliness of supply, as well as the quality of products supplied, taking into account their weighting coefficients that are defined by methods of expert evaluation. The logistics costs criterion shows the rejection of product prices offered by suppliers and delivery costs from the minimum values of these indicators in the markets at the time of making procurement decisions.

The developed linear programming model allows optimising the procurement of different types of products from several traditional suppliers under the objective function, combining the evaluation criteria of supply reliability and logistics costs, given the weighting coefficients of product types. The model contains a rational combination between the elements of retrospective and marketing analysis, optimisation with expert reviews, which provides the optimal solution when selecting traditional suppliers. We proposed indicator assessing procurement efficiency. The developed method of multi-criteria selection of traditional suppliers is based on the proposed mathematical model.

The article shows the numerical example, illustrating the application of the developed model and method that confirms their efficiency as tools of justifying decisions made by the management of the consumer company in the context of a different procurement options from several traditional suppliers and limited financial resources.

An important task in further research is the development of a model for simultaneous selection of both traditional and new suppliers.

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How Can Strategy Influence the Internal Nature of Business Model?

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Abstract

Business model and business strategy fundamentally determines the existence and performance of a company. Despite the numerous research on business models and business strategies dealing with each topic separately, the research of their relationship is almost absent and therefore insufficient. In this paper, we present the results of our research on the relation between the business model and strategy focused on business model blocks with the most internal influence. Our research was conducted on a sample of 231 companies using linear regression method to determine the relations. As a result, we identified approaches how companies tried to develop quality business model and strategies supporting this approaches. We then identified strategies with the most influence on the complexity and the difficultness of the business model. These results can have both practical and theoretical application because understanding this relationship can help manage limited resources efficiently and further improve the present state of knowledge.

Keywords: business model; business strategy; strategy-model relationship

JEL Classification: M10; M21

Introduction

The state of the art knowledge in the field of strategic management reached a situation that requires some explanation of the relationship between the business model and the business strategy. After a thorough literature research, a satisfactory explanation was missing what led to this research. Currently, the dynamics of knowledge progression is increasing under the influence of globalization and information technologies. The progression created new diverging branches of this field with specific characteristics but fundamentally related. These include the concept of strategy and business model. This situation results in the need to review some established concepts, and to separate and study its components.

Business strategy and business model are two determinants, which affect the essence of existence, position, and performance of a company. Both the strategy and model are the object of long-term academic research and are separately well investigated. Although there is a natural perception of their relationship, this relationship is not adequately researched. Existing studies recognize some links between the business model and strategy, even some common features, but these rather have the character of an opinion usually lacking a proper empirical research. The presented research is built on an extensive theoretical knowledge research on strategy, business models and their relations and studies the specific relation between strategy and business model using an actual field research of 231 companies. Our findings contribute to the present state of knowledge on the relation between strategy and business model and improve the knowledge of strategic management itself.

1. Literature review

Business model portrays and displays a notion about the company's resources, which are grouped and arranged in a process to produce a value for the customer and earnings for the entrepreneur. The business model,

therefore, answers the fundamental question of company's existence and the business itself, which is a satisfied and paying customer and efficient business whose revenues exceed costs, and therefore is profitable. Every company that is creating positive cash flow has to have a working business model regardless if it is explicitly recognized and cultivated, or if the existence of the model is implicitly perceived and developed intuitively. The topic of the business model as it is seen today was introduced mainly due to the rise of information technology and the internet, which have transformed the resources and processes throughout the industries. They introduced new needs and brought new ways of satisfying them. New sources of income appeared from the difference of new business models compared to those typical for the industrial era of business. Business models in the digital economy are using other ways to earn money than in the traditional industrial economy.

Afuah (2004), Wheelen and Hunger (2008), Mullins and Komisar (2009) consider the business model as the system to make money. Johnson, Christensen, and Kagerman (2008) do not offer a very explicit definition of the business model. However, they state that the model should express how a company meets the customer's needs on a profitable basis. According to Teece (2010), business model expresses the logic of how the company creates and provides value to the customer, how a company shapes and delivers value to customers and ultimately how it converts received payments into profit. Chesbrough and Rosenbloom (2002) wrote similarly that the business model embodies the essence of the organizational and financial setup of business.

Zott and Amit (2010) brought a broad view of the business model. They understand the concept of the business model as a system of interrelated activities that go across company boundaries. The system of activities allows along with partners to create value and also capture a portion of this value. Demil and Lecocq (2010) in general see the business model as a concept that describes the relationships between its various components, which are a precondition to creating value for customers and the company itself. The business model of Wirtz, Schilke, and Ulrich (2010) displays a system of operation and outputs that captures the way how a company works and creates value.

Casadesus-Masanell and Ricart (2011) approached the business model definition very differently. Based on research, they suggest that one component of the business model are the decisions taken by executives on how to operate the company. That could be decisions on compensation, procurement, placement of operations, the extent of vertical integration, sales or marketing. These managerial decisions have consequences which are the second component of the business model. They argue that the choice of price affect the volume of sale, which in turn affects the economies of scale and bargaining power. These consequences affect the business logic of value creation and value capturing. Therefore the consequences must also have their place in the definition. That is why, in the simplest conceptualization, the business model consists of a set of managerial decisions and the consequences of those decisions.

McGrath (2010) deals with the topic just briefly, but she gives a picture of its essence when she writes that the concept of business model offers an unusual opportunity to display a better way how to turn a set of resources into something the customer is willing to pay.

In most of the definitions, three separate elements appear. These are products or services offered to the customer, the way the company is organized to create and deliver these products and services to the customer, and how to capture a part of the created value, thus a profitable revenue model. Definitions differ in the emphasis put on these elements.

Business strategy positions the company in the business environment at some position, its most difficult task is to strengthen and improve this position. The business strategy then leads the company across the business environment towards more or less ambitious goals, which can range from extraordinary performance to survival at least, it provides guidance how to confront or avoid competitors. The importance of the strategy increases in a complex and dynamic business environment that is unclear and unstable. The strategy provides guidance in such an environment identifies the starting position, the desired position in the future and usually formulates several contingencies how to overcome possible difficulties to reach the desired result in the future. A company that knowingly acts somehow can be considered having a strategy. This strategy can be systematic and planned, created before the company begins to act, and the company tries to behave according to it to achieve its objectives. The opposite strategy is unplanned, spontaneous or opportunistic.

The traditional concept of the strategy encompasses a vision, positioning into the environment or among the competitors, direction towards the future and the way how to get there (Andrews 1971, Ansoff 1965, Chandler 1962, Porter 1998). Principal decisions are being made about the medium and long term goals and company's approach to achieving them. These general concepts were supported in the course of later development of the theory and practice and were further extended by other academics trying to cover the fundamental strategic question "How to achieve set objectives?" Karnani (2008), in his work, attempts to describe the essence of the strategy. He sees it as a set of interrelated decisions about the environment in which the company will compete, about the sources of company's competitive advantage, about the value, which is offered to customers and organizational setup needed to implement the strategy. All these decisions are complex and controversial. The very essence of the strategy, according to him, is trade-offs and compromises. Markides (2001) was initially inclined to use general terms when he wrote that the strategy must decide what game we want to play, and then decide how to play this game right. However, then he specified that decision about the game focus on two dimensions: who are the customers and what to offer to them. Finally, he concludes that the strategy is based on the answers to three related questions: Who is our target customer? What products and services should we offer? How should we provide these products and services to our target customers in an efficient and innovative way? Magretta (2002) although primarily addressed the topic of business models, she indicated that different strategies could emerge on the same business model. These strategies should be unique in the following components: market, position, technology, product, services, and customers. The extensive notion of business strategy can be further traced in the works of Hambrick and Frederickson (2001), Wirtz, Mathieu, and Schilke (2007), Carter *et al.* (1994), Gamble, Strickland, and Thompson (2007) and Simons (2010). These notions are then reflected in a set of parameters which we used to describe the business strategies of companies studied in our research.

In the following section, we study the attempts to describe the relationship between business model and business strategy. Magretta (15) writes: "*The business model and strategy are two different things. One explains who your customers are and how you plan to make money when you deliver value, other how to beat the competition when you are different.*" She further adds: "*Business models describe how business elements fit together in one system. They do not take into account one critical dimension of performance, which is a competition. Sooner or later, usually sooner, every company runs into competitors. To deal with this reality is a matter of strategy.*" Newth (2012) formulates these ideas in a similar way: "*The business model is about how the company works, and strategy is about how the company competes.*" He further explains: "*The business model is an internal system that is composed of elements, links, and dynamics, while the strategy is an external competitive approach using competencies that have developed in the business model.*" From that view of Magretta (2002) and Newth (2012) follows that the strategy and model are related and complementary but relatively independent entities.

Casadesus-Masanell and Ricart (2010) wrote: "*The business model is a reflection of the implemented strategy. The strategy is a contingent plan how to use business model.*" The business model, based on their perception, is a part of a wider strategy, where the strategy selects the appropriate business model, shapes the business model, and determines how it is used. Another connection (Casadesus-Masanell and Ricart 2011) they see between strategy and model is that "*while every company has a business model, not every company has a strategy, thus an action plan for any emergency that may arise*." According to this, it can be reasonably assumed that also a company which has not a planned, formal policy, but acts in a certain logic can be considered having a strategy, and thus a business model.

DaSilva and Trkman (2014) consider "*business model as a reflection of business strategy and they give a reason that the strategy shapes the development of capabilities that may change the contemporary business models in the future*." Some practice, however, shows that models can emerge non-strategic, unplanned way as a consequence of many trials and errors.

From the quoted opinions of Casadesus-Masanell and Ricart (2010, 2011), DaSilva and Trkman (2014) follows that the strategy and model are linked entities, where the strategy determines the model. On the other hand, Seddon and Lewis (2003) argue that the business model determine the strategy. They use the analogy of

the models in architecture and engineering services, which are known as the successful building blocks for conceptualization and building of strategy. Many uncertainties related to business strategy and the business model comes from the proximity of these two related but separate phenomena. Stieglitz and Foss (2015) therefore merely state: "*Sometimes business models are seen as subordinate and at other times as superior towards business strategy*."

Wirtz *et al.* (2016) wrote that the research of business models in the course of time was performed from three fundamental points of view, from the technological, organizational, and strategical view. The technological point of view perceives the business model as a set of operational processes. The organizational perspective perceives the business model as a tool for company-wide abstraction. From a strategic point of view, the business model is a connection between the planning of future and operational implementation. These three aspects are currently converging into a single unit. More and more authors deal with the strategic perception of the business model and therefore the difference between business model and strategy is getting in the forefront. Although it has been found that both concepts intersect each other, they do not mean the same. Casadesus-Masanell and Ricart (2010) emphasize: "*According to our formulation, model and strategy are related but distinct concepts: the business model is a direct result of the strategy, but in itself is not a strategy*."

The presented literature review provides sufficient reasons to study the relationship between business model and business strategy as we were able to identify enough arguments supporting a relationship between them but keeping the boundaries unclear.

2. Objectives and methods

The objective of this research is to describe the relationship between business strategy and business model represented by the blocks that are most susceptible to internal influence and to evaluate the tightness of this connection. The tightness of dependence has practical implications. Tight dependence seems to reduce the variability of model and variability of strategy, in other words, a change of business model will reflect an adjustment to the strategy and vice versa. More loose dependence gives more freedom to adapt and to vary the business model and the strategy, without impairing the functionality of their relationship. These results will also provide partial evidence of the relationship between business strategy and business model in general.

Our research sample size was 231 companies. To study business models we used the visualization method from the authors Osterwalder and Pigneur (2010) called Business model canvas and adjusted it to our needs. To cover the parts of the business model that are more intrinsic properties of a business model, and so more susceptible to company's decisions, we separated the inputs and the product from the rest of the business model. The business model is described using the business model canvas from which we selected three blocks (proposed value, key resources, and key activities) most susceptible to internal influence. Blocks less susceptible to internal influence (key partners, customer segments, customer relationships, channels, cost structure and revenue streams) were not taken into account for the sake of the evaluation. Such a representation of the business model is similar to the business models presented by Johnson, Christensen, and Kagermann (2008) whose business model interpretation consist of proposed value, resources, processes and profit formula blocks. Selecting blocks that have internal character, and excluding those that have more external character, or their quality and performance depends on external factors, is a subject to a careful separation of business model and strategy. The business model for the purpose of this research is considered to be the more of an internal property of a company that is shaped relative independently of the external environment. Strategy, on the other hand, was for the purpose of this research considered to be more of an external property of the company, which is how the business is acting and reacting to competition.

The objects of the business model assessment are following blocks:

- the proposed value that is brought to the customers
- key resources (anything that is useful, tangible or intangible) and capabilities (socially complex routine, that will determine the efficiency of the transformation of inputs to outputs)
- key activities (are used to transform the key resources into outputs, primary and supportive).

In our research we assessed the quality of the selected blocks of a business model based on a comparison with similar companies or competitors, resulting in the overall quality of the model. Although the higher resulting quality was regarded as better, sometimes it can be costly and even unnecessary. Quality range is from 1 to 5: 1 - minimal, 2 - low, 3 – about the same, 4 - high, 5 – exceptionally high level compared to competitors.

The business model is expressed in two ways in our research, in complexity, and difficultness. In either case, we evaluated the quality of the business model blocks.

The complexity of the model reflects its quality as the sum of averages of all blocks. We created the indicator of the business model complexity as the sum of the average level quality of the business model blocks proposed value, key resources, capabilities, key activities and support activities. This indicator in its essence can have values between 5 and 25. The value 5 means that elements of the blocks had the lowest possible level, and the value of 25 means that the company achieved the highest possible level in all the blocks. A complex business model is one that requires the development of a large number of elements at the highest level, without a minimum level criterion. Such company with a complex business model has a strongly diversified business model with elements of the highest average level.

The difficultness of a business model is expressed as the sum of adjusted evaluation of all blocks. Ratings of 5 points were adjusted to 3 points, 4 points scores adjusted to 1 point, and scores of 3 points or less were adjusted to 0 points. The purpose of this adjustment was to isolate the exceptional elements of the business model, so this indicator can show off how many elements have to reach high specialization level and thus how difficult is to achieve this type of business model as it has to be specialized in more elements. This approach also separates demanding business models from models that have a lower number of above average quality of its blocks. In other words, a demanding business model is one that has a large number of elements in the highest level (level 4 and 5 of 5). Thus, the companies have to be specialists in those elements. A company with the highly demanding business model has more of elements that are at the highest level and so is more difficult to create. Indicator of demanding business model was constructed as a sum of the elements with exceptional value level of the blocks proposed value, key resources, capabilities, key activities and support activities. These values had a weight of 3 or 1, depending on whether it was the highest or second highest level. The indicator could essentially take values from 0 to 114, where 0 would mean that the company had not a single above average element in the studied blocks. The total value of 114 would, on the other hand, mean that the blocks consist exclusively of the highest level elements.

The business strategy is considered to be a tool of competition and it manifests itself in the actual acting of the company. The strategy as a competing tool can be described by following factors on the competitors:

- *Differentiation level:* 1 – no difference 2 - a little difference, 3 - the greater difference, 4 - a big difference, 5 - complete difference.
- *Competitive position*: 1 - on the periphery, 2 - in the bottom half, 3 - average, 4 - in the upper half, 5 – leading.
- *Strategic position in respect of business expansion:* 1 - defensive, 2 – offensive.
- *Strategic approach due to behavior:* 1 – complaisant, 2 - cautious, 3 – aggressive.
- *Strategic approach due to planning and assertion:* 1 - opportunistic, 2 – systematic.

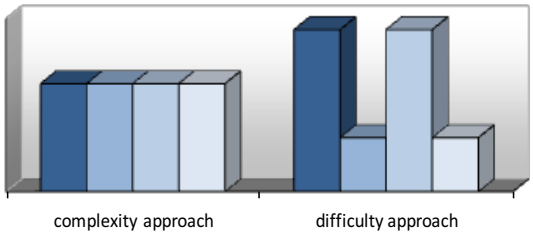
In our research, we proceeded as follows. First, we started with a general description of the data obtained in our research to create the image of the present state of companies, using descriptive statistical methods. The data were collected using a questionnaire method in 231 companies. Next, we analyzed the impact of the strategy on the difficultness of the business model, to find out which aspects of strategy can reach the most significant effect. Subsequently, we analyzed the impact of the strategy on the complexity of the business model with the same objective of identification of strategies with the greatest impact. To analyze these relationships we used the inductive statistical methods while the most important was the linear regression method. The results were considered to be statistically significant if the p-value was 0.05 and less.

3. Results

In this section, we deal with the results of our research. Table 1 summarizes the business models and strategies of the companies studied in our research. We describe our research sample using methods of descriptive statistics, so we create an overview of the situation on the market and present the composition of our sample. To describe the sample, we used the count of valid responses, arithmetic mean, standard deviation, minimum, and maximum.

We got following results about the business models. As the indicators to describe and compare the business models we use the business model complexity and difficultness of the business model. The complexity of the average business model is not significantly volatile. The fact that the typical business model is average in complexity indicates proper sampling. On the other hand, the difficultness of business models is highly volatile, what indicates big differences of the business model difficultness level between the real companies in our survey. Putting these indicators together suggest, that these companies achieved similar complexity level by a different combination of business model elements in the blocks. This deviation suggests that there are two ways how companies chose to develop their business model. They either chose to develop as many elements of their business model as possible, to achieve the most elements with higher minimal quality. The other approach was to achieve an extraordinary quality level of as many of the elements as possible, meaning that the company focused on developing specialization level of fewer elements leading to similar overall average as other companies. The idea is illustrated in Figure 1. Both approaches can have the same average quality of business model development but different ways to build their business model.

Figure 1. Complexity and difficulty approach



Based on the results of our research we have the following description of the strategies used by studied companies. In our sample 79.82% (182) of companies differs to their competitors only slightly. A systematic strategy is used in 84.47% (174) of companies. The offensive position was declared by 77.98% (170) of the surveyed companies, while 22.02% (48) held a defensive position.

The average company in our research only slightly tried to differentiate itself from its competitors, while it focused more on proposed value rather than on cost. However, their approach can be referred as stack in the middle as they did not clearly commit to one distinct strategy. This lack of commitment can be a problem in the sense that it is hard if not in some situations impossible to achieve a superior level in two unrelated approaches the same time. Some positions require trade-offs like quality components versus the costs, or processing quality versus time, while some positions need continuity to develop culture, chemistry, synergy or mastery. There is also another disadvantage connected with the overall value orientation that we have to mention. Companies that are more successful are being related to value orientation instead of cost orientation. However, if companies do not have anything to offer, or to offer it in a different way, it seems they would be better off if they try to be more effective rather than cost oriented.

We have to mention that while the average company proclaimed that it achieved above average competitive position, this is considered to be a common self-evaluation phenomenon, and we assume that the ratio between the companies stayed preserved, and only the overall level is increased.

Table 1. Description of research variables

Variable	N	Mean	Std Dev	Min	Max
Business model difficultness	230	33.37	15.77	4	77
Business model complexity	229	17.44	1.93	12.4	21.6
Differentiation level	228	2.78	0.86	1	5
Cost-value orientation	223	3.53	0.86	1	5
Competitive position	229	3.93	0.96	1	5
Defensive-offensive position	218	1.78	0.42	1	2
Complaisant-aggressive approach	214	2.42	0.51	1	3
Opportunistic-systematic approach	206	1.84	0.36	1	2

Source: Own research

The average company took an offensive position, seeking to expand its markets and market shares and it did this in an active way, on the border between cautious and aggressive behavior, trying to attract its competitors. Most businesses acted purposefully and had a systematic strategy based on intrinsic goals. Companies preferred a systematic approach, in which they planned their objectives, way how to achieve them and stayed with their game plan rather than just floating in the competitive environment and looking for opportunities.

In the result section of our research, we described the business models and strategies of studied companies. This description represents the first step of our association analysis that can identify causalities and can be used to draw a conclusion on population, as this will be the objective of the discussion section.

4. Discussion

In the discussion section, we analyze and evaluate the relationship between the business strategy, describing the acting of a company and representing the external environment decisions, and the internal nature of the business model, describing the more internally influenced building blocks of a company's logic and representing the internal environment decisions.

Using linear regression analysis, we analyzed the impact of the strategy on the difficultness of the business model. Table 2 shows the model of the business model difficultness and factors influencing it. Among the studied strategic factors, we identified statistically significant effects of differentiation, competitive position, cost-value orientation and of the defensive-offensive position all of which meet the required significance level of 0.05. Among them the biggest impact had the differentiation (Beta = 0.19) and competitive position (Beta = 0.19), followed by cost-value orientation (Beta = 0.18) and defensive-offensive position (Beta = 0.13). This model explains 14 percent of the variability in difficultness of the business model. The business model is more demanding if the company focuses more on differentiation, is occupying leading competitive positions; it prefers proposed value instead of costs and if it is trying to expand its market and market share. Companies with a better position, greater differences, value orientation and an offensive position had a business model that was over the standard demanding on more elements of the business model compared to other business.

Table 2. Impact of the strategy on the business model difficultness

	Business model difficultness	Business model difficultness
Differentiation level	3.86** (1.32)	3.44** (1.24)
Competitive position	2.52* (1.22)	3.13** (1.07)
Defensive-Offensive position	3.89 (2.93)	4.97* (2.50)
Complaisant-aggressive approach	0.21	-

	Business model difficultness	Business model difficultness
	(2.32)	
Opportunistic-systematic approach	4.32 (3.16)	-
Cost-value orientation	3.04* (1.26)	3.28** (1.18)
R-squared adjusted	0.13	0.14

Note: ° significance level 0,1, * significance level 0,05, ** significance level 0,01. Standard error in parenthesis
Source: Own research

In Table 2 presented results of the linear regression analysis are not only new and noteworthy findings, but they also present an opportunity for setting up a business to address these findings and so to create an advantageous competitive position. The advantageous position can be reached by selecting more efficient tools and spending its limited resources on tools with the potential for a better result. The regression model includes all the researched factors with significant impact on the difficultness of the business model. In the previous text, we identified two ways how companies create quality business models. The company has to decide which strategies that influence the business model difficultness fit more its organization and strengths. In the case of limited resources, the company can choose to develop the strategy with the most impact. An example could be a company that is trying to develop a competitive advantage creating a demanding business model. If it has enough resources, it can combine the factors that fit its organization the most and start a program to differentiate itself, while orienting on value, trying to gain market share and so the market position. In the case of limited resources, the company has to decide which strategy corresponds the best with the business setup. For example, if it is producing some basic products with a lower opportunity to differentiate itself it would be beneficial to try to focus on acquiring market share. There is one more idea hidden in the results. There are two distinct groups of approaches how to achieve the difficultness of business model, which are of particular importance in the case of limited resources. One group consist of differentiation level and cost-value orientation, both dealing with how to create a unique position. The second group is competitive position and offensive-defensive position dealing with market share acquisition.

To analyze the impact that the strategy has on the complexity of the business model we used the linear regression method. Table 3 shows the model of the complexity of the business model and how it is influenced by the studied strategic factors. Among those strategic factors, we identified, on the statistical significance level of 0.05, a significant influence of the competitive position, opportunistic-systematic approach and cost-value orientation. At a marginal significance level of 0.1, we also identified an impact of defensive-offensive strategic position. Among these factors the biggest impact had the competitive position (Beta = 0.29), followed by opportunistic-systematic approach (Beta = 0.17), cost-value orientation (Beta = 0.16) and on the lower statistical significance level of 0.1 defensive-offensive position (Beta = 0.12). This model explains 15 percent of the variability in the complexity of the business model. The business model is regarded as more complex in the case of businesses with better competitive position, more systematic approach, higher value orientation and with an offensive position. In other words, the business model is considered to be more elaborate, that means that it has a total of more developed business model elements compared to the competitors, if the company occupies a better competitive position, prefers proposed value instead of the costs, plans systematically and is expanding its market.

Table 3. The influence of strategy on business model complexity

	Business model complexity	Business model complexity
Differentiation level	0.19 (0.16)	-
Competitive position	0.52** (0.15)	0.59** (0.14)
Defensive-offensive position	0.49	0.56°

	Business model complexity	Business model complexity
	(0.35)	(0.32)
Complaisant-aggressive approach	0.12 (0.28)	-
Opportunistic-systematic approach	0.90* (0.38)	0.92* (0.37)
Cost-value orientation	0.30* (0.15)	0.35* (0.15)
R-squared adjusted	0.15	0.15

Note: ° significance level 0,1, * significance level 0,05, ** significance level 0,01. Standard error in parenthesis
Source: Own research

As in previous analysis, we have similar possibilities of using these results of the linear regression analysis shown in Table 3. These results present as well an opportunity for setting up a business to address the findings and to create an advantageous competitive position. A company that chooses the approach of developing quality business model going the complexity way can choose between the identified strategies to achieve its goal. Unlike in the case of difficultness, the companies has more approaches to choose from as they cannot be grouped as easy as in the previous case. The company that has enough resources can address all strategies, which are compatible with its setting. Meanwhile, a company with limited resources has to select those strategies that are the best fit for its business and has the greatest impact.

If we compare the two results of our analysis, we can, even more, refine some of our interpretations. In the case of business model complexity, there are more ways how to achieve the goal than in the case of business model difficultness. However, the more different approaches also mean, that there are fewer opportunities to group the strategies the same time. As there are some differences, there are also some similarities. Both competitive position and cost-value orientation were present in significant level in both models. This knowledge about the similarities is especially valuable in the case of startups and beginning companies, which are still looking for the final business concept but want to make a positive step ahead to the competitive advantage.

Conclusion

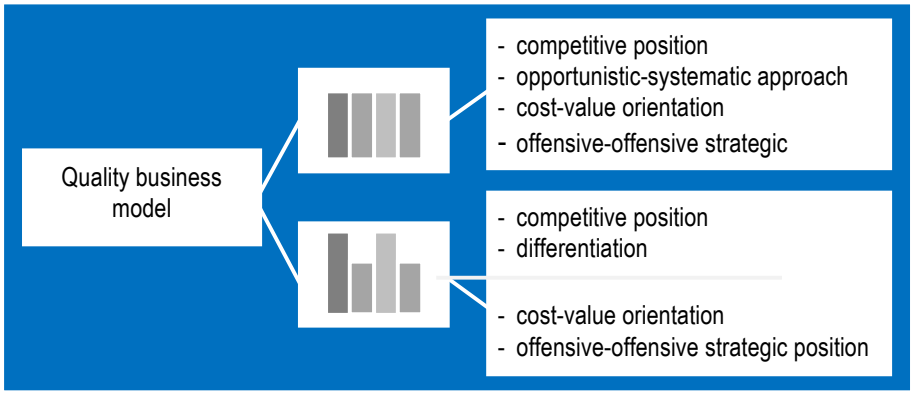
The presented results of our research are very valuable because they contribute to fundamental understanding of business, how it is constructed and how its actions shape it.

In our research, we identified the effects that differentiation, competitive position, cost-value orientation and the defensive-offensive position have on how demanding is the business model. Companies that want to use certain strategies have to make proper adjustments to their business models. In the case of mentioned factors, it is more difficult to build such business model as it has more exceptional levels of the business models elements related to the competitors. This knowledge, and so the use of presented combination of strategies can be a potential tool to create a competitive advantage as it is inherently difficult to create such a business.

Our second contribution to the present state of knowledge is the identification of the effect that competitive position, opportunistic-systematic approach, cost-value orientation and at a marginal significance level defensive-offensive strategic position have on the complexity of the business model. Complexity speaks about the overall level of a business model without minimal requirements. A complex business model can be costly to obtain as it can have many expensive elements involved in the model and there are circumstances where a complex business model can be a competitive advantage or can provide an entry barrier to the competitors.

There were two ways how companies created quality business models. One was to have more business model blocks with the highest average quality of blocks without variations in quality between blocks. The second was to have as many specialized blocks as possible, with variations in quality between the blocks. Both approaches are outlined in Figure 2 and can be supported by different sets of strategies.

Figure 2. Approaches to develop quality business model



In general, as we were able to identify a causal relationship between the business strategy and the selected business model blocks, we can conclude that there must be a relationship between business strategy and business model as a whole also. However, the tightness of this relationship is according to our results rather loose. That means we can see a relationship, but there are also a lot of different degrees of freedom of this relationship.

Understanding this relationship can help companies to spend their limited resources effectively and to choose the right combination of strategies that fit the organization and has a clear impact on the desired outcome. Researchers can build on our findings as we built our research on findings of our colleagues. The relationships that we uncovered have to be further studied as well as other business model blocks and other strategy types. Another research opportunity is presented in the form or studying these relationships in different business environments and conditions.

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Economic Assessment of Marketing Elements of Exhibition Activities

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Abstract

The purpose of the article is to address the challenge of formulating guidelines for assessing the economic efficiency of marketing aspects of participation in activities and organization thereof. Achieving this goal involved the use of a systematic approach in constructing the economic efficiency assessment system for marketing elements of exhibition activity; generalization and specification when comparing foreign and domestic experiences; marketing analysis for studying marketing elements of exhibition activities; algorithmic presentation for analyzing and modeling of the impact of changes in marketing factors on the exhibition activities of enterprises; selection of the most effective assessment system elements among those applicable in practice to construct the economic assessment system for marketing events. In the course of work, features of analysis of exhibition activities were considered, the role of marketing factors in carrying out this type of activities was updated, and the basic aspects of organizing exhibitions for the participants and the organizers were defined. Scientific-methodological and practical provisions for structuring an economic efficiency assessment of marketing aspects of exhibition activities were formulated. The most effective assessment system elements among those applicable in practice for marketing events were selected to construct a comprehensive economic efficiency assessments system for exhibition activities. Proposals developed within this article were applied by the example of the X Anniversary Central Asian International Exhibition "Agriculture" AgroWorld Kazakhstan 2015 organized by LLP "Iteca" at the exhibition complex "Atakent", Almaty, Republic of Kazakhstan. The results of the study are aimed at enhancing the management of exhibition activity, based on a balance of marketing goals and interests of the organizers and participants of the exhibition events.

Keywords: exhibition activities; assessment; marketing; structure; elements; logistical costs

JEL Classification: M10; M31; Q13

Introduction

Rapid development of technologies, including the marketing ones, short lifetime of innovations, dynamic changes in the economic life of society, scientific and technical environment, constant changes in consumer preferences increase the value of such communication activities as exhibitions in the modern economy (Suleymanova 2016, International events… 2016, Mei-Chin and Sui-Ming 2013), since they allow to adequately react to changes in the market environment, to disseminate and receive information on developments in the various fields of science, technology, economy and cover a wide range of target audience interested in this information (Kapitonov *et al.* 2016).

Under these conditions, the study of problems of exhibition activities reveals to analysts a wide field of unsolved tasks related to consideration of interest of all participants of the exhibition process, namely organizers, participants and visitors; problems related to optimization of costs for exhibition activities, methodical provision for economic effectiveness estimation of marketing elements related to exhibition activities for both exhibitors and exhibition organizers.

Along with the need to find scientifically well-founded methods of ensuring the organizers of exhibition activities that marketing tasks are fulfilled to the greatest possible extent during organization of exhibitions, the above mentioned moments determine the relevance of the subject of this paper.

Studying the problem of achieving marketing objectives in the exhibition activities, analysis and assessment of its effectiveness, included a review of various sources, covering both theoretical papers, analytical models and recommendations on exhibition activities organization (Isakov 2016, Jin and Weber 2013, Rubinstein and Blinov 2015) and the empirical analysis of conditions and results of exhibition activities organization (Kim and Chon 2009, Kurkina 2008, Nugzar 2016, Davis 2006). In particular, the experience of domestic exhibition companies and exhibition activities at the regional level have been considered on the example of the X Anniversary Central Asian International Exhibition "Agriculture" AgroWorld Kazakhstan 2015 organized by LLP "Iteca" at the exhibition complex "Atakent", Almaty, Republic of Kazakhstan (LLP "Iteca" – website; AgroWorld Kazakhstan – website).

When analyzing the scientific literature, a reference should be made to the papers of Kellerman A., where the concept of "exhibition logistics" is defined as "oriented activities carried out through the management of an efficient flow of exhibition services and related information from the place of origin of this stream to the point of its consumption with the purpose to fully meet consumer demands, i.e. to ensure full service range for exhibition services in a timely manner, in the right range, with the required quality of service, in a certain place, and cost-effectively for both the organizers and exhibitors (Kellerman 2016, 510).

1. Literature review

A review of scientific literature related to the subject of this study revealed a number of problems associated with the improvement of effectiveness of exhibition activities based on optimization of the costs used for organization and carrying out exhibitions (Badillo 2016, 78; Munkova 2016, 215; Huang 2009; Gusev 2005). In particular, the following outstanding aspects of the general problem of analyzing exhibition activities are defined in this paper (Munkova 2016, 215): clarification of the "exhibition logistics" concept; definition of exhibition logistical costs and the need to optimize them; studying the correlation of interests of various participants of the exhibition process; definition of common criteria for assessing the effectiveness of exhibition activities; analysis of methodological approaches and guidelines for assessing the effectiveness of the exhibitor's participation in the exhibition; analysis of international requirements and assessing mechanism for determining the economic effectiveness of exhibition activities for the exhibition organizers.

Materials dedicated to finding solutions to the problems of increasing the effectiveness of exhibition activities are also widely represented in the scientific literature. Thus, Egorchenkova (2016, 680) studies the whole sphere of exhibition services, types of services, directions and respective interests of various participants of the exhibition process during and after the exhibition in order to improve the effectiveness of interaction between the consumers of exhibition services.

Papers devoted to the analysis and assessment of various aspects of the effectiveness of exhibition activities are particularly relevant to this study. Suleymanova (2016, 42) and Isakova (2016, 27) offer to carry out the factor analysis, which is a multivariate statistical method based on processing visitor personal data and their assessments regarding the products represented by companies on a 7-point scale (Kuzner 2008, 23).

An important scientific problem consists in establishing criteria for assessing the effectiveness of participation in exhibitions and determining the economic effect of the exhibition activities. The existing approaches in assessing the effectiveness of exhibition activities are based in most cases on the expert determination of the significance level for those factors that determine the communicative effectiveness of the exhibitor participation in terms of points and with consideration of the exhibition specifics (Kurkina 2008, Lee and Palakurthi 2013).

Karvitskaya (2016, 32) separately highlighted the need to address logistical costs, the analysis of which includes a review of their dynamics, composition and structure, and proposed to group them according to the directions of functioning distribution: for expansion of service provision; for support of exhibition activities; for realization of exhibition services.

Moll-de-Alba, Prats and Coromina (2016, 261) proposed to use the scale of exhibition performance indicators, such as costs per visitor; costs per one promising contact; various variants of return on investment, lowering of production costs due to the participation in the exhibition; change in sales margins due to additional secure contracts through participation in the exhibition.

Loboda (2007) considers the problem of assessment of exhibition effectiveness that may be carried out by using a number of indicators, including those related to the costs for organization of the exhibition and results obtained. Patsalyuk (2016, 238) considers the problem of assessment of exhibition effectiveness that may be carried out by using a number of indicators, including those related to the costs for organization of the exhibition and results obtained. At the same time, Löfstedt and Holmberg (2016, 309) consider that the major drawback of the most approaches presented in the scientific literature is the lack of sufficient valid data for carrying out the analysis.

Reviews of scientific papers of domestic and foreign authors do not give the answer to a series of theoretical, methodological and practical issues, especially with regard to assessment of economic effectiveness of exhibition activities. In this regard, further research is aimed at studying methodological aspects of assessing the economic effectiveness of exhibition activities (Lu and Roto 2016, 6).

Along with this, the author of this scientific paper considers it important to allocate other outstanding aspects of the general problem of assessing the marketing elements related to exhibition activities, in particular to ensure the interests of not only exhibitors and its visitors, but also of the organizers, which is often not taken into account in the methodological approaches of contemporary researchers. An important problem of this methodical plan is also identification of the most significant criterion for assessing the effectiveness of organization and participation in the exhibition. There is also a considerable interest is finding the methods of determining directions of increasing the effectiveness of exhibition activities carried out by the organizers and participants of the exhibition that can be viewed primarily as an iterative process that involves assessment of results already obtained in the course of the exhibition.

The research is carried out to achieve the *goal* of developing guidelines for assessment of economic effectiveness of marketing aspects related to exhibition activities based on disclosure of the essence of exhibition processes for exhibition participants and organizers using the international experience and modern methods of marketing analysis.

Achievement of this goal is associated with solution of the following issues:

- Identification of features of the exhibition activities analysis;
- Determination of the fundamental aspects in the procedure of organizing management and carrying out exhibitions and exhibition related events for the participants and organizers;
- Development of scientific-methodological and practical provisions related to structuring of the economic effectiveness assessing system that evaluates the marketing aspects related to exhibition activities, as well as regarding the selection of methods of improving exhibition management;
- Selection of the most effective – and applicable in practice – elements of the marketing activity economic assessment system to form a comprehensive economic effectiveness assessing system for exhibition activities.

The results of this study are primarily aimed at solving the problems of exhibition management and product promotion activities in the context of achieving the balance between marketing objectives and interests of the exhibition organizers and participants, since these problems had not been resolved in the scientific environment until the present study. This is especially true for the countries with economies in transition, in particular the Republic of Kazakhstan, where the practice and level of organization of exhibition activities at the moment significantly differ from those in the countries with the market economy in terms of standards, scope and level of effectiveness.

3. Methodology

The methodological and theoretical foundation of this paper is formed based on scientific developments of domestic and foreign scholars related to management of exhibition activities and improvement of effectiveness of this activity in the market economy.

In order to ensure the authenticity and validity of results of this research study, the following methods were applied: systematic approach in constructing the economic effectiveness assessing system for marketing elements related to exhibition activities; generalization and specification when comparing foreign and domestic experiences; marketing analysis for studying marketing elements of exhibition activities; algorithmic presentation for analyzing and modeling of the impact of changes in marketing factors on the exhibition activities of enterprises (Kirillov 2016, 166-180).

Selection of the most effective elements of the assessing system among those applicable in practice was also used to construct the economic assessment system for marketing events, by comparing effectiveness assessment methods for exhibition activities according to their impact on achieving the marketing objectives set by the exhibition organizers and participants (Melikova and Nakhratova 2016, 149-156).

Scientific developments and publications of domestic and foreign scholars on the development of competitive potential of the organizers and exhibitors on the basis of marketing management are well reflected in this paper. When working on the paper, we analyzed the practical experience of exhibition activities carried out by LLP “Iteca, Almaty, Kazakhstan, which is a partner of the international exhibition company ITE Group Plc (UK) in Kazakhstan and Central Asia. In particular, the practice of organizing the X Anniversary Central Asian International Exhibition “Agriculture” AgroWorld Kazakhstan 2015 held on 4-6 November 2015 at the exhibition complex “Atakent”, Almaty, was studied.

The information basis of this study was primary accounting and statistical data published in periodicals and Internet resources, materials, periodicals and online publications, scientific conferences, regulatory and reference materials.

4. Results

In the modern economy, exhibition activities are the most important means of communication and source of information on establishing research and development projects, production of new products and their introduction to the markets. It is endowed with the ability of representing the company and its products while establishing personal contacts with clients and exploring their interests and needs (Yang and Lin 2015). Exhibitions allow tracking processes that occur in the market, the range and types of changes, directions and pace of future development of the industry. It is considered that participation in exhibitions allows obtaining the required information faster and cheaper than under normal conditions (Qiu *et al.* 2014); assessing the market situation, investigating the dynamics of various parameters at regular intervals on a particular subject (Ren and Szilvia 2013); identifying new opportunities and focusing on the study of those areas, which are considered the most promising.

The analysis of current trends in the development of exhibition business shows that the exhibition features have significantly expanded (Li *et al.* 2016, 1332). In addition to traditional functions, such as advertising, information, communication functions, the exhibition becomes a place of quality certification of products and services, market research, formation of relationships between developers, producers and consumers, between buyers and sellers and other participants of the exhibition process.

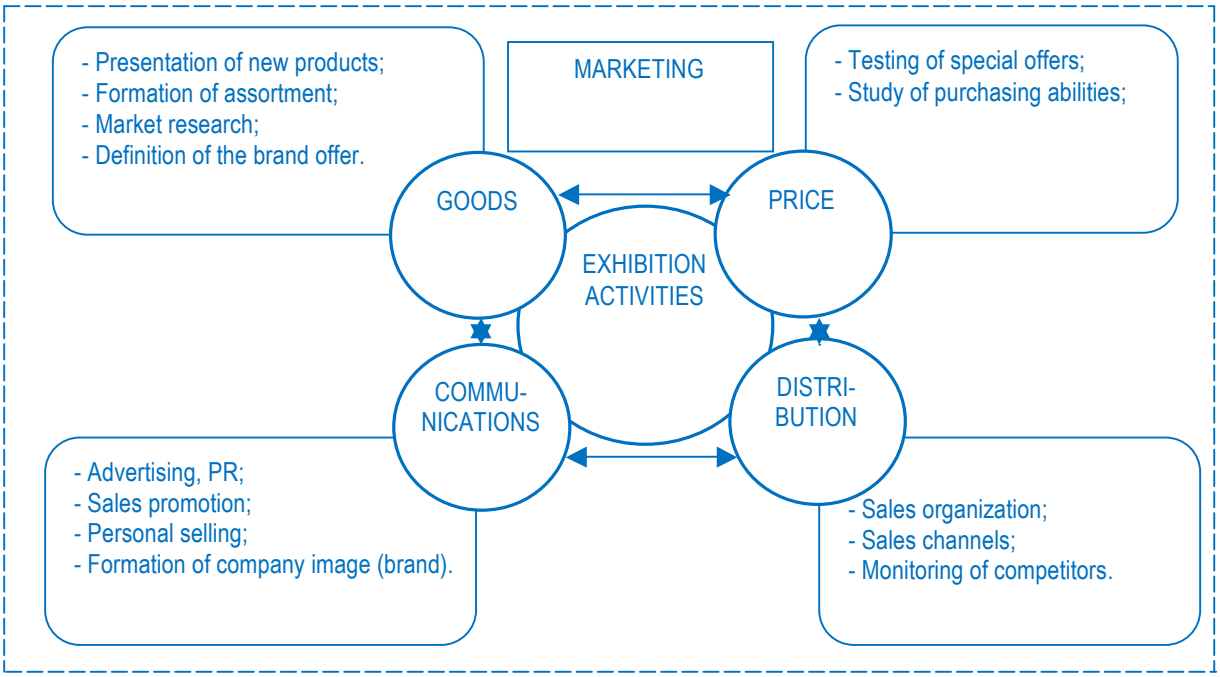
The term of “exhibition activities” is wider than the participation in the exhibition as such, since it covers solution of a wide range of issues related to planning and preparation for participation in the exhibition, organization of participation in exhibitions and activities at the stand, and activities following the exhibition, which should be carried out after the exhibition to fix the obtained results.

Exhibition activities should be included as a mandatory element of the company marketing activities used to plan the strategy of promoting the product on the market (Shabalina 2016, 43).

Such activities should be seen as an integral component of the marketing plan, as a means to achieve long-term goals of creating the image of the company and its product. In addition, it should be emphasized that definition and awareness of factors influencing the success of participation in the exhibition and ability to manage them are of great importance. Thus, the exhibition and fair activities are an integrated means of the company marketing policy, since it includes all components of the marketing mix (Figure 1).

Thus, the exhibition activities as a means of the company marketing policy create prerequisites for achieving a variety of goals in specific areas, such as personal selling, customer relationship management, public relations, brand promotion, market research, etc. These exhibition events – through personal contact – provide personal address to a specific consumer, allow maintaining a dialogue with them and demonstrate personal responsibility. And thanks to the mass scale of exhibition activities, a higher result due to the attention concentration effect can be achieved (due to time constraints).

Figure 1. Relationship of the marketing mix elements in implementation of exhibition activities



The main marketing feature of the exhibition activities is provision of high quality exhibition services in a timely manner, in the required range, at a specific location and with optimal costs for both organizers and exhibitors. In this connection it is interesting to study the whole sphere of exhibition services, their types and directions, respective interests of various participants of the exhibition process.

As noted earlier, the Belarusian scientist Loboda (2007, 10) offers to solve the problem of assessing the effectiveness by using indicators related to the costs for exhibition organization and results obtained during the exhibition (Loboda 2007, 10). In this context, the author's approach is as close as possible to the economic assessment of the marketing aspects related to exhibition activities, as it allows to move away from the expert methods established in practice (Giorgini and Sartori 2016, 1826), (Rubinstein and Blinova 2015, 47).

In the context of the economic assessment of effectiveness based on comparison of results and resources used, costs for participation in the exhibition are closely linked to its effectiveness and completely dependent on the latter. Therefore, this approach is closest to traditional understanding of the economic effect and economic effectiveness.

Data on effectiveness of exhibition activities are necessary for the eventual exhibition participants to decide on their participation in exhibitions, as well as for exhibitions to gain international recognition that is ensured by data transparency and accuracy of information.

To implement these requirements, professional exhibition companies place emphasis on introduction of uniform procedures for statistical data collection and processing, which are based on the "Rules of the Society for Voluntary Control of Fair and Exhibition Statistics" (FKM, Germany) and the rules of other international organizations. All of them provide for common methods of counting the number of visitors and participants, while highlighting the direct and indirect participants (including the distance form of participation), counting the number of exhibition spaces – "net" and "gross", and their division into closed and open, equipped and unequipped ones (Isakova 2016, Kim 2005).

Besides, according to the international standards it is offered to calculate such indicator as the "scale of exhibition" – actually paid space, showing how much money has been invested in the exhibition. This makes it possible to assess the effectiveness of investments in the exhibition process and the real return of the exhibition organization related to carrying out such exhibition. It seems to be rational to allocate economic indicators, which are more commonly associated with assessment of success of participating in the exhibition by the exhibitor, as well as by the exhibition organizer.

The effectiveness of participation in exhibitions or organization of exhibition activities should be assessed separately for each of the marketing mix elements, using previously formulated specific areas of assessing. In particular, such basic directions of assessing the effectiveness of the company's participation in exhibitions are:

- assessment of economic effects of a particular event, assessment of real incomes, financial analysis;
- comparative analysis of effectiveness of participation in various fairs (exhibitions), justification of the choice to participate in activities (organization of events);
- comparative analysis of effectiveness of participation in exhibitions (organization of exhibitions) for different exhibition budgets and concepts of participation (organization), well-founded formation of exhibition policy;
- comparative analysis of exhibitions with other means of marketing communications (important for exhibitors);
- analysis of the goals and tasks achieved, update of the concept of participation in exhibition activities (its organization) in accordance with the company objectives and market situation;
- analysis of existing shortcomings, selection of remedial actions, improvement of exhibition policy.

The authors of the paper propose a matrix of priority of directions of comprehensive assessment for marketing elements related to exhibition activities (Table 1), which allows representing the process of assessing exhibition activities in a consistent manner in terms of importance of certain directions of assessment to reflect the real situation, problems, potential and prerequisites for improving exhibition activities of a particular object of study. In this case, the study subject can be both the participant of the exhibition and its organizer, who represents the exhibition as the product sold in the framework of the exhibition activities.

Table 1. Matrix of priority of directions of comprehensive assessing for marketing mix elements related to exhibition activities

Assessing direction	Marketing mix elements			
	"Goods"	"Price"	"Communication"	"Distribution"
Assessment of economic effects of a particular event, assessing of real incomes, financial analysis	++	+++	+	+++
Comparative analysis of effectiveness of participation in various fairs (exhibitions), justification of the choice to participate in activities (organization of events)	+++	+++	+	+++
Comparative analysis of effectiveness of participation in exhibitions (organization of exhibitions) for different exhibition budgets and concepts of participation (organization), well-founded formation of exhibition policy	++	+++	+	++

Assessing direction	Marketing mix elements			
	"Goods"	"Price"	"Communication"	"Distribution"
Comparative analysis of exhibitions with other means of marketing communications (important for exhibitors)	+	+	+++	++
Analysis of the goals and tasks achieved, update of the concept of participation in exhibition activities (its organization) in accordance with the company objectives and market situation	+++	+++	+++	+++
Analysis of existing shortcomings, selection of remedial actions, improvement of exhibition policy	++	+++	+	+++

Legends: +++ – this direction is major for qualitative assessment of the marketing elements of exhibition activities; ++ – this direction is important for qualitative assessment of the marketing elements of exhibition activities; + – additional direction for assessment of marketing elements of exhibition activities.

Methodological content of each block in this matrix has its own specificity, which determines the need for objective research and development of methodological base of a comprehensive assessment of the effectiveness of marketing elements of exhibition activities. Considering the research tasks of this paper, the method of economic assessment of marketing elements according to direction "1" is offered. In particular, it is proposed to use the following methodical approach:

- for exhibition participants – an increase in net income from sales of products or services through additional obtaining of contracts as a result of participation in the exhibition ($\Delta NI_{participant}$);
- for exhibition organizers – an increase in net income from sales of exhibition services by increasing the number of exhibitors ($\Delta NI_{organizer}$);

Increase in the net income should be considered as an absolute indicator, namely as the economic effect of participation in the exhibition (organization of the exhibition). Company net income (or other earnings) may be also considered as an absolute indicator, depending on the industry specifics and research goals set (Stancanelli and Van Soest 2016, 12).

To measure the relative economical effectiveness of an exhibition project (Ee) for the exhibition participant, the economic effect (E) should be compared to costs (C), namely, the company's total expenses for exhibition activities, accumulated in its logistical costs (LC).

$$E_e = \frac{E}{C} = \frac{\Delta NI}{LC} - 100\% \quad (1)$$

Logistical costs should be considered as separate operational expenses ("Distribution" element of the marketing mix) associated with promotion of exhibition services and related information from the point of origin to the point of consumption with a purpose to best meet the consumer demands ("Product" element of the marketing mix). The price of the exhibitor's participation in the exhibition should be defined based on allocation of the complex of logistical costs, ("Price" element of the marketing mix).

Item-by-item analysis of logistical costs will contribute to their balance, optimization and more efficient use and, as a consequence, to increase of the level of economic effect of exhibition activities as such (Grigoryeva and Doglyad 2016, 182).

To measure the relative economical effectiveness of an exhibition project (Ee) for the exhibition organizer, the economic effect (E) should be compared to costs (C), namely, the company's total expenses for exhibition organization (C_{Org}).

$$E_e = \frac{E}{C} = \frac{\Delta NI}{COrg} - 100\% \quad (2)$$

Along with the overall economic assessment, it is reasonable to expand on this assessment with the analysis of additional indicators, such as costs for contacts per one visitor ("Communication" element of the marketing mix), costs for one promising contact, comparison of the number and significance of contracts (or negotiations) effected to the total costs for participation in the exhibition and others (International events, 2016:

1052). It should be noted that the methods of measuring results of the exhibition can only be determined based on the degree of achieving the goal set for the participation in the exhibition.

When working on the paper, we analyzed the practical experience of exhibition activities of LLP "Iteca, Almaty, Kazakhstan, which is a partner of the international exhibition company ITE Group Plc (UK) in Kazakhstan and Central Asia. In particular, the practice of organizing the X Anniversary Central Asian International Exhibition "Agriculture" AgroWorld Kazakhstan 2015 held on 4-6 November 2015 at the exhibition complex "Atakent", Almaty, was studied.

The proposed methodological approach was tested using the example of assessing the economic effectiveness of organizing the X Anniversary Central Asian International Exhibition "Agriculture" AgroWorld Kazakhstan 2015 at the exhibition complex "Atakent", Almaty. Indoor exhibition area of the event was 1,890 sq. m (1,152.9 sq. m – Kazakhstan exhibitors, 737.1 sq. m – foreign exhibitors). The number of exhibitors at AgroWorld Kazakhstan 2015 was more than 60 companies.

The number of unique visitors reached 5,066. The number of unique visitors from the Republic of Kazakhstan reached 4,559 people. The number of unique foreign trade visitors was 507 people. The exhibition was visited by 4,558 specialists (90% of the total number of visitors).

The results of the economic assessment of effectiveness of exhibition activities carried out by organizers of the AgroWorld Kazakhstan 2015 exhibition are summarized in Table 2. This example illustrates the ability to determine the absolute (total cost) and relative (share of the total costs) contribution of the costs for specific marketing elements of the exhibition activities to the achievement of the resulting economic effect.

The sum of costs was assigned to a separate item in accordance with the criteria of meeting the objectives of marketing activities to the fullest extent possible for a certain direction. In this example, the assignment was carried out using the entire amount of costs according to this item, in addition to other costs, which were distributed between the marketing elements in equal parts.

Table 2. Results of the economic assessment of effectiveness of the organizers' exhibition activities

No	Sources of income and expenditure of organizers	Sum, USD	Absolute contribution of costs for providing marketing elements of exhibition activities to the achievement of the resulting economic effect			
			Goods	Price	Communi cations	Distibution
1.	Sources of income					
1.1.	Income from fees for participation in the exhibition	90,915				
1.2.	Income from the rental of exhibition spaces	202,275				
1.3.	Income from advertising services	112,665				
1.4.	Fees for the services of consultants, translators and others	11,310				
1.5.	Other sources of income	22,185				
Total net income:		435,000				
2	Expenditure items					
2.1.	Maintenance of exhibition spaces and equipment (electricity, water, communications, etc.)	90,828	90,828			
2.2.	Transportation and storage (logistical) costs	27,144				27,144
2.3.	Expenses for staff salaries	27,144		27,144		
2.4.	Expenses for security services	6,960		6,960		
2.5.	Expenses for decoration of the exhibition	76,212	76,212			
2.6.	Information and advertising expenses	69,252			69,252	
2.7.	Expenses for organizing the cultural program at the	13,572			13,572	

	exhibition					
2.8.	Other expenses	36,888	9,222	9,222	9,222	9,222
Total expenses for the exhibition organization:		348,000	176,262	43,326	92,046	36,366
Economical effectiveness of the exhibition project:						
Absolute value:		87,000				
Relative effectiveness:		*25%*				
Structure of expenses for providing marketing elements of exhibition activities aimed at achieving the resulting economic effect			*50.65%*	*12.45%*	*26.45%*	*10.45%*

Thus, the assessment of effectiveness of participation in the exhibition by using the approaches proposed in this paper, given the importance of assessing results for managerial decision regarding further participation or organization of exhibition activities, is required at every stage of the life cycle of products being exhibited: it is suitable both when launching new products on the market, and when promoting sales of the product already marketed; both when supporting relationships with existing customers, and revival of contacts with old customers; both for market research to define the directions of product improvement, and maintenance of market presence during the troubled period for the company or the product.

5. Discussion

Both the participation in the exhibition and its organization should be considered as an element of entrepreneurship, namely in the context of dynamics of the company business activities, as well as an element of the marketing mix. When the company is unable to use all the tools of exhibition related technologies and is unwilling to spend energy and money on their acquisition, this impairs the effectiveness of participation in exhibitions and decreases returns on the funds invested. After analyzing the main components of the marketing mix and determining the position of exhibition activities in this mix, we believe that the use of exhibitions is an effective marketing tool.

Exhibition activities can interact with all marketing tools, the coordination of which contributes to the achievement of maximum benefit for the company. At the same time the establishment of criteria for assessment of effectiveness of participation in the exhibition and definition of the economic effect of exhibition activities represented in this paper is an important scientific problem (Luyten *et al.* 2016, 780).

Exhibition activities as a large-scale event should ensure satisfaction of interests of the exhibitors, organizers and visitors. The analysis of interrelation of customer interests, most of whom are exhibition participants, are reflected in all types of the services ordered with the possibility of their granting by the exhibition organizing company or ensure their implementation by other organizations. When studying the interests of exhibition participants, it is especially important to consider and assess the possibility of maximum use of an entire range of services, which have been offered by the company, as well as to evaluate the optimal comparison of the estimated income that is planned to be obtained from the services rendered to the costs with respect to their implementation (Qiu and Chen 2014, Egorchenkova 2016).

The analysis of effectiveness of exhibitions and exhibition events depends to a large extent on the systematic and consistent method of collecting information, methods of processing and applications separately for the participants – exhibitors, and exhibition organizers. This approach will allow assessing and making well-founded conclusion about the effectiveness of the exhibition as a whole, taking into account the participants, and contribute to obtaining guarantees of successful exhibitor participation in the exhibition and increasing the effectiveness of its implementation for the organizers.

The theoretical basis and practical implementation of approaches proposed in this paper makes it possible to improve the competitiveness of domestic companies, while business entities have interaction with accelerators of commercial distribution, *i.e.* infrastructure elements. That is why we need to develop the marketing approach in managing the exhibition activities, as it will systematically contribute to improvement of the infrastructure service

level and the company's financial state. According to the author of this paper, the generalizing criterion for assessing the effect of the exhibitor's participation in the exhibition (organization of exhibition activities) is the fullness of solving the marketing objectives, with the obligatory definition of their priority.

Conclusion

The studies carried out and the results obtained have allowed us to formulate the following conclusions and suggestions:

- It was founded that costs for carrying out and participation in the exhibition are closely linked to its effectiveness and completely dependent on the latter, and are important for implementation of the marketing mix;
- For the economic assessment of the marketing elements of exhibition activities, it is offered to use a system of indicators that characterize the level of organization of the exhibition services and allow applying a comprehensive approach to identifying priorities for assessing from the marketing point of view;
- Scientific-methodical and practical provisions for structuring the economic effectiveness assessing system for marketing aspects of the exhibition activities, as well as provisions for selection of directions of improving exhibition activities management have been developed,
- Directions of the comprehensive assessing of marketing elements of exhibition activities have been determined and compared to the elements of the marketing mix to determine their priority for the qualitative assessing.

The proposed approaches and economic assessment using the example of the specific event can be supplemented and specified both on the basis of further analytical research and improvement of the method of analysis, and by conducting further expert and marketing work.

Advanced researches should be focused on studying those tasks that have not been solved yet and relate to exhibition activities organization and management and taking of administrative decisions in this area according to the marketing principles.

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Implemented Crisis Management Measurements by Selected Entrepreneurs

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Abstract:

The paper concerns with crisis management issue in enterprises oriented on furniture production field in region of Slovak republic. Partly the paper contributes with evaluation of last crises impact in Slovak republic, because in this analyzed period in conditions of Slovak republic we met crisis for the first time. It is a survival test of companies and test of crisis managers' skills achieve businesses through this period. The general aim is to come up with analyses based on data gathered in personal interview with managers and bring up an overview of crises management approach in crises conditions and point out measurements taken. Ability crisis seen, to determine the proper steps to overcome it, to manage and control the implementation of these actions, and not least to learn from past experiences have to be an essential part of the equipment crisis manager. Often they we can find solutions that do not require unacceptable levels of additional costs. The research is supported adopting of bankruptcy and scoring modelling of enterprise performance as we analyzed their creditworthiness or vulnerability on the basis of three selected models. Integral elements of the work are findings as well added by recommendations and conclusions.

Keywords: management; crisis management; furniture production; measurements; strategy

JEL Classification: L26; G32

Introduction

Current world is affected by a state of emergency in multiple consecutive years. Regularly, we can capture many views on the crisis in many areas of human society regarding business, finance, personal values and relationships. The crisis hits enterprises, people, whole corporations and countries that lead to loss of market or inability to create market demand for products. It results in slowing down production, partial or total liquidation of a certain company. Loss of income of the population is reflected in the decrease of available resources, which has an adverse effect and downward pressure on demand. This cycle is known as an economic phenomenon that creates a downward spiral leading to constant deterioration of the economic situation. Consequently, the phenomenon is also reflected in the behavior of people in the society and often will result in negative outcomes, such as the increase in crime, depression and suicides (Campello, Graham and Harvey 2010).

The enterprises must know how to react correctly, quickly and efficiently if they want to fulfil their mission. It means to realize that the crisis is not only a real threat to business. It is important to understand the reasons, causes, connections, transform them into effective strategy that must be communicated in the internal and external environment and then overcome the crisis step by step. All these activities require completing the plans and if it is necessary, following the instructions within the framework of these plans.

1. Literature review

Important and desirable task of enterprise management is to understand the crisis as a challenge to activities. The objective of these activities is to bring classical, modified or completely new solutions which aim is to shift the company into new areas and to ensure the stability of the company in the certain space and time. The companies that are unable to keep up with the pace of the current period and to successfully implement continuous change will not progress. In addition, acting stereotypically without taking advantage of opportunities will always lead to the crisis. This process causes decline in performance, loss of market, competitiveness, management, owners and client's confidence too (Crandall, Parnell and Spillan 2014).

In crisis management, it is necessary to define the concept of crisis because there are a lot of questions that must be answered. What is an enterprise crisis? When and how does it begin? What impact does it have? How can we identify the crisis? What are the correct procedures to combat the crisis and what steps we need to bring in order to avoid a crisis or at least minimize its impact in advance? If we want to cope with a crisis, we must answer these questions. It is a severe test for the enterprises of all sizes and regions. On the other hand, the crisis represents opportunities for change, new challenges and goals. Many enterprises and whole corporations will pass the crisis with "new-look", but many companies will not pass the crisis at all. So far, our history shows that a power of people and companies can successfully overcome the crisis (Coombs 2014).

The roots of crises in any environment are when conflicts within the environment grow over the level which represents the threat of change of substance of this environment (Booth 1993). We say about a special situation which an individual or company (society) is facing, but without ability to be dealt by the way of routine procedures and processes and in which the stress is rising by instant changes (Booth 1993). The crises status in general is perceived as a negative state, by the consequence of which the status of firm worsens or the ability of the firm to react is reduced.

In this state the necessity of new or unconventional solutions can be investigated. It is the situation in firm that long-timely or entirely presents a negative deviation from a normal status (Smejkal and Rais 2006). A crisis is a part of live cycle of business during which adverse of performance appears by mean of a turnover decrease, equity decrease, the market share downgrade and liquidity decrease. By this its future existential is limited immediately in case the development will continue in negative manner and trend (Majtán *et al*. 2009). In this phase the resolution comes up. The resolutions whether the business is going to get back (at least) into pre-crises situation or the goals and aims of business are prospectively threaten or eventually its future existence is endangered (Zuzák and Königová 2009). According to (Majtán *et al*. 2009) side effects and inner signals are as follows: decline of number of innovation; tolerance and excuse of partial defects and failures; unreasonable cross-foundation of earnings and profits into loss-making departments; marginalization of problems and issues, neglect of reserves revelation and new opportunities; cutting of number and quality worsening of courses and trainings or other professional education of staff.

The occurrence of crises could be connected to managerial failures in terms of strategic field as well as in terms of decision-making, control and informational field. Based on (Smejkal & Rais 2006) the most frequent killer of organizational efficiency is: unclear strategy; priorities conflict; inefficient top management; inappropriate management style; inadequate communication; unsatisfactory functional coordination; nsufficient managerial skills; insufficient staff motivation.

Kislingerová (2010) says that actual crises can be seen as very first really global crises with features of computer virus – it is unusually inventional, adaptable and highly innovative. Ironically said, this crisis disposes with all the features which should a modern and dynamic firm dispose with in global economics.

The essential and desirable role of management is to understand the crises as a challenge to act. One such area of growing importance for today's organizations is project management (Kita, Grossmanova and Konstiak 2014). The goals of these activities is to bring up classic, changed or brand new solutions that should move the firm toward new status and thus set up stability of the firm in terms of place and time. Inevitable role of management is to dedicate and devote itself in business strategy continuously. One of the basic crises

management models was introduced by (Gonzalez-Herrero and Pratt 1995). According to them the model counts the following: problems management; planning and prevention; crises status and post-crises status.

Gonzalez-Herrero and Pratt even say that even though a crisis is an accidental occurrence can be anticipated from several signals before it appears. In terms of crises management, it is inevitable to resolve the question why the enterprises always are prepared to deal with the passed crises, not the future ones (Kislingerova 2010).

One of the sectors impacted by crises in Slovakia is the furniture production, a traditional sector within Slovakia. SMEs play an important role in the economic systems of the Czech Republic and Slovakia, because in Slovakia in 2012, the share of SMEs in the total number of active enterprises was 99.2%. These enterprises are more flexible when it comes to adapting to the market changes; they constantly produce and innovate in order to survive in the strong competition battle (Krošláková, Kubičková, Jurkovičová and Kubiniy 2015). On the other hand, more than 90% of unsuccessful SMEs fall into bankruptcy due to bad organization processes and weak management (Strážovská, Strážovská, Krošláková and Bažó 2016). Before 1989 the economics in general was centralized and under state control. Most of the domestic enterprises neither took part in the international market nor experienced its competitive pressures (Melikhova, Bažó, Holubcová and Camacho 2015). After 1989 the economics got privatized and furniture production had spread abroad into small and medium sized enterprises including micro-businesses and manufactories. Small and medium-sized enterprises have specific features and fulfill important tasks in an economic system. The crisis has been a very new experience mainly for enterprise managements that had never been in the crisis before. An economic development in Slovakia had been extremely successful before the crisis. It influenced a system as a whole and managers had to find another ways to manage their enterprises. There is a huge variety of approaches, ideas and theories which talk about the effects of crisis in their development and about the approaches to crisis management that can lead the business out of the crisis minimize its effect or completely avoid another crisis (Pudło and Gavurova 2012, 2013). We see this topic currently being high on the agenda and consider the research having the potential to bring new facts and findings in this area. Therefore, the centre of our attention was focused on management approach and decisions that could protect a company before the crisis.

2. Methodology

The object is focused on the research sample of companies in the area of furniture manufacturing in Slovak Republic. The process of selection of enterprises is described below in the text. The perception, approach and taking actions against the crisis represent the main object of research. We were interested in the measures taken by the various functional areas of the company as well as decision-making criteria when the managers had to prepare the strategy to analyse and they evaluated the application of procedures for crisis management.

Specific companies that have gone through the global crisis in recent years were defined as a subject of research. The enterprises within that period took a number of strategic and change crisis measures. For research purposes, we spoke to a group of 16 companies in the sector of furniture manufacturing. As a criterion was chosen criterion of number of employees in 2011, but only the enterprises that employed at least 10 employees in 2011 were considered as a relevant. A limit was chosen due to the fact that the companies with fewer employees were not considered as relevant in terms of management because the majority of them are mostly small family businesses with not fully developed management structure. In case of the enterprises with more than 10 employees, we think that this size of business is forced to create the diversification of employees and management structure. With the research agreed 8 of companies which also participated in the research (see Table 1).

Table 1. Basic data about analyzed enterprises

Enterprise	Data for 2011	
	Average number of employees	Sales
P1	825	50 323 241
P2	17	1 742 265
P3	25	1 737 583
P4	109	7 329 215
P5	320	10 215 446
P6	105	4 236 523
P7	60	2 422 181
P8	91	4 026 629
Sum	1552	481 942 083

Source: own processing

Then we performed the analysis of 8 companies based on above mentioned aspects. We would like to complement other facts regarding the extension of analysed sample. The relevance of the collected data can be interpreted through the following information (data obtained from the database of the European Statistical Office (Eurostat) for the year 2011, available online at http://ec.europa.eu/eurostat/data/database).

The number of companies related to furniture manufacturing sector represents 1508 companies in the Slovak Republic. A distribution of enterprises in terms of size (number of employees) of the company can be seen in the Table 2. The Table 2 shows that most enterprises are in category 0-9 employees.

Table 2. Distribution of enterprises in terms of size (number of employees)

Number of enterprises	Number of employees				
	0 - 9	10 - 19	20 - 49	50 - 249	250+
1.508	1.343	57	55	48	5

Source: own processing

This category involves mainly individual businesses (entrepreneurships) and other small businesses without strict enterprise management. Our research focused on small and medium-sized enterprises with at least ten employees. In this category, the enterprises create better management structures and in terms of researching managerial approach to the management of the companies we considered them as relevant. In selected category in 2011 operated 165 enterprises of which our sample represents 5%. In the chosen category of 10 and more employees in 2011, the companies generated the sales in total of 660.6 million € (12.4% of our sample).

Table 3. Distribution of enterprises in terms of turnover

Total yearly turnover (EUR million)	Number of employees				
	0 - 9	10 - 19	20 - 49	50 - 249	250 +
735,1	74,4	24,3	64,5	264,8	307,1

Source: own processing

Therefore, the selected sample of enterprises we considered as relevant for the crisis management research in all aspects (sales, managerial practice, and crisis management). During the process of data collection different empirical and exploratory methods were used including basic empirical method - observation. Further research was conducted through a questionnaire. We emphasized one part of the research that contains the personal interviews with the managers of each company. This method has been the most beneficial. It eliminates anonymity of the questionnaire and the personal character provides greater reliability of the collected data. In the

initial phase, each manager received the questionnaire to fill out. Subsequently, these questionnaires were supplemented by structured personal interviews with the managers. The aim was to form a broad and clear picture of the management approach, the perception of the crisis and its measures. To assess the economic situation of enterprises were used the data from a financial statement. In addition, we obtained the information from publicly available statistics to compare the crisis impacts. The data and information were recorded and processed.

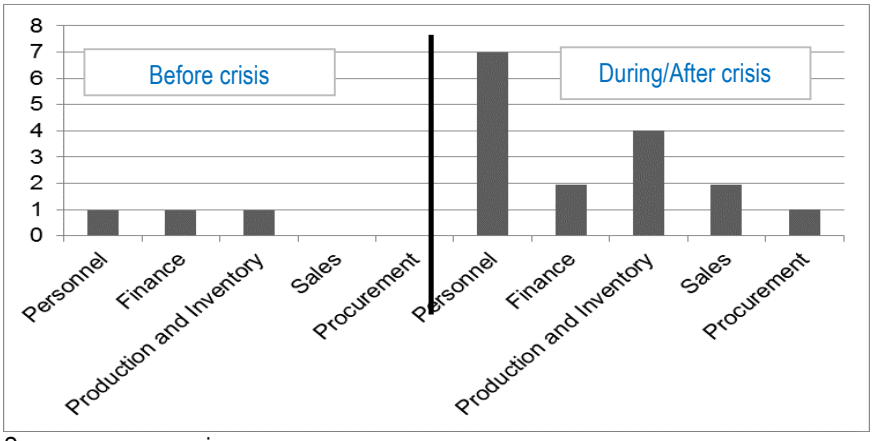
3. Research results

We review the approaches of managers to corporate governance in times of global crisis and the implementation of the attributes of crisis management in practice. Although, some procedures and crisis management tools are unified in their own way, every crisis manager must apply a combination within the context of their own business and goals. At the same time, we make recommendations that we see as being suitable for application in everyday business, in particular to give a know-how to corporate executives as well as earlier identification of problems and ways to prevent a crisis situation in the company.

Crisis management

In general, every theory splits the crisis management into the different phases – steps before, during and after crisis. It had been implemented a minimum of crisis management procedures before crisis. After the arrival of the crisis, several firms responded by applying at least some of the practices of crisis management.

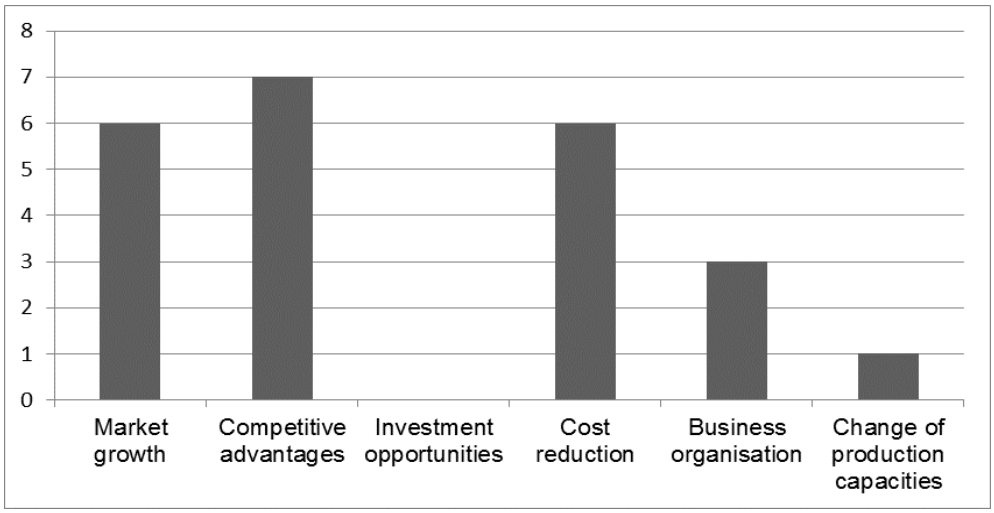
Figure 1. Development in crisis management



Source: own processing

It is obvious that most procedures were focused on the area of personnel management. Further crisis management measures were introduced in areas such as production management and inventory, sales management, financial and procurement management and purchasing (see Figure 1). In the first place, we observe the approach of crisis managers to the company´s development strategy in times of crisis. The majority of managers did not identify the crisis and they completely ignored it. We suppose that this fact reflects the lack of experience of Slovak managers. The corporate governance sought the potential for growth and positive development. An ignorance of crisis blends in the low level of implementation of early warning systems. Therefore, it is possible that even if the information were available, these managers underestimated them, respectively; they did not pay enough attention. When the management is deciding about the next future of company, it is important how the management teams look to circumstances concerning the company itself and also other companies in this area. For that reason, we wondered which factors were considered for a certain strategy (see Figure 2).

Figure 2. Factors considered for a certain crisis strategy



Source: own processing

The factors related to costs and future growth of the market was mostly chosen by managers. Market growth assumptions correspond to the positive perception of the crisis. Only a minority of enterprises focused on internal changes (business organization, production capacity).

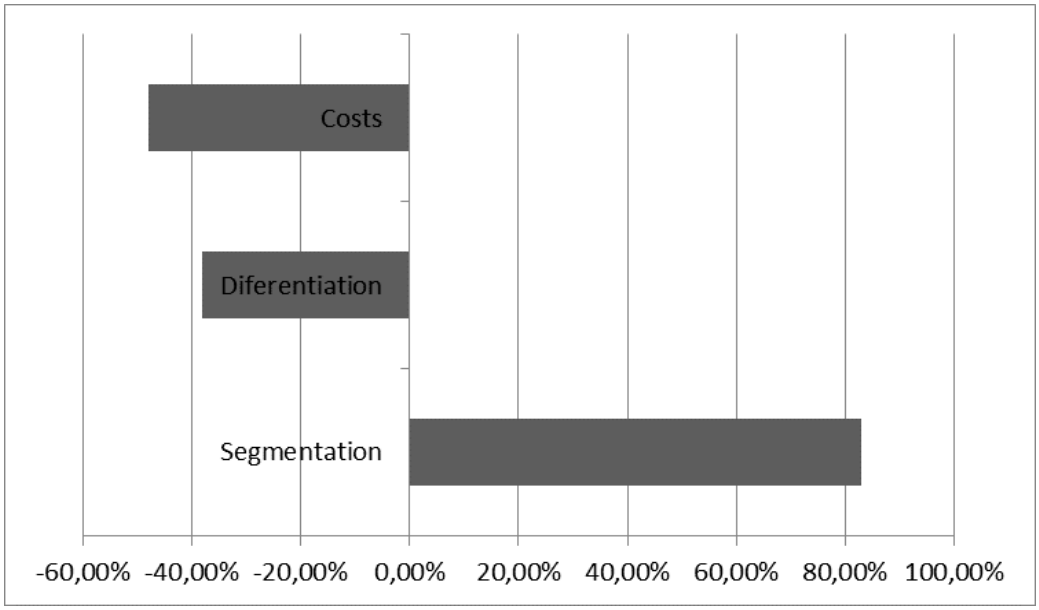
Figure 3. The most relevant findings in crisis management approach

Before crisis	During/After crisis
▪ Insufficient cris perception	▪ Long term crisis expected; ▪ Rather positive; ▪ Rather opportunity
▪ Behaviour influenced by low crisis experience	▪ New lessons learnt from crisis management
▪ Strategy based on very positive development in recent years	▪ Strategy based on comparative advantages, differentiated markets and cost management; ▪ Segmentation strategy
▪ Insufficient level of EWS and emergency planing	▪ Massive deployment of EWS and emergency planing

Source: own processing

Based on the findings, we state that only some enterprises had established the strategy for their development thanks to an oral communication which is insufficient. These findings also suggest that the most successful strategy was the final segmentation business strategy. The area of emergency planning was not managed well by management. Almost no company had adopted contingency plans before the crisis. We are surprised by a low number of adopted crisis plans. Although, many companies covered some of the areas, an overall scope of the plans was very low. The managers either do not consider the contingency plans as an important and valid tool for crisis management or they still have not understood their importance. We see as a positive fact that many managers began to see the crisis as an opportunity. Unless, we are talking about business strategy, it has been shown that only the companies with the segmentation business strategy noted sales growth in the period 2008-2013.

Figure 4. The most relevant findings in crisis management approach



Source: own processing

The enterprises with other strategies declined in their sales. It means that proper selected segment and its orientation can be useful for businesses and it brings a success in comparison with others. Recommendations:

- establish and implement early warning systems or other systems which can identify the crisis before at the beginning;
- respect the outputs of early warning systems and do not underestimate the scope and impact of the crisis;
- create and update contingency plans;
- according to available information on the state of the business and the market it is important to determine the right strategy of business development in crisis considering the needs and goals of the company and find the most appropriate way of its dissemination and application (written dissemination, regular review).

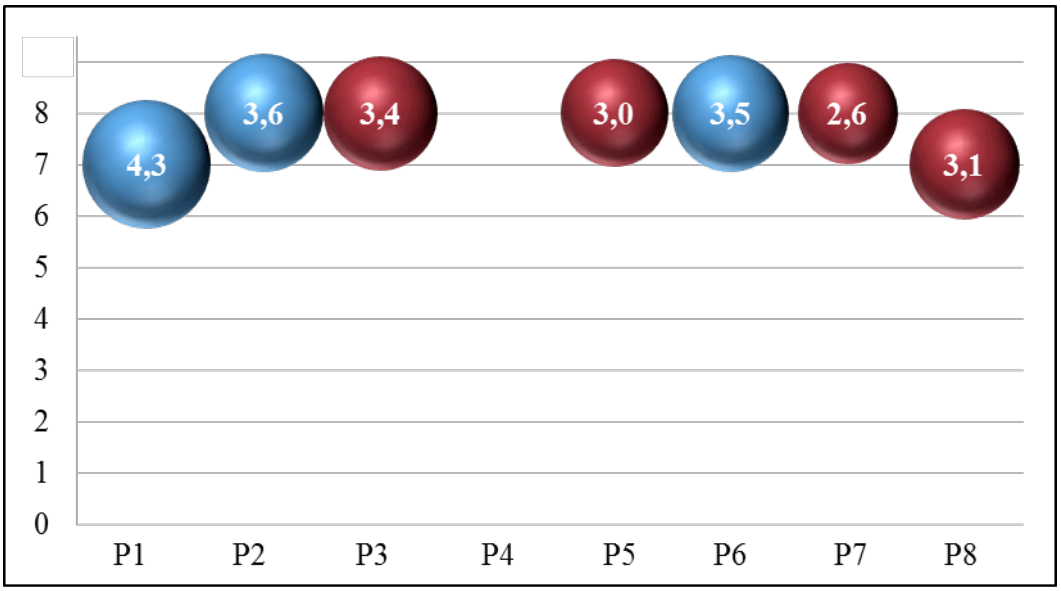
Crisis management measures in response to the crisis

As the crisis had different impacts on the enterprises, it was indispensable to take new measures in case of similar situation. The managers decided to use: identification of conditions; planning and coordination; identification of risks; definition of reaction; avoid causing damage and its spreading; resolve the incident; avoid the same situation; restore functionality. While managers have the option to choose the importance of each measure on a scale from 1 to 5 as follows: (1) minimum; (2) slightly; (3) Average; (4) strong; (5) maximum.

Blue bubbles show more successful businesses. It is clear that companies P1 and P6 are considered as the most successful companies with the highest number of adopted measures (see Figure 4). It is natural that not all companies do the same. There is a difference between the scope and location of the crisis in each company and their capabilities, determination and goals. The findings with regard to the application of crisis management measures proved to be most important:

- reduction (cost, personnel, inventory);
- lack of receivables management;
- lack of liability management;
- receiving additional funds: own resources, bank loans, supplier credits;
- applying changes in the product, suppliers, finding new domestic markets.

Figure 4. Measures taken in enterprises



Source: own processing

We develop further findings by functional areas of the company.

Personal management

In this area, all businesses are focused on reducing the number of employees. The other decisive factor is the reduction of salaries. Amount of personnel costs did not decrease. It is connected with the fact that the companies provide a severance payment to an employee who has been laid off. In the short term, it can lead to an increase in personnel costs. Other measures in the field of personnel management such as staff training did not belong to the main instruments for dealing with crisis situations. We are convinced that the reduction of employees and salaries or a combination of both is relatively simple, fast solution for companies and that is why they always choose this possibility as quickly as possible.

Financial management

A financial management is an important and decisive factor not only in crisis management. In general, it is obvious that most enterprises chose a cost reduction, especially the costs that are variable. A surprising finding is that only a half of the enterprises sought solutions in activities related to the receivables management. This perception of the situation is very insufficient. We are convinced that the receivables management also represents a significant factor for success in non-crisis period. The receivables are classified as the most important aspect of company´s assets along with bind-capital risk. Another surprising finding is related to liability management. We see a positive fact in all companies that used equity as an additional source of funding. It reflects a commitment and interest in improving the development in the company where its owner also became a crisis manager. The source of finance for the biggest part of companies was a supplier credit. It is used at the expenses of the creditors and is linked to liability management. This means that the managers did not seek th solutions in the field of liabilities and they did not pay off their obligations. When we are talking about investments, whose volume was not negligible, the companies sheltered their investments through loans. In case of two enterprises, the crisis situation led to the restructuring.

Production management

Almost all companies have acceded to optimize their inventory. This step leads to reducing in operational capital and its progressive easing into another part of business cycle, or financing of other demands of the company. We

consider as a positive that a large number of enterprises changed the assortment of products. This is a proactive approach in order to attract new customers and reach a market share. The changes in suppliers and production capacities result from the finance. In many cases, the change of supplier is a forced step, especially in cases when the company does not pay off its obligations on time. The main reason consists in obtaining a new supplier who is not aware of company´s insolvency. Of course, this approach is short-sighted but we often face many uncertainties in crisis management that are set just a short period. Finding new suppliers is linked to an optimization of inventories and change of products. The positive situation occurs if there is a change of supplier in order to get cheaper suppliers and improve the quality of supply.

Sales management

Analysed company managements resort to measures related to the acquisition of new customers because of positive expectations after crisis. Moreover, there were not any changes in marketing. Every marketing strategy can be a quite powerful tool for managing sales and that is why this finding surprised us. Because of high costs, the managers did not make any changes. On the other hand, it is less effective for the companies with fixed customer portfolio.

Recommendations:

- introduce austerity measures but also taking into account the needs, further development and efficiency growth
- focus on internal changes, including changes in the organization of the company or in production capacities;
- implement a system of training and development;
- pay attention on managing cash flow and production cycle (inventories, receivables, liabilities);
- search other financial instruments (trade finance, hedging financial instruments);
- spend time on marketing and look for cheaper marketing solutions.

3.3 Models to determine the performance and creditworthiness of enterprises

For the purpose of addressing the need for an analytical approach in crisis management, we analysed their creditworthiness, crisis or vulnerability on the basis of three selected models. We used data for 2009 and 2013, the period of the crisis. The first, Altman model identified distressed companies with a tendency to get into crisis. Distribution of the companies in each category of data for year 2009 and 2013 is presented in the Table 4 and Table 5 below.

Table 4. Distribution according to Altman's model as of 2009

Altman's Z score	Distribution
Good conditions	2
Grey zone	2
Risk of bankrupcy	4

Source: own processing

As shown in the Table 5, in 2013, distribution of the companies in terms of their numbers in the categories has not changed. However, the names of the companies among the categories have changed.

Table 5. Distribution according to Altman's model as of 2013

Altman's Z score	Distribution
Good conditions	2
Grey zone	2
Risk of bankrupcy	4

Source: own processing

As another was used Taffler's model that similarly identify problematic companies, respectively companies that can expect problems in the future. Distribution of the companies in each category for the years 2009 and 2013 are presented in Table 6 and Table 7.

Table 6. Distribution according to Taffler's model as of 2009

Taffler's Z score	Distribution
Low probability of bankrupcy	3
Grey zone	1
High probability of bankrupcy	4

Source: own processing

Table 7. Distribution according to Taffler's model as of 2013

Taffler's Z score	Distribution
Low probability of bankrupcy	2
Grey zone	3
High probability of bankrupcy	3

Source: own processing

Finally, we applied Douche's model which is closest to an environment corresponding to the conditions of the Slovak economy. Douche's model is based on progressive calculations of individual indicators (stability, liquidity, activity, profitability). In this work we progressively present the distribution of the individual indicators for 2009 and 2013. We present an abbreviated comment on the indicators and the distribution of the final indicator. The findings show that the area of stability is not the most critical area for businesses. The findings show that the area of stability, it is the most critical for businesses. Comparing the years 2009 and 2013 there were only a small shift in the distribution of the companies, while no one ended at the stage of substantial financial problems. Based on data from 2009, the liquidity ratio ranked in the problematic area of six companies, but none as a company with serious financial problems. As unproblematic in this category were companies P1 and P6. In 2013, the situation has improved when three companies moved into a better category. On the one hand, a summary indicator of activity has the best results, when in 2009 ranked six companies into the area of good situation. On the other hand, it is the first indicator above all, which ranked one company into the area of substantial financial problems. In this category company P4 showed the highest business problems. Using this indicator between 2009 and 2013 shows that the companies have worsened and some of them were moved into a worse category. The summary indicator of profitability divided the examined samples into six unproblematic companies and two companies into the critical area. In this category, the P4 and P8 again re-appear as the worst companies in 2009. Company P8 even with extremely high negative score. In 2013 another company was moved into the worst category. The Table 8 and Table 9 below show the distribution of companies by total score (C). Calculating the individual summary indicators, we have reached a final indicator that identifies a total of six enterprises without any problems, one company with impending problems, and one company with significant financial problems.

Table 8. Distribution according to Douche's model for total score C as of 2009

Total score	Distribution
Good conditions	6
Acceptable situation	0
Impending problems	1
Significant problems	1

Source: own processing

Table 9. Distribution according to Douche's model for total score C as of 2013

Total score	Distribution
Good conditions	5
Acceptable situation	0
Impending problems	1
Significant problems	2

Source: own processing

From the data for 2013, we can see a shift between categories, while overall conditions have worsened when another company was added into the worst category. An important fact is that according to the statements of managers of examined companies, no company applied any of these or similar methods for assessing their creditworthiness, respectively businesses at risk. We believe that if the management of these enterprises would have applied some of the methods, they would get a better picture of the situation of the company and have a better space to decide the next steps in the development of their company. Companies which have got into existential problems would have more chance to avoid these problems.

Recommendations are: choose any model of scoring the creditworthiness and financial situation and apply the chosen model or combination of models, at least on an annual basis and on the basis of the findings of the company adjust grow strategy modifications, respectively take an action.

We believe that the use of creditworthy and crisis model is correct tool not only for companies that were used as the subject of our research. Since these models have been progressively and over a period modified to take into account the needs of different types of enterprises in many areas, we think they are also useful for the purposes of a wide range of enterprises throughout the economy.

Conclusion

The crisis should be seen as a normal part of business life. The companies and managers cannot avoid and evade the crisis, because it is constantly ready at any moment to threat them. On the contrary, they need to be prepared and know how to solve a crisis cases. The crisis has even become an impulse for change. The most important is the company's ability to overcome the crisis. If the crisis is understood only in a negative sense, it will limit the view on the issue; because of the crisis may be even an opportunity at the same time. Many times, overcoming the crisis pushes the management and employees of the company forward in their professionalism. The main objective is to find the most optimal solutions in managing the crisis situations in the company.

Therefore, we think that every crisis also brings its positive effects. For example the fact that the winners will be bigger and stronger enterprises, better product and processed base in enterprises or improved emergency plans, able to prevent the company in the future. The companies should not passively wait an end of the crisis. In times of crisis, there is enough space for improvement in many areas of the company: process improvement; product development; employee training; development of early warning systems; finding new points of sale in the market; identification of new partners and innovation.

Often they will find solutions that do not require unacceptable levels of additional costs. Therefore, it is necessary to plan, apply, engage them in the widest potential of the business and got the company to a level to be ready for the boom which comes after the crisis.

The companies from the Slovak Republic met the crisis for the first time. It is a test of survival of companies and skills of crisis managers to conduct them through this period. We think that Slovak managers are able and skilled as well as others, they know how to manage businesses in the conditions of the crisis, and also they will be enriched by new experience and thus be more prepared for the next crisis. However, it is important to follow the best intentions in the theory of crisis management which are confirmed over time by practice. By researching and analysing we have achieved the aim of thesis and we highlighted the fact that the managers of the companies approached differentially to the crisis management. We pointed out the successful companies, which by involving the elements of the crisis management achieved good results in times of the crisis and it

improved in the referenced period. On the contrary, there were also managers which mismanaged company during crisis and company resulted in the restructuring. In neither case we cannot speak about the perfect application of procedures of crisis management and that is why we are pleased that the work defines recommendations that managers should consider in the future. Every crisis manager should be able to: see the crisis, determine the proper steps to overcome it, manage and control the implementation of these steps and learn from own and another's mistakes. In addition, it is important to be able to use more available system resources and proper communication to all participants. Compliance with these assumptions gives the company and its manager's good prospects for successful crisis management. Experience has shown that the crisis arrival is only a matter of time.

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Modified Method for Sensitivity Analysis of Investment Projects Efficiency Criteria

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Abstract

The article deals with the theoretical and practical aspects of applying the sensitivity analysis method for efficiency criteria of investment projects. The advantages and disadvantages of the method have been analyzed. A modified version of the method has been proposed, in which the model of the project cash flow is refined and, unlike the standard method, the elasticity coefficient, calculated on the basis of regression model development, is used as the index of sensitivity. In addition, for the situation of representative statistical data on dependent parameters of the project being absent, the proposed method includes a procedure for developing a regression model based on the distribution table of a two-dimensional random variable obtained on the basis of plausible expert judgments about the interrelationship of project parameters. An integrated approach to risk assessment of investment projects has been considered, consisting in joint application of the sensitivity analysis method and the method of analysis of project development scenarios. The scenario analysis method has been supplemented with a quantitative indicator of risk assessment that is more informative in comparison with the variation coefficient and characterizes the probability for an investment project to prove unprofitable.

Keywords: investment project; risk assessment; sensitivity analysis; scenario analysis; computer simulation

JEL Classification: C18; B26; C40; C60

Introduction

Analyzing the investment activity of an enterprise is one of the most difficult sections of financial management. The decisions made in this area are designed for long periods of time and the following aspects are usually inherent in them (Lukasevich 1998):

- are part of the development strategy of an economic entity (firm, enterprise, *etc.*) in the future;
- entail significant outflows of cash;

- as from a certain point in time can become irreversible;
- rely on predictive estimates of future costs and revenues.

The latter aspect determines a limited application of deterministic methods to justify investment decisions and requires considering random and uncertainty factors in assessing the efficiency of investment projects. Sensitivity analysis is one of the relatively simple and at the same time highly effective methods enabling to take into account uncertainty and to identify factors that could affect the success of the project implementation.

1. Literature review

There has been a lot of contributions to the problems of risk management (Ermasova 2008, Gracheva 2009, Haimes 2009, Aven and Renn 2010, Urodovskih 2011, Peterson 2012, Anderson 2013, Passenheim 2013, Crouhy *et al.* 2014, Hardy 2014, Pritchard 2014, Allen 2015, Mercantini and Faucher 2015, Skoglund and Chen 2015 and others). They deal with the main concepts of risk, provide various classifications, methods, and systems of risk management within a market economy.

Among the risk management system components, the analysis and risk assessment subsystem is of particular significance; it is based on the qualitative and quantitative methods considered in the following works: (Kossov *et al.* 2000, Tihomirov 2003, Shapkin and Shapkin 2005, Pham 2011, Rausand, 2011). The mathematical aspects of quantitative methods are covered in the works (Bühlmann 1996, Dubrov *et al.* 2000, Korolev *et al.* 2011, Meyer and Quell 2011, Yoe 2012, Chan and Wang 2013, Batkovskiy *et al.* 2015).

The method for analyzing the sensitivity of investment efficiency criteria was considered in the works by Vilenskij *et al.* (2002), Korosteleva (2007), Ragsdale (2012), Samonas (2015).

Practical application of the sensitivity analysis method is associated with its implementation at the software level. At this point, what is the most interesting is not traditional programming, but the use of standard office software by the analyst, in particular, MS Excel spreadsheet. The issues of automation of financial and economic calculations and the construction of computational models in the MS Excel environment are dealt with in the works by Sengupta (2004), Lai *et al.* (2010), Charnes (2012), Fairhurst (2012), Benninga (2014), Alastair (2015), Avon (2015), Goossen (2015), Michael (2015), Batkovskiy *et al.* (2016), and others.

2. Methodology

2.1. Basic approaches and methods of risk assessment in investment projects

There are two main approaches to assessing the risks of investment projects: qualitative and quantitative ones. The main objective of the qualitative approach is to detect and identify possible types of risks for the investment project under consideration, as well as to identify and describe the sources and factors that affect this type of risk. In addition, qualitative analysis involves a description of possible damage, its valuation, and measures to reduce or prevent risk (diversification, risk insurance, provisioning, etc.).

The qualitative approach that does not allow defining numerical value of the risk of the investment project is the basis for further research using quantitative methods that widely use the mathematical apparatus of the probability theory, mathematical statistics, and operations research. The main task of the quantitative approach is to numerically measure the impact of risk factors on the investment project efficiency criteria.

Among the qualitative methods for assessing investment risk, the following ones are the most commonly used: the cost appropriateness analysis method; the analog method; the expert evaluation method. Among the quantitative methods, the following are to be distinguished: the discount rate adjustment method; the threshold level indicators analysis method; the project efficiency criteria sensitivity analysis method; the project development scenarios analysis method; the 'decision tree' development method; Monte Carlo method (simulation statistical modeling method).

One of the most common quantitative methods for assessing the risks of investment projects is efficiency criteria sensitivity analysis. Sensitivity analysis allows assessing the impact of the main parameters of the project financial model on its efficiency criterion; thereby it allows identifying the most critical factors for the project. The analysis of sensitivity is not about reducing the risk of investing, but rather about showing the consequences of

misestimating the analyzed parameters of the project. In addition, the results of the sensitivity analysis can be taken into account when comparing interchangeable and non-interchangeable investment projects, with budget ceiling restrictions. All other conditions being equal, the investment project (projects) is chosen that is least sensitive to degradation of the initial parameters.

2.2. A typical procedure for analyzing the sensitivity of project efficiency criteria

The method of analyzing the sensitivity of project efficiency criteria consists in a numerical measurement of the project initial parameters impact on its success. In other words, this method allows answering the question: how will a project efficiency criterion change if any of the project parameters change by a particular amount? Hence, its second name is 'what if' analysis.

A typical sensitivity analysis procedure involves changing *one* initial parameter, while the others are considered *constant* values. Typically, carrying out such an analysis involves the following stages:

- in the form of a mathematical equation, a relationship is established between the initial parameters of the project and its efficiency criterion.
- the most probable values for the initial project parameters and possible ranges for their changes are defined.
- by changing the values of the initial project parameters, their effect on the efficiency criterion is investigated.

In the paper by (Kossov *et al.* 2000), the following is recommended as the main indicators used to calculate the productivity of an investment project: net value *NV*, net present value *NPV*, internal rate of return *IRR*, payback period *PP*, profitability indices *PI*. In the sensitivity analysis method, the efficiency criterion is normally the *NPV* indicator calculated by formula (1):

$$NPV = PV - I_0, \tag{1}$$

where: PV is the present worth of cash flow; I_0 is the amount of investment.

The value of *PV* is determined from the formula (2):

$$PV = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}, \tag{2}$$

where r is the discount rate; *n* is the number of project implementation periods; CF_t is the net flow of payments during a period of time *t*.

In the event that investment costs are incurred for a number of years, formula (1) will take the following form:

$$NPV = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - \sum_{t=1}^{n} \frac{I_t}{(1+r)^t}. \tag{3}$$

If $NPV > 0$, endorsement of the project is advisable; if $NPV < 0$, the project should be rejected; if $NPV = 0$, the project is not unprofitable, but also does not render a profit. The sensitivity analysis is usually carried out at the request of the project participants after completion of the expected efficiency calculations and only if the *NPV*, corresponding to the basic cash flow, has turned out to be positive. In the course of the analysis, it becomes clear how the project cash flows and its *NPV* change when individual parameters change, *i.e.*, how much influence a particular parameter exerts on the process of implementation and the efficiency of the project. Based on the analysis findings, a conclusion is drawn about the sustainability of the project. Depending on the degree of sustainability, there are sustainable, sufficiently sustainable, and unsustainable projects (Nikonova 2012).

A project is considered sustainable if, with possible changes in all the basic parameters of the project and its economic environment, it is financially feasible and effective, while possible adverse consequences are eliminated via the measures envisaged by the project business mechanism. A project is considered sufficiently sustainable if, under all reasonably foreseen changes in all the initial project parameters and its economic environment, it turns out to be financially feasible, and possible adverse consequences are eliminated by the measures provided for by the project business mechanism. The project is considered unsustainable if, under some reasonably foreseen changes in its initial parameters or its economic environment, it turns out to be financially unfeasible or leads to consequences that do not meet the objectives and interests of the project participants. In case of low sustainability of a project, its participants may refuse to implement it or make the necessary adjustments to the project implementation business mechanism, for example:

- the amount and/or terms of loan disbursement are reviewed (for example, the possibility of a more flexible repayment schedule is discussed);
- the possibility of changing the size of reserves, resources or contributions to additional funds approved during the basic cash flow formation is considered (for example, if it is found that with all the considered changes in the project parameters the approved financial reserves are excessively large);
- the terms of mutual settlements between the project participants are adjusted; where necessary, insurance of transactions or indexation of prices for goods and services supplied to each other is envisaged;
- the possibility of insuring project participants against certain insurance events is provided.

After making the necessary adjustments, the project basic cash flow and the expected *NPV* value are recalculated.

2.3. Modified model of the project Net Present Value sensitivity analysis

2.3.1. The model of the project basic cash flow

Based on the analysis of indicators and methods for assessing the efficiency and risks of investment projects, the *NPV* indicator was taken into account as being the most common in the practice of investment project development (Vilenskiy *et al.* 2002, Gracheva 2009). This indicator is calculated on the basis of the known economic relations and is based on estimation of cash flows from the operating, investment, and financial activities of the enterprise.

Formula (1) was adopted as a basic one. After substituting it for formula (2), it takes the following form:

$$NPV = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - I_0. \quad (4)$$

To determine the discount rate, the authors proceeded from the following expression:

$$r = r_1 + r_2, \quad (5)$$

where r_1 is the fixed deposit rate in high-rated banks; r_2 is a risk premium.

The main financial indicators (expenditures, prices, etc.) are considered in conventional monetary units (c.m.u.). To find the value of CF_t, the following notations for the initial project parameters are introduced: *Q* stands for production quantity, pcs.; *P* stands for price per piece, c.m.u.; *FC* stands for fixed costs, c.m.u.; *AVC* stands for variable costs per production unit, c.m.u; *A* stands for amortization allowances, c.m.u.; *T* stands for corporate income tax, %. Obviously, the total receipts from the project implementation will be:

$$TR = Q \times P, \quad (6)$$

and the total costs:

$$TC = FC + VC = FC + AVC \times Q. \quad (7)$$

Then, the project profit before tax will be:

$$PR_1 = TR - TC. \quad (8)$$

The tax is levied on the difference between profit and amortization allowances, so the assessable profit will be:

$$PR_2 = PR_1 - A, \quad (9)$$

And the amount of corporate income tax:

$$S = PR_2 \times T. \quad (10)$$

The net flow of payments will represent the cash flow from operating activities and will be calculated using the formula:

$$CF_t = PR_1 - S = TR - TC - S. \quad (11)$$

Applying expressions (6) – (10) to formula (11) and carrying out mathematical transformations allow obtaining a resulting formula for the cash flow:

$$CF_t = [Q \times (P - AVC) - FC - A] \times (1 - T) + A. \quad (12)$$

Applying expression (12) to formula (4) allows obtaining a final expression of the *NPV* indicator:

$$NPV = \sum_{t=1}^{n} \frac{[Q \times (P - VC_1) - FC - A] \times (1 - T) + A}{(1 + r)^t} - I_0. \quad (13)$$

Formula (12) is a mathematical model of the economic system under examination, the investment project to act as one.

2.3.2. Definition of project stochastic parameters

The second stage of modeling is dividing the project parameters into deterministic and stochastic ones. Taking into account the economic essence of the parameters and the degree of a random component presence in them, the following have been referred to the group of deterministic parameters: I_0, *i.e.* the amount to be invested; *r, i.e.* discount rate; *n, i.e.* the number of project implementation periods; *A,* amortization allowances. *Q, i.e.* production quantity; *P, i.e.* the price per piece; *FC, i.e.* fixed costs; *AVC,* i.e. variable costs per production unit have been assigned to the group of stochastic parameters.

2.3.3. Determination of project sensitivity index

The third stage of modeling is the selection (development) of the project sensitivity index. As such an indicator, it is proposed to use the coefficient of elasticity, showing by what percentage on average the value of *NPV* will change when the respective project stochastic parameter is changed by 1%.

As an information base for calculating the elasticity coefficient, it is proposed to use a substitution table formed in the process of varying the project stochastic parameters (Table 1).

Table 1. Substitution table for calculating the coefficient of elasticity

Range of deviations from the reference value	Running values of the project stochastic parameters	*NPV values*
-nh%	$X^{-nh\%}$	$NPV^{-nh\%}$
: : : : : : : : : : : : : : : : : :	: :	: : : : : : : : : : : : :
-kh%	$X^{-kh\%}$	$NPV^{-kh\%}$
: : : : : : : : : : : : : : : : : :	: :	: : : : : : : : : : : : :
-2*h*%	$X^{-2h\%}$	$NPV^{-2h\%}$
-h%	$X^{-h\%}$	$NPV^{-h\%}$
0%	$X^{0\%}$	$NPV^{0\%}$
+h%	$X^{+h\%}$	$NPV^{-h\%}$
+2*h*%	$X^{+2h\%}$	$NPV^{+2h\%}$
: : : : : : : : : : : : : : : : : :	: :	: : : : : : : : : : : : :
+kh%	$X^{+kh\%}$	$NPV^{+kh\%}$
: : : : : : : : : : : : : : : : : :	: :	: : : : : : : : : : : : :
+nh%	$X^{+nh\%}$	$NPV^{+nh\%}$
Average	$\overline{X}$	$\overline{NPV}$

The substitution table contains the following values: $X^{0\%}$ is the expected (basic) value of the project stochastic parameter; $NPV^{0\%}$ is the expected value of *NPV*; *h*% is the step of changing the project stochastic parameters; *-nh*% is the left variation interval boundary; *+nh*% is the right variation interval boundary.

The substitution table allows analyzing how the value of the *NPV* criterion changes when the values of the selected stochastic parameter change. On the basis of the table statistical series (columns Running values of the project *X* stochastic parameters and *NPV* Values), the elasticity coefficient can be found from formula (14):

$$E = a\frac{\overline{X}}{\overline{NPV}}, \tag{14}$$

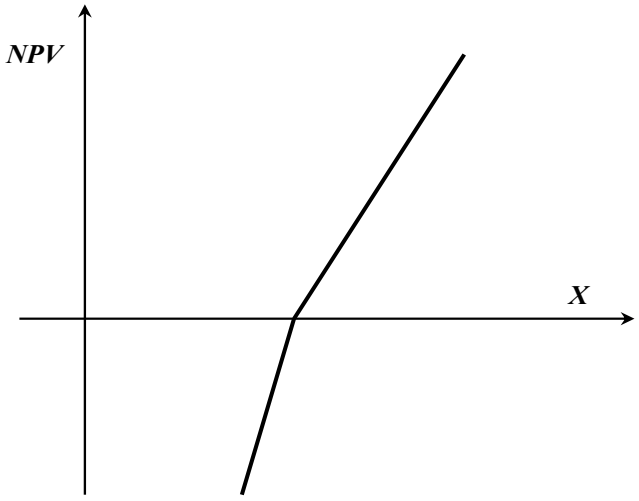
where $\overline{X}$ is the average value of the respective project stochastic parameter; $\overline{NPV}$ is the mean value of the *NPV* criterion; *a* is the coefficient in the paired linear regression equation *NPV* = *aX* + *b*.

it should be keep in mind that under the conditions of significant uncertainty, the variable range of the project stochastic parameters may be as high as ±30% or more. This circumstance should be taken into account in the model by setting the limits (15):

$$PR_2 = \begin{cases} PR_1 - A, \text{если } PR_1 \geq A, \\ 0, \text{если } PR_1 < A. \end{cases}, \tag{15}$$

If the condition $PR_1 < A$ is met in the process of varying the project stochastic parameter, the relationship between *NPV* and the parameter under consideration can take a nonlinear form and is not a straight line, but a polygonal line (Figure 1).

Figure 1. Dependence *NPV* = *f*(*X*) provided that $PR_1 < A$



The parameters of the paired linear regression equation $NPV = aX + b$ can be found using the least square method. After finding the elasticity coefficients for each of the project stochastic parameters, they are recorded in the sensitivity table (Table 2). The '–' sign with the elasticity coefficient indicates an inverse change in *NPV* when the project stochastic parameter changes.

Table 2. Sensitivity table

Stochastic parameters	Value of the elasticity coefficient	Sensitivity
Parameter 1	E_1	Sen_1
: : : : : : : : : : :	: : : : : : : : : : :	: : : : : : : : : : :
Parameter *k*	E_k	Sen_k
: : : : : : : : : : :	: : : : : : : : : : :	: : : : : : : : : : :
Parameter *n*	E_n	Sen_n

In the sensitivity table, sensitivity values can be represented by qualitative evaluations from the following set: 'very low', 'low', 'medium', 'high', and 'very high'. There are no clear limits of sensitivity for certain values of the elasticity coefficient; however, based on the analysis of various sources (Vilenskiy *et al.* 2002, Korosteleva 2007, Gracheva 2009, Urodovskih 2011), basic boundaries presented in Table 3 are proposed.

Table 3. Basic values of the elasticity coefficient

Value of the elasticity coefficient	Sensitivity
$E < 0,5$	very low
$0,5 \le E < 2$	low
$2 \le E < 5$	average
$5 \le E < 10$	high
$E \ge 10$	very high

A high value of the elasticity coefficient indicates that the parameter should be subjected to further research in terms of riskiness (for example, to undertaking a risk assessment by years (half-years), as the project cash flows during fledging years can be estimated to higher accuracy than during the subsequent ones) and to close monitoring during the project implementation process.

3. Results

The proposed model was tested at a number of investment projects of machine-building industry companies. To accelerate and facilitate the calculations, the major elements of the model were implemented at the software level in the MS Excel spreadsheet environment.

Let us consider the practical aspects of working with the computer model through the risk assessment example of an investment project for the production of turbochargers for ship power plants (the calculation results are reported in conventional monetary units). At the first stage, the project stochastic parameters were defined and their most probable values were set (Table 4).

Table 4. Stochastic parameters of the project

Parameter	Probable value
Production quantity *Q*, pcs.	220.00
Price per piece *P*, c.m.u.	45.00
Variable costs per production unit *AVC*, c.m.u.	28.00
Fixed costs *FC*, c.m.u.	750.00

As a mathematical model of the investment project, which determines the relationship between its initial parameters and the efficiency criterion, model (13) is used. The calculated values of the project basic cash flow parameters are shown in Table 5.

Table 5. Calculated values of the project basic cash flow parameters

Parameter	Value
Total revenue *TR*, c.m.u.	9900.00
Total costs *TC*, c.m.u.	6910.00
Profit return PR_1, c.m.u.	2990.00
Amortization *A*, c.m.u.	1500.00
Assessable profit PR_2, c.m.u.	1490.00
Corporate income tax amount *S*, c.m.u.	447.00
CF_t from operating activity, c.m.u.	2543.00

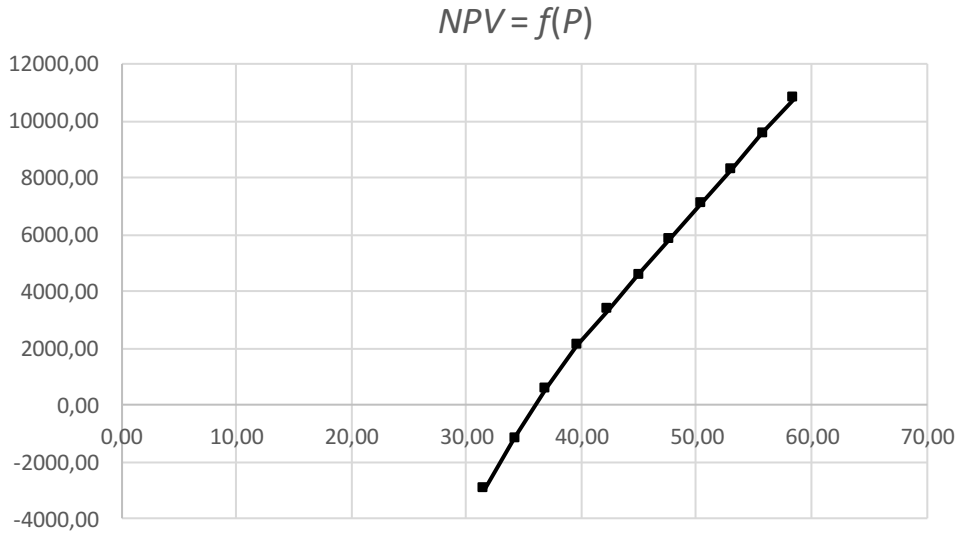
For the basic cash flow, $NPV \approx 4605.13$ c.m.u. At the second stage, variation ranges of the project stochastic parameters with respect to their most probable values are set, the running values of the parameters and the respective values of the *NPV* efficiency criterion are calculated. To calculate *NPV*, the Datasheet tool is used, which allows efficient 'mass' calculations in one table of substitutions for all the stochastic parameters of a project. Table 6 shows the calculations for the parameter *P* when it varies in the range of ±30% in increments of 6%.

Table 6. *NPV* values for variation of parameter *P* in the range of ±30%

Range of variation	Running values	*NPV*
-30%	31.50	-2,940.19
-24%	34.20	-1,163.76
-18%	36.90	612.66
-12%	39.60	2,118.13
-6%	42.30	3,361.63
0%	45.00	4,605.13
6%	47.70	5,848.62
12%	50.40	7,092.12
18%	53.10	8,335.62
24%	55.80	9,579.11
30%	58.50	10,822.61

The graph of function *NPV* = *f*(*P*) is shown in Figure 2.

Figure 2. Graph of function *NPV* = f (P)



Based on the substitution table data, the regression equation *NPV* = *aX* + *b* is found. For the data of Table 6, the regression equation has the form (16):

$$NPV = 496.26 \times P - 17943, \quad (16)$$

To calculate the coefficient of elasticity, the value of parameter *a* is taken from the regression equation and applied to expression (14). For the data of Table 6, *a* = 496.26, whence the value of the elasticity coefficient is found:

$$E = a\frac{\overline{P}}{\overline{NPV}} = 426.96 \times \frac{45}{4388.33} = 5.09. \quad (17)$$

Thus, for the project under consideration, with an increase (decrease) in the product price by 1%, the *NPV* value will increase (decrease) by an *average* of 5.1%. Similar calculations are performed for other stochastic parameters of the project. The results of the sensitivity analysis of the *NPV* criterion to the change in the project stochastic parameters are summarized in the sensitivity table (Table 7).

Table 7. The sensitivity table of the project in question

Stochastic parameters	Elasticity coefficient	Sensitivity
Production quantity *Q*, pcs.	1.70	low
Price per piece *P*, c.m.u.	5.09	high
Variable costs per production unit *AVC*, c.m.u.	-2.87	average
Fixed costs *FC*, c.m.u.	-0.34	very low

As a result of the analysis performed, it has been established that for the project under consideration, the sensitivity of the *NPV* criterion to the change in stochastic parameters is not significant except for the product price. Thus, the analyzed project has sufficient sustainability in relation to parameters *Q*, *AVC*, and *FC*. Regarding the parameter *P*, the project is less sustainable, but for this parameter it is not crucial either, so it is possible to talk about the sustainability of the project as a whole.

4. Discussion

4.1. Disadvantages of the sensitivity analysis method

The sensitivity analysis method is a good illustration of the individual initial parameters effect on the result and indicates the line of further research. However, this method has a number of disadvantages, the most significant ones to be the following:

- The sensitivity analysis method involves changing one initial parameter, while the others are assumed to be constant values. However, in practice, there are relationships between the parameters, and changing one of the parameters often automatically leads to a change in the others;
- The sensitivity analysis method does not allow obtaining probabilistic estimates of possible deviations of the analyzed criteria.

4.2. Deriving equations of relationship between project parameters

The first disadvantage of the sensitivity analysis method can be overcome by simultaneously changing several stochastic parameters of the project (for example, the MS Excel tool Datasheet allows for sensitivity analysis with simultaneous change of two parameters) or by setting up equations of parameter relationships, which, in the authors' opinion, is a more constructive approach.

Upon the availability of statistical data, the equations of relationship can be derived on the basis of the regression analysis means discussed above. In the event that representative samples of the investigated project parameters do not exist or are difficult to obtain, it is proposed to derive a regression equation based on the distribution table of the two-dimensional random variable *(X, Y)* where *X* is a factor criterion, and *Y* is a performance one (Table 8).

Table 8. The distribution of the two-dimensional random variable

X \ Y	y_1	y_2	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	y_j	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	y_n
x_1	p_{11}	p_{12}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{1j}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{1n}
x_2	p_{21}	p_{22}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{2j}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{2n}
⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮
x_i	p_{i1}	p_{i2}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{ij}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{in}
⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	⋮ ⋮ ⋮ ⋮ ⋮ ⋮
x_m	p_{m1}	p_{m2}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{mj}	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	p_{mn}

Table 8 of the distribution of the two-dimensional random variable contains the following values: x_i is the *i*-th value of the random variable *X*; y_j is the *j*-th value of the random variable *Y*; p_{ij} is the probability of the event that the value of *X* is x_i, and the value of *Y* is y_j, wherein the condition $\sum_{i=1}^{m}\sum_{j=1}^{n} p_{ij} = 1$ must be met.

The table for distribution of the two-dimensional random variable *(X, Y)* can be drawn up on the basis of making plausible expert judgments about possible combinations of *X* and *Y* values, as well as the probability of their occurrence. In the authors' opinion, drawing up such a table is one of the few constructive ways to reduce uncertainty in the absence of representative samples on the basis thereof a regression equation could be derived.

In the case of the objective under consideration, the price for the product can be used as the value of *X*, and the expected sales volume as the value of *Y*. As the points of departure for drawing up a table, three possible scenarios for each of the values can be considered: worst-case, most probable, and optimistic ones. Thus, there will be two arrays $\{x^p, x^{nv}, x^o\}$ and $\{y^p, y^{nv}, y^o\}$, which allow specifying nine values of p_{ij} (Table 9).

Table 9. Distribution of the two-dimensional random variable *(P, Q)*

Scenarios	Y / X	Worst-case	Most probable	Optimistic
		$y_1 = y^p$	$y_2 = y^{nv}$	$y_3 = y^o$
Worst-case	$x_1 = x^p$	p_{11}	p_{12}	p_{13}
Most probable	$x_2 = x^{nv}$	p_{21}	p_{22}	p_{23}
Optimistic	$x_3 = x^o$	p_{31}	p_{32}	p_{33}

On the basis of Table 9, a linear regression equation can be derived:

$$M(Y / X = x) = ax + b, \tag{18}$$

where $M(Y / X = x)$ is a conditional mathematical expectation; *a, b* are parameters of the regression equation.

It is known from the mathematical statistics theory that (Kalinina and Pankin 1998):

$$a = r_{XY} \frac{\sigma_Y}{\sigma_X}, \tag{19}$$

$$b = m_Y - r_{XY} \frac{\sigma_Y}{\sigma_X} m_X, \tag{20}$$

where m_X, m_Y are the mathematical expectations of *X* and *Y*; σ_X, σ_Y are the standard deviations of *X* and *Y*; $r_{XY} = \frac{m_{XY} - m_X m_Y}{\sigma_X \sigma_Y}$ is a correlation coefficient.

Applied to the model under consideration, the desired regression equation will have the form of expression (19):

$$M(Q / P = x) = ax + b. \tag{21}$$

The regression equation (21) allows one of the most significant shortcomings of the standard procedure of the sensitivity analysis method to be overcome, and thereby increases the probability of a more accurate prediction of the expected *NPV* value.

4.3. Scenario analysis

Methods for analyzing investment project risks based not only on the concept of the time value of money, but also on probabilistic approaches, are devoid of the second drawback of the sensitivity analysis method. One of fairly simple and at the same time highly effective methods that allow obtaining probabilistic estimates of possible deviations of the analyzed criteria is the method of analyzing the scenarios for a project development.

In general, the procedure for analyzing scenarios involves the following steps:

1. Several options of changes in the initial parameters of the project are defined;
2. Each option of the change is attributed to its probabilistic evaluation;
3. For each option, the expected value of the efficiency criterion is calculated, as well as estimates of its deviations from the expected value.

Three possible scenarios are going to be considered, *i.e.* worst-case, most probable and optimistic ones; hence, three values of *NPV* are calculated:

- NPV_1 is the *NPV* value for the worst-case scenario;
- NPV_2 is the *NPV* value for the most probable scenario;
- NPV_3 is the *NPV* value for the optimistic scenario.

To each scenario, its probabilistic estimate is assigned and the main probabilistic characteristics are calculated:

- mathematical expectation:

$$M(NPV) = \overline{NPV} = \sum_{i=1}^{3} NPV_i p_i, \quad (22)$$

- dispersion:

$$D = \sum_{i=1}^{3} (NPV_i - \overline{NPV})^2 p_i, \quad (23)$$

- standard (mean-square) deviation:

$$\sigma = \sqrt{D}. \quad (24)$$

In expressions (22) – (23), p_i is the probability of the scenario. To reduce the degree of subjectivity in determining the probabilities p_i, it is proposed to use the method of analyzing hierarchies by Saati (1989). To do this, the analyst (or a group of analysts) makes qualitative judgments about the degree of preference for one scenario over another one, resulting in a preference table. The preference table is processed according to the scheme (25):

$$\left|\begin{array}{cccc|c|c} 1 & a_{12} & \ldots & a_{1n} & A_1 = \sqrt[n]{\prod_{j=1}^{n} a_{1j}} & p_1 = \dfrac{A_1}{\sum_{i=1}^{n} A_i} \\ a_{21} & 1 & \ldots & a_{2n} & A_2 = \sqrt[n]{\prod_{j=1}^{n} a_{2j}} & p_2 = \dfrac{A_2}{\sum_{i=1}^{n} A_i} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \ldots & 1 & A_n = \sqrt[n]{\prod_{j=1}^{n} a_{nj}} & p_n = \dfrac{A_n}{\sum_{i=1}^{n} A_i} \end{array}\right|, \quad (25)$$

where a_{ij} is the degree of preference of the *i*-th scenario over the *j*-th scenario on the scale of the hierarchy analysis method; p_i is the *i*-th element of the priority vector (probability of the *i*-th scenario).

As a probabilistic index of risk in investment project development, the standard deviation σ has become most widespread. The smaller the standard deviation is, the 'narrower' the probability distribution is and the lower the risks are. However, this indicator is convenient to use when comparing investment projects with each other. When analyzing one project, this indicator becomes less informative. Therefore, it is suggested adding one more indicator to the standard scenario analysis procedure for investment risks, i.e. the probability of the event that the project will prove unprofitable:

$$P(NPV < 0). \quad (26)$$

To find the probability $P(NPV < 0)$, let us hypothesize a normal distribution of the *NPV* value. The validity of such assumption is based on Lyapunov theorem and the analysis of papers devoted to the problems of decision-making in the field of economics and finance. Assuming the normal distribution of *NPV*, it is possible to calculate the probability of the event that the *NPV* is less than the specified value of *x*:

$$P(NPV < x) = \Phi\left(\frac{x - \overline{NPV}}{\sigma}\right), \quad (27)$$

where $\Phi = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{(t-\bar{x})^2}{2\sigma^2}} dt$ is Laplace's function.

Since it is suggested using the probability of the event as a probability risk indicator that the project will prove unprofitable, that is, when $NPV < 0$, the probability of this event will be calculated using formula (27):

$$P(NPV < 0) = \Phi\left(\frac{0 - \overline{NPV}}{\sigma}\right) = 1 - \Phi\left(\frac{\overline{NPV}}{\sigma}\right). \quad (28)$$

Let us demonstrate the proposed scenario analysis procedure for the project in question. The group of analysts has considered three scenarios for the project development: worst-case, most probable, and optimistic ones. For each of the scenarios, the values of the project stochastic parameters are given and judgments about the preferability of the project implementation are provided:

- the most probable scenario has a significant preference over the worst-case scenario and an obvious preference over the optimistic scenario;
- the worst-case scenario has some preference over the optimistic scenario.

Based on the judgments and the scale of the hierarchy analysis method, a comparative table of project implementation scenarios is drawn up (Table 10).

Table 10. Comparative table of project implementation scenarios

Scenarios	Worst-case	Most probable	Optimistic
Worst-case	1	1/5	3
Most probable	5	1	7
Optimistic	1/3	1/7	1

Processing the data of Table 10 in accordance with the procedure scheme (25), one obtains estimated probability of the project implementation for each of the scenarios: $p_1 = 0.188$; $p_2 = 0.731$; $p_3 = 0.081$. Table 11 shows the values of the project stochastic parameters, the probabilities of the scenarios implementation, and the calculated values of *NPV*.

Table 11. Parameters of the project development scenarios

Project stochastic parameters	Scenarios		
	Worst-case	Most probable	Optimistic
Scenario probability	0.188	0.731	0.081
Production quantity *Q*, pcs.	170	220	260
Price per piece *P*, c.m.u.	35.00	45.00	55.00
Variable costs per production unit *AVC*, c.m.u.	30.00	28.00	25.00
Fixed costs *FC*, c.m.u.	800.00	750.00	700.00
Project *NPV*, c.m.u.	-2,850.47	4,605.13	13,209.12

Table 12 lists the values of the calculated *NPV* probabilistic estimates.

Table 12. Probabilistic estimate of *NPV*

Probabilistic estimate	The estimate value
M(*NPV*), c.m.u.	3,900.40
D(*NPV*), c.m.u.^{2}	15,949,830.66
σ(*NPV*), c.m.u.	3,993.72
P(*NPV* < 0)	0.16

The calculated value of *P*(*NPV* < 0) = 16% indicates a mean probability of the project proving unprofitable. The project can be admitted for consideration, but it is necessary to make certain adjustments to the project implementation business mechanism that would allow reducing its riskiness.

The main disadvantage of the scenario analysis is a limited number of scenarios one can consider. The method of simulation statistical modeling (Monte Carlo method) is free from this disadvantage, which allows generating thousands of random scenarios (Batkovskiy *et al.* 2015). However, this method also has a significant drawback – the main condition for its effective application is defining appropriate laws for distribution of random variables. An incorrect assumption about the form of the distribution laws can lead to significant errors in risk assessment.

Conclusion

Thus, it can be argued that the comprehensive approach to risk assessment is the most effective involving the use of diverse economic and mathematical methods. This approach does not only allow obtaining a variety of quantitative risk assessments, but also gives a more complete qualitative model of possible results of project implementation as a whole.

The proposed modified method has been brought to the level of practical implementation in the form of a computer model in the Excel spreadsheet environment. The method and the computer model have been practically tested and endorsed through an example of risk assessment of an investment project for production of turbochargers for marine power plants.

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Calculation Method and Software Development for Prime Cost Calculation in Case of Road Freight Transport Trips

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Abstract

Due to growing market globalization, increasing global competition the forwarding companies are compete together for client orders. Clients will choose the quality and cheap service providers. In the study a precise calculation method and a total prime cost function are elaborated, the cost components of the prime cost function and calculation methods for these are also defined. Based on the elaborated theory a software was developed to define the prime cost of a given transport task. Due to the precision of the calculation method and software the bid for the transport task will not be lower or higher than the market price, so risk and waste of the company can be reduced, and profit can be realized. It is especially important in case of long international transport trips. Due to the fastness of the software the company will be able to fast respond to client's orders. A software is also introduced in this article which is absolutely original and unique.

Key words: road transport; transport trip; prime cost calculation; software development

JEL Classification: R40; L91

Introduction

The intensity of the transport activities connected to production and service is ever increasing due to the growth of the efficiency of the economy and the bigger supply chains (Kovács and Kot 2016, Lukinskiy and Lukinskiy 2016).

The research study is very important and actual, because the 30% of the cost of the whole supply chain comes from transportation. The ratio of road transport in Europe is 78% of the total transit volume (Fraunhofer 2015). Due to it, every company focus on optimization of transportation and reduction of transport costs, especially in case of long international transport trips.

Recently in practice the calculation of transport fee of a transport task is not supported by software at transport companies, but depends on the individual estimation of the transport managers. It results wastes if the bid for the transport task is lower than the prime cost, profit will not be realized for the companies. If the bid for the transport task is higher than the prime cost the fee of the transport task will be over the market price, so the company will not be competitive. It is problem especially in case of long international transport trips. The idea of a software for a prime cost calculation of a road freight transport was initiated by this fact, so the software can offer precise and prompt solution for an everyday task.

The goal of this research is to elaborate a precise calculation method, to define the total prime cost function and cost components of the prime cost function, and elaborate the calculation methods for these. After it based on the elaborated theory a software was developed to define the prime cost of a given transport task. This software is absolutely original and unique, especially that it can provide a fast and precise prime cost calculation for a given transport task based on minimal number of input data.

Due to the fastness of the software the company will be able to fast respond to customer orders and due to the precision the bid for the transport task will not be lower or higher than the market price, so risk and waste of the company can be reduced, and profit can be realised. The developed software can also help the strategic decision making, optimization of transport activities and making short and long term operative plans. The developed software is absolutely fit to the customer demands and very cost effective. Precision and reliability of the elaborated prime cost calculation method and software compared to the improper practice was verified by

comparative analysis. The developed software was implemented successfully at a Hungarian forwarding company.

1. Literature review and methodology

Logistics literature often deals with description of general characteristics and costs of road freight transport. The road transport is one of the most expensive logistical activities (Swanson 2016, Glock 2017, Golyand *et al.* 2017). There is a huge amount of literature on general logistics costs (*e.g.* Rushton *et al.* 2010, Ross 2015, Kovács and Kot 2016, Grondys and Dragolea 2016) and introduction of transport cost components (*e.g.* Birge and Linetsky 2007, Gudheus and Kotzab 2009, Anbuudayasankar *et al.* 2014, Ślusarczyk 2014).

The three general network structures of transport systems for possible connections of stations and nodes are: line structure, ring structure and star structure (Gudheus and Kotzab 2009, Simchi-Levi *et al.* 2014; Anbuudayasankar *et al.* 2014) and the combination of these. The most common used structure in international freight transport is different types of ring structures, so called freight round trips.

The main goal of the planning of the round trips is the minimization of freight cost per unit shipped (Birge and Linetsky 2007, Caramia and Dell'Olmo 2008, Ehmke 2012).

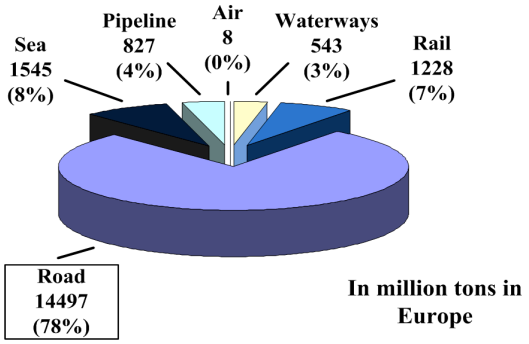
In the last years I had several Research & Development projects realised at forwarding companies, so I have practical experience in field of transportation. Recently in practice the calculation of transport fee of a transport task is depends on the individual estimation of the transport managers. My empirical experience initiated the idea of the prime cost calculation method and software. This research topic is not only theoretical, but a prime cost calculation software is also developed which can be applied very efficiently and widely in the everyday practice. This software application is also described in our study.

A prime cost calculation software was developed for Small and medium-sized enterprises (SMEs), which enterprises cannot invest into expensive ERP (Enterprise Resource Planning) systems. Before the software development I consulted with SMEs about their requirements relating to our software. Based on the customer demands I elaborated the calculation method for total prime cost of freight transport trips and based on this theory a calculation software was developed. Further advantage of this software that absolutely fit to the customer demands and very cost effective.

2. Role of road freight transport in the total freight transport volume

In Europe the ratio of road transport in the total transport volume is 78% (Fraunhofer 2015) furthermore this ratio is constantly growing. The remaining 22% breaks up to railway (7%), river vessels (3%), sea carriers (8%), and pipeline transport (4%), while air freight transport is almost negligible with its performance of 8 million tons per year.

Figure 1. Ratio of transport modes in Europe (Fraunhofer 2015)



Road transport has many advantages compared to the other transport modes:

- relatively cheaper mode of transport,
- high density of road network,
- shorter transit time,

- flexibility to the demands of customers,
- flexible in routing and time scheduling,
- low risk of damage of goods during the transportation,
- provides door-to-door service.

One of the most important intentions of the transport policy of the European Union is to increase the cooperation between the transport modes (road, rail, water and air) (Banister *et al.* 2000), in order to realize economic and fast transport, and the advantages and synergies between the different modes can be combined. The result of this intention is that the contribution of road transport will be reduced, noise pollution, environmental pollution, and traffic jams will be decreased.

In despite of intentions of the transport policy of the European Union, it can be forecasted that the intensity of the road transportation will be increasing to a small extent or stagnate so the road transport will be the most significant transport mode in the future. Therefore, every production companies and service providers will put large emphasis on the optimization of transportation and reduction of transport costs in the future.

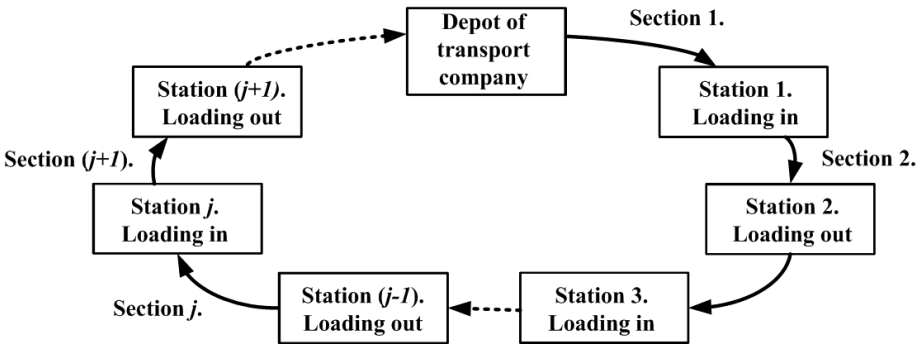
The optimisation of transport trips can be realized by the following ways:

- modernization of vehicle fleet,
- integration of more transport tasks into one transport trip,
- cooperation and coordination between the transport modes (rail, road, water and air) to form faster and more economic transport chains, advantages and synergies of the different modes can be combined and utilized,
- optimization of the transport coordination and utilization of resources (vehicles, human, etc.),
- elimination of idle loads,
- application of logistic informatics tools improves the efficiency of transport tasks, and ensures better monitoring and tracking,
- optimisation of transport costs to realise efficient operation.

3. Structure of international round trips

The goals of the organization of transportation are to ensure a more cost efficient transport tasks, especially in case of long international freight transport trips. Due to it the integration of more transport tasks as required into one round trip as shown in Figure 2. It means that the vehicle starts from the depot of the transport company to the first station where the freight is loaded in. Then the vehicle goes to the next station, where the freight is loaded out. After it the vehicle goes to the next station, etc. After the last station the vehicle goes back to the depot of the company. In the next part of this study we will often use term “section” which is a transport way between two stations. Concluded the round trip is consisting of transport sections.

Figure 2. Structure of a transport trip



4. Elaboration of prime cost calculation method for road freight transport trips

Recently in practice the calculation of transport fee of a transport task is not supported by software at transport companies, but depends on the individual estimation of the transport managers. The transport manager (who organize and dispose the transport trips) after receiving of a client order for a given delivery task, have to make a bid for the fee of transportation as soon as possible. This price estimation is based on specific transport costs obtained from analysis of historical transport data. It can result in many cases false fee calculation. So the offered transport fee of a given transport task can be under the own prime cost or can be much higher than the own prime cost.

If the bid for the transport task is lower than the prime cost of the transport task, profit will not be realized for the transport company. If the bid for the transport task is higher than the prime cost the fee of the transport task will be over the market price, so the company will not be competitive, will not realize income. To define a correct transport fee, we have to pre-calculate the prime cost of a given transport task.

The goal of this research is to elaborate a precise calculation method, to define the cost components of the prime cost function, and elaborate the calculation methods for these. After it based on the elaborated theory a software was developed to define the prime cost of a given transport task.

At first the cost components of the cost function should be defined. The theory of cost calculation will be discussed in the next part of this article. Total prime cost of the *i*-th transport trip (C_{Pi}) can be calculated:

$$C_{Pi} = \sum_{j} (C_{Uij} + C_{Eij} + C_{Wij} + C_{Aij} + C_{Oij} + C_{WTij}), \quad (1)$$

where: C_{Uij} - cost of useful transport way (vehicle carried useful freight), C_{Eij} - cost of empty transport way (vehicle carried no freight), C_{Wij} - wage cost of drivers, C_{Aij} - additional costs (fee of motorway usage, parking fee, *etc*.), C_{Oij} - operation and maintenance cost of vehicles, C_{WTij} - cost of waiting time, *I* - identifier of the freight transport trips, *j* - identifier of the transport sections.

4.1. Cost of useful transport way

The cost of transport sections with useful freight can be calculated by the next equation:

$$C_{Uij} = c_{Uij} \cdot L_{Uij}, \quad (2)$$

where: L_{Uij} : length of useful transport way with freight in case of the *i*-th transport section of the *j*-th transport trip [km], c_{Uij} : specific cost of transport way with useful freight in case of the *i*-th transport section of the *j*-th transport trip [euro/km],

$$c_{Uij} = c_{Ue}\left[f_e + f_e \cdot \varepsilon_{ij}^{T} + \varepsilon^{L} \cdot m_{ij}\right] \text{ [euro/km]}, \quad (3)$$

where: c_{Ue} - fuel price [euro/liter], f_e - specific fuel consumption of empty vehicle [liter/km], ε_{ij}^{T} - correction factor for fuel consumption depending on topology (different in case of flat or mountainous conditions), ε^{L} - correction factor for different loading conditions (every additional tons of useful freight results 0.5 liter additional fuel consumption) $\left[\frac{\text{liter}}{\text{ton} \cdot \text{km}}\right]$, m_{ij} - transported useful freight [ton].

4.2. Cost of empty transport way

The cost of empty transport way of transport sections without freight can be calculated:

$$C_{Eij} = c_{Eij} \cdot L_{Eij} \text{ [euro]}, \quad (4)$$

where: L_{Eij}: length of empty way without freight in case of in case of the *i*-th transport section of the *j*-th transport trip [km], c_{Eij}: specific cost of empty way without freight [euro/km],

$$c_{Eij} = c_{Ue}\left[f_e + f_e \cdot \varepsilon_{ij}^{T}\right]. \quad (5)$$

4.3. Wage cost of drivers

The average wage cost of derivers in case of one driver can be calculated:

$$C_{Wij} = T_{ij} \cdot c_{ij} \text{ [euro]}, \quad (6)$$

where: T_{ij}: time consumption of a freight transport trip is the sum of time consumption of useful ways (T_{Uij}) and time consumption of empty ways (T_{Eij}), and waiting times (T_{WTij}) [hour], c_{ij}: average wage cost of a driver [euro/hour].

4.4. Additional cost

Total additional cost (C_{Aj}) is the sum of the motorway fee, parking fee, etc.:

$$C_{Aj} = C_{ARj} + C_{APj} \text{ [euro]}, \quad (7)$$

where: C_{ARj}: fee of motorway sections used by vehicles, C_{APj} – fee of parking.

4.5. Operation and maintenance cost of vehicles

Operation and maintenance costs of a transport trip are including *e.g.:* leasing, maintenance, assurance, *etc*. This cost component can be calculated by:

$$C_{Oij} = T_{ij} \cdot c_M \cdot \varepsilon_M \quad \text{[euro]}, \quad (8)$$

where: T_{ij}: time consumption of the *i*-th transport section of the *j*-th transport trip [day], ε_M: correction factor for maintenance cost of different vehicles (depending on the age of the vehicles), c_M: specific operation and maintenance cost of vehicles (leasing, maintenance, assurance, etc.) [euro/day].

4.6. Cost of waiting time

The cost of waiting time during the transport way can be calculated as the sum of the following components:

$$C_{WTij} = (T_{Lij} + T_{Wij} + T_{Rij} + T_{Fij} + T_{Sij}) \cdot c_{WTij} \text{ [euro]}, \quad (9)$$

where:

T_{Lij}: time consumption of loading in and loading out [hour],

T_{Wij}: waiting for loading in and loading out activity [hour],

T_{Rij}: waiting time due to required resting [hour],

T_{Fij}: waiting time at the frontier station [hour],

T_{Sij} : waiting time due to camion stop [hour],

c_{WTij} : specific cost of waiting [euro/hour].

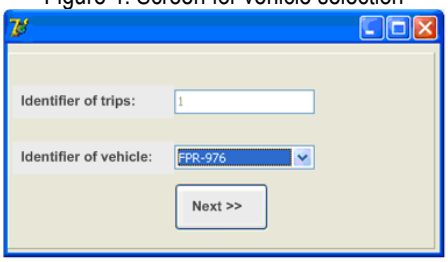
5. Software development for prime cost calculation of road freight transport trips

The most important screens of the developed software will be showed in the next part of the article. The software was developed by the contribution of college Szabolcs Schmidt. The software provides the possibility of:

- building and modification of database (menu "*Data base*")
- calculation of prime cost of transport tasks (menu "*Calculation*"), and
- listing and checking of historic transport task's calculations (menu "*Archive data*") (Figure 3.).

Figure 3. Main menus of the software

Figure 4. Screen for vehicle selection



In the menu "*Data base*" the most important parameters can be defined relating to transport vehicles (*e.g.* ID, specific fuel consumption, specific operation-, maintenance- and assurance costs, *etc.*), fee of motorway usage for different roads and countries, actual fuel price, *etc*. In the menu "*Calculation*" the most important parameters can be defined relating to the actual transport task. At first the vehicle has to be selected for a transport task (Figure 4). The general characteristics of the selected vehicle (*e.g.* specific fuel consumption in case of empty vehicle or maintenance cost which are recorded in a database,) will be automatically taking into consideration during the cost calculation.

The next step of the operator is to define the parameters (Figure 5) relating to the different sections of the round trip (identifier of the section, the transport length of the section and the average topography of the section (flat or mountainous) and the transported useful freight load). If a round trip consists of more sections, all of the parameters have to be defined for all of sections.

Figure 5. Screen for parameter settings of the round trip sections

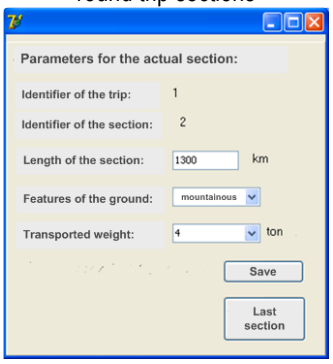
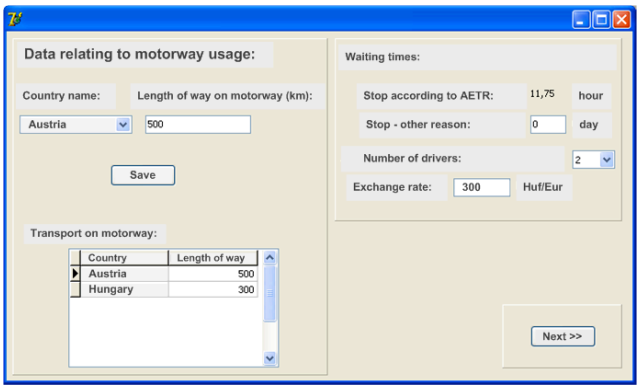


Figure 6. Screen for further parameter setting



Because of the difference of fees of motorway usage of different countries, the length of motorways used in different countries has to be defined for all of sections (Figure 6). The waiting times can be also given, which will result the waiting cost. The time consumption of the total transport way also can be calculated by the software, so the minimum break and rest times according to the „European Agreement Concerning the Work of

Crews of Vehicles Engaged in International Road Transport" rules is automatically calculated and listed on the screen. The exchange rate of the Huf/Eur can be also defined, so the costs can be listed in both of Huf and Euro.

The number of drivers can be selected, so the wage cost is also can be taken into account in the calculation. After the definition of the parameters required for the calculation (eq. 1-9.), the total prime cost and its components can be calculated and listed in case of a given transport task (Figure 7).

Figure 7. Screen of results of the calculation

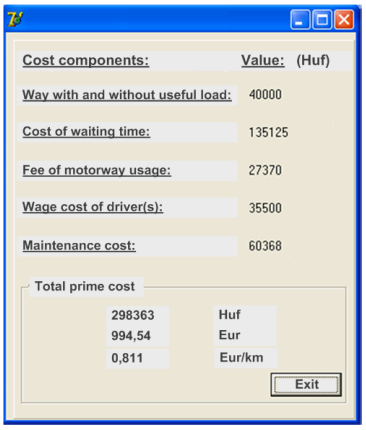
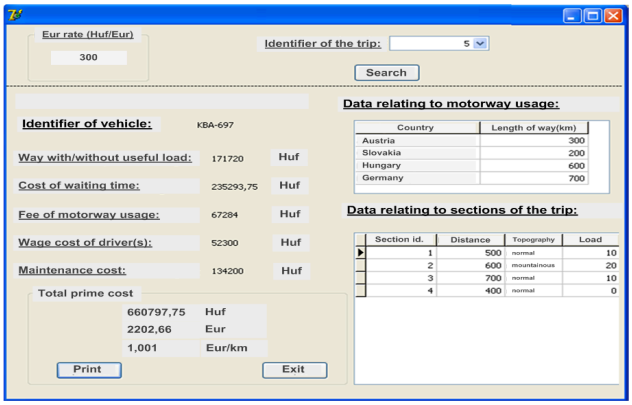


Figure 8. Screen of an archive calculation



Based on this pre-calculation of prime cost of a given transport task the transport manager can give a precise and reliable transport fee offer for the potential clients. So the offered transport fee will not be lower than the own prime cost or will not be higher than the market price. So the waste and the risk of the transport company can be minimised, especially in case of long international transport trips.

The earlier saved transport plans and calculations can be searched in the menu "*Archive data*". Figure 8 shows an example for the result of an archive transport task's calculation. It is very useful if we want to compare the plans and the real data after the realization of transport tasks.

This software was developed for SMEs; these are enterprises cannot invest in expensive ERP systems. Before the software development I consulted with these enterprises about their demands relating to this calculation software. Based on the customer requirements we developed the prime cost calculation software. The developed software is absolutely fit to the customer demands and very cost effective, which was implemented at a Hungarian forwarding company. The feedback about our developed software is absolutely positive and other enterprises are interesting in.

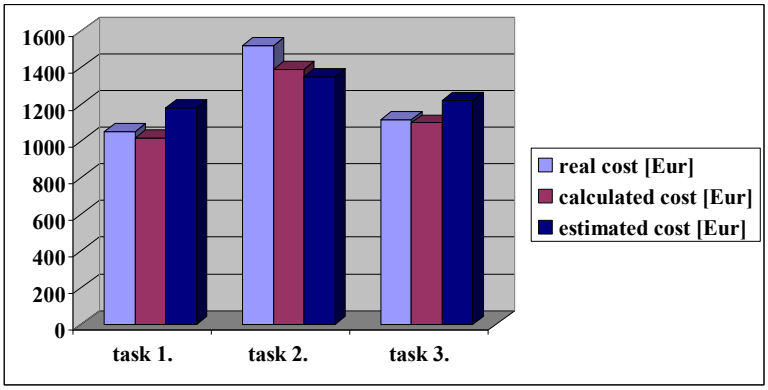
6. Efficiency verification of the elaborated calculation method and the developed software

The precision and efficiency of the elaborated prime cost calculation method can be verified by comparison of the calculated and real costs of transport tasks. The company where the software was implemented provided historic data for this comparative analysis. The estimation based (recent practice: individual estimation of the transport managers) cost calculation results are also included in Table 1. The difference of real costs and calculated costs, and the difference of real costs and estimated costs were also calculated (Table 1). Costs of three archived transport tasks were compared (Figure 9).

Table 1. Data relating to real-, calculated- and estimated costs

	Task 1.	Task 2.	Task 3.
Real cost [Eur]	1.050	1.520	1.115
Calculated cost [Eur]	1.018	1.390	1.098
Estimated cost [Eur]	1.180	1.350	1.220
Difference of real cost and calculated cost	- 3,05 %	+ 3,2 %	- 1,52 %
Difference of real cost and estimated cost	+ 12,38 %	- 8,55 %	+ 9,42 %

Figure 9. Comparison of real-, calculated- and estimated costs



It can be seen in Table 1. that the difference of real cost and calculated cost in case of the evaluated three transport tasks are approximately ±3,2%, which are not significant on a long international transport trip. This result shows that the elaborated prime cost calculation method is absolutely precise.

Based on the comparison of real cost and estimated cost, it can be summarised that the differences are significant, approximately ±12%, which shows high difference in cost. This high difference can result wastes if the bid for the transport task is lower or higher significantly than the market price of the transport task, therefore profit will not be realized for the carrier or the company will not be competitive.

Conclusions

Production companies and service providers put large emphasis on the optimization of transportation and reduction of transport costs. Especially in case of long international freight transport trips, because the transportation is one of most expensive logistical activity. The performance of transportation sector shows that the ratio of road transport in Europe is 78% of the total transit volume. Due to it, this research is very actual and important because the optimization of road transport activities results a significant cost reduction.

The reason of the elaboration of the calculation method and software development was the improper practice applied at transport companies that the calculation of the transport fee of a transport task is not supported by software, but depends on the individual estimation of the transport managers.

In the study a precise calculation method and a prime cost function were elaborated, the cost components of the prime cost function and calculation methods for these were also defined. Based on the elaborated theory a software was developed to define the prime cost of a given transport task.

The elaborated calculation method and software is absolutely original and unique, especially that it can provide a fast and precise prime cost calculation. This software was developed for SMEs, which cannot invest in expensive ERP systems. Further advantage of the software that absolutely fit to the customer requirements and very cost effective.

Due to the fastness of the software the company will be able to fast respond to client orders and due to the precision the bid for the transport task will not be lower or higher than the market price, so risk and waste of the company can be reduced especially in case of long international transport trips. The developed software can also help the strategic and operative decision. Precision and reliability of the elaborated prime cost calculation method and software compared to the improper practice was verified by comparative analysis (Section 7).

The software was implemented successfully at a forwarding company; other enterprises are also interesting in this software. Our future plan is to develop an “expert system” for this software which can make suggestions automatically based on the evaluation of historic transport data for improvement of road freight transport activity.

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Does Outlier need to be removed from Regression Analysis? Case Study in Economics Research

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Abstract:

The linear relationship between response and predictor variables in economics can be expressed in a regression model. The Ordinary Least Square in estimating the parameters in the regression will produce a less valid estimator whenever outlier appears in the data. The identification of the outlier needs to be done to improve the validity of the results. The objective of this study is to examine how is the effect of deleting outliers from the data sets will change the adjusted coefficient of determination R^2_{adj} as compared to the use of full data (with outlier). Using twenty five sets of data obtained from the final projects of undergraduate students in economics of University of Brawijaya, two methods of deleting outlier observation are examined, *i.e.* (1) by deleting observation with the largest residual without considering the number of outliers in the data sets and (2) by deleting all outliers at once. The results of the analysis show that deleting observation with the largest outlier from the data sets increase an average of R^2_{adj} by 6.33% and an average increase of R^2_{adj} by 7.78% after deleting all outliers at once. Therefore, it is required to have a very careful analysis so that it can be decided whether or not to include outlier in the process of the regression analysis.

Keywords: outlier; least square; adjusted coefficient of regression

JEL Classification: C10; C51; C52

Introduction

Multiple linear regression analysis is a popular statistical technique for students in economics to determine the relationship between a response variable and several predictor variables. The regression model is usually represented by the following equation (Draper and Smith 1981):

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_p X_{ip} + \varepsilon_i \quad (1)$$

where: Y_i: the *i*th response variable; β_0: intercept; $\beta_1, \beta_2, \ldots, \beta_p$: partial regression coefficient; $X_{i1}, X_{i2}, \ldots, X_{ip}$: predictor variables; ε_i: the *i th* residual; *n*: the number of observations; *p*: the number of predictor variables

Parameter $\beta_1, \beta_2, \ldots, \beta_p$ on the model *(1)* cannot be exactly known because in almost every condition, researcher is using only a small fraction of the population (sample) from the values of Y which are related to the values of several X values. Therefore, the equation *(1)* can be estimated using following sample model:

$$Y_i = b_0 + b_1 X_{i1} + b_2 X_{i2} + \ldots + b_p X_{ip} + e_i \quad (2)$$

One of the methods to estimate the parameters of linear regression models is the Ordinary Least Square (OLS) with assumptions: independent and normal distributed residual, with mean zero and variance of σ^2, which can be summarized as $\varepsilon_i \sim NID(0,\sigma^2)$ (Draper and Smith 1981).

In many studies, it is commonly found that there are observations which are suspected to be outliers, *i.e*. observations with larger absolute residual values compare to other residuals. There are various definitions of an outlier namely: is a score in a set of data which is so extreme that, by all appearances, it is not representation of the population from which the sample is derived (Sheskin 2000); is an observation that do not follow the common patterns and is located far from the centre of the data (Weisberg 2005) and is an observation that deviates far from other observation, which may arise due to wrong measurement (Hawkins 1980).

The identification of outlier is needed to determine whether outlier should be removed or not from the data analysis. This is because the presence of outlier will cause some problems such as altering or obscuring the conclusions made by researchers, so that the research result become invalid (Draper and Smith 1981).

Robust regression method is one of the methods to overcome the influence of outlier in the data set. This method requires more complicated mathematical calculation, as shown by Fox (2002). Draper and Smith (1981) then suggested removing the outliers from the data and re-analysing without the outliers. Similarly, Weisberg (2005) stated if there are problems associated with outlier, then the diagnostic tool which can identify the outlier problem is needed. One of the methods is removing the outlier from the data then re-analyzes the data without outlier.

The important indicator to measure the accuracy or the suitability of regression obtained from the parameter estimation based on samples is the coefficient determination (R^2). R^2 can also be used to measure the proportion of the total variability around the mean which can be explained by the regression line (Hamilton 1992). Draper and Smith (1981) defined the value as coefficient determination and is calculated as follows:

$$\mathbf{R^2 = \frac{\sum_{i=1}^{n}(\hat{Y}_i - \bar{Y})^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2} = \frac{SSR}{SST} = 1 - \frac{SSE}{SST}} \quad (3)$$

where: SSR: Regression sum of squares; SST: Total sum of squares; SSE: Error sum of squares; R^2 in equation (3) is sensitive to the addition of predictor variables, where the more predictor variables are involved, the greater the value of R^2 will be.

Therefore, the number of variable in the model should be considered. Coefficient determination that takes into account the number of predictor variables in the model is called the adjusted coefficient determination R^2_{adj}. The coefficient of determination has been adjusted to the respective degrees of freedom each sum of squares. According to Drapper and Smith (1981) R^2_{adj} is defined as:

$$R^2_{adj} = 1 - \frac{SSE/_{n-p-1}}{SST/_{n-1}} \quad (4)$$

where: SSE: Error sum of square; SST: Total sum of square; *p*: Number of predictor variables; *n*: number of observations.

The value of R^2_{adj} lies between 0 and 1 is ($0 \leq R^2_{adj} \leq 1$). The closer the value of R^2_{adj} to 1, the better the data fit with the model, and conversely the closer the value of R^2_{adj} to 0, then the regression model obtained is not appropriate to predict the value of dependent variables Y. In general, the interpretation of the corrected coefficient determination is the proportion of the total variability of Y explained by the diversity of predictor variables X (Hamilton 1992).

Although multiple regression analysis is commonly used in economics research and the assumption test was done so that the conclusions are valid, the identification of outlier is rarely performed. Meanwhile, OLS is a sensitive estimation method when outliers are presence (Hamilton 1992). The objective of the study is therefore to examine how deleting outliers affects the accuracy or suitability of regression as measured by the change in the adjusted coefficient of determination.

The rest of this paper is as follows. In the second section, the material and method will be explained. The following section contains the results and discussion. As for the final section, this paper presents the conclusion.

2. Material and method

The data used in the study are 25 sets secondary data obtained from the final project of undergraduate students of Faculty of Economics and Business and Faculty of Sciences, University of Brawijaya, Indonesia. All the data fulfil the assumptions underlying the regression analysis, such as normality of variable, the homogeneity of variance, the independence residuals, and multicollinearity (Gujarati 2004). Two sigma principles are used to detect the outliers as illustrated in Seo (2002).

The steps of data analysis are as follow: the regression analysis is done to the complete data set using OLS, the adjusted coefficient of determination is denoted by M_1, where R^2_{adj}.is the adjusted R^2 for full dataset (Method 1). Then, the residuals of each observation $e_i = y_i - \hat{y}_i$ is calculated and the absolute value of residual $|e_i| = |y_i - \hat{y}_i|$ is noted. Detect the outliers using two standard deviation (2σ) methods: The mean and standard deviation of residuals: $\bar{e}_i$ and σ_{ei}, are calculated and the observations (y_i) is defined as outliers if $|e_i| \geq \bar{e}_i + 2\sigma_{ei}$.

Futher the outlier observations are removed with 2 methods.

i) remove the outliers with the largest $|\varepsilon_i|$. Re-run the regression analysis and adjusted coefficient of determination is denoted by M_2 R^2_{adj} (Method 2);
ii) remove all the outliers at once so that there is no more outlier in the data sets. The regression analysis is re-run and adjusted coefficient of determination is denoted by M_3 R^2_{adj} = R^2_{adj} with no outliers (Method 3).

Finally, the value of, R^2_{adj} as the result of regression parameter estimation using OLS on complete dataset (M_1 R^2_{adj}), the data without the largest outlier (M_2 R^2_{adj}) and without outlier (M_3 R^2_{adj}) are tested using Friedman test. Testing the following hypothesis using Friedman as follow":

$$H_0: \mu_{M1} R^2_{adj} = \mu_{M2} R^2_{adj} = \mu_{M3} R^2_{adj}$$

H_1: at least one pair of means are significantly different

This test is done to determine whether removing outliers using two methods will give significant different effect to the magnitute of R^2_{adj} and in turn to determine whether outliers need to be removed from the regression analysis from the dataset. All the statistical analysis has been done using statistical packages of *Genstat 17.*

3. Result and discussion

The example of statistical analysis is presented using the data set (48 number of observation) of Fahmi (2011), one of student of Faculty of Economics and Business, Brawijaya University, entitled: The Analysis of Variables which Affect the Payment of Dividend at a Consumer Good Company. The variables observed are cash (X_1), profitability (X_2), firm size (X_3), leverage (X_4), dividend (Y). The regression analysis result of full data is presented in Table 1.

The data stastifies all assumptions underline the regression analysis required by OLS. y fitted value and residuals (e_i) are obtained, and put into the absolute value $|\mathbf{e_i}|$.

Method 1 (M_1). Regression Analysis for Full Data Set (with outliers)

The regression analysis result is shown in the second column of Table 2 (M_1). In the first method the R^2_{adj} is equal to 60.4%. The mean and standard deviation of absolute value all $|\bar{\mathbf{e}}_\mathbf{i}|$ = 0.68822, and sigma $\sigma_{\mathbf{ei}}$ = 0.178; $|\bar{\mathbf{e}}_\mathbf{i}| + 2\sigma_{\mathbf{ei}}$ = 2.124347. Observations with $|\mathbf{e_i}|$>=2.124347 is defined as outliers. There are 3 outliers, observation no.13 ($|\mathbf{e_i}|$ = 2.327), no.20 ($|\mathbf{e_i}|$ = 2.322) and no 38 ($|\mathbf{e_i}|$ = 3.938) (see table 1).

Method 2 (M2). Regression Analysis after Deleting Observations with the Largest $|\mathbf{e_i}|$.

From Table 1, it can be seen that there are 3 outliers; observation number 13, 20 and 38. In this case observation number 38 having the largest e_i is removed from the dataset. Further, the dataset without observation number 38 is re-analysed. The R^2_{adj} no is equal to 72.2% (see Table 2).

Method 3 (M3) Removing All Observation at Once.

In the third method, all outliers are removed. Further, the dataset without all outliers' observation (number 13, 20, 38) is re-analysed. The R^2_{adj} = 80.20% (Table 2). From the analysis, we can say that M_2 and M_3 increase R^2_{adj} by 11.80% and 19.80% accordingly compared to the analysis of full data with outliers (M_1).

Table 1. The Regression Analysis Result of Full Data (with Outliers)

No.	Y	X1	X2	X3	X4	e_i	$\hat{y}_i$	$\lvert e_i \rvert$
1	0.20	0.7	0.1	13.7	0.7	-0.73440	0.329	0.734
2	0.19	0.7	0.1	13.8	0.7	-0.83520	0.338	0.835
3	0.25	2.4	0.1	14	0.7	-0.54790	0.351	0.548
4	0.47	3.5	0.1	13.3	0.3	0.78561	0.327	0.786
5	0.27	3.5	0.1	13.5	0.3	-0.64850	0.389	0.648
6	0.44	3.1	0.2	13.5	0.3	-0.06340	0.452	0.063
7	0.41	4.6	0	17.2	2.6	-0.07260	0.422	0.073
8	0.40	4.1	0	17.5	3.1	-0.39600	0.466	0.396
9	0.39	2.2	0.1	17.5	2.5	-0.08730	0.405	0.087
10	0.22	0.9	0.1	17.5	0.7	-0.06370	0.231	0.064
11	0.20	1.6	0.1	14.9	1.3	-0.94050	0.371	0.941
12	0.10	0.9	0.1	15	1	-1.59350	0.391	1.593
13	1.01	0.5	0.1	13.3	2.1	2.32736	0.603	2.327
14	0.34	1.3	0.2	13.8	1.7	-1.99020	0.704	1.990
15	1.70	1	0.3	13.8	8.4	1.02830	1.616	1.028
16	0.33	0.3	0.1	17	0.7	0.62925	0.219	0.629
17	0.36	0.6	0.1	17	0.6	0.69849	0.236	0.698
18	0.36	0.4	0.1	17.1	0.5	0.34254	0.299	0.343
19	0.65	0.2	0.2	16.6	0.9	0.74027	0.517	0.740
20	0.12	0.1	0.2	16.6	1	-2.32250	0.538	2.322
21	0.66	0.1	0.3	16.7	0.7	0.47500	0.576	0.475
22	0.54	0.3	0.2	12.3	0.4	-0.17130	0.570	0.171
23	0.68	0.8	0.3	12.6	0.4	-0.10180	0.698	0.102
24	0.79	0.9	0.4	12.7	0.2	-0.15360	0.816	0.154

No.	Y	X1	X2	X3	X4	e_i	$\hat{y}_i$	$\|e_i\|$
25	0.50	3.3	0.1	13.2	0.2	0.91592	0.333	0.916
26	0.35	3	0.1	13.4	0.3	-0.07110	0.363	0.071
27	0.35	2.5	0.1	13.6	0.4	-0.19710	0.386	0.197
28	0.14	1.6	0.1	15.5	0.3	-1.14400	0.351	1.144
29	0.18	1.9	0.1	15.6	0.4	-0.78990	0.325	0.790
30	0.27	1.7	0.1	15.7	0.4	-0.44810	0.352	0.448
31	0.30	4.3	0	14.1	0.5	0.12558	0.277	0.126
32	0.25	4	0	14.2	0.5	-0.13110	0.274	0.131
33	0.22	2.6	0	14.3	0.6	-0.24660	0.265	0.247
34	0.50	1.1	0.3	12.7	0.2	-0.55150	0.600	0.551
35	0.52	1.4	0.3	12.8	0.2	-0.33200	0.580	0.332
36	0.82	0.5	0.3	13.0	0.2	0.67062	0.701	0.671
37	0.40	3.4	0.1	14.8	0.3	0.47738	0.313	0.477
38	1.05	3.1	0.1	14.9	0.3	3.93657	0.328	3.937
39	0.44	3.3	0.1	15.0	0.3	0.59161	0.332	0.592
40	0.46	0.9	0.2	13.5	0.1	0.41953	0.384	0.420
41	0.53	0.9	0.1	13.7	0.1	0.98675	0.351	0.987
42	0.52	1.2	0.1	13.8	0.1	0.91704	0.352	0.917
43	0.20	7.9	0	12.7	0.1	-0.65550	0.300	0.655
44	0.25	4.4	0.1	12.8	0.2	-0.29740	0.303	0.297
45	0.20	4.1	0.1	12.8	0.2	-0.54860	0.299	0.549
46	0.83	0.2	0.4	15.5	1	0.37957	0.764	0.380
47	0.83	0.3	0.4	15.7	1.1	0.32913	0.773	0.329
48	0.80	0.3	0.4	15.8	1	-0.12270	0.821	0.123

Table 2. Regression Coefficient for the Regression Analysis using M_1, M_2 and M_3

Coefficient	M_1	M_2	M_3
b_0	0.491	0.586	0.245
$0b_1$	0.0081	-0.0020	0.0099
b_2	1.526	1.472	1.717
b_3	-0.0262	1.472	-0.0122
b_4	0.1137	0.1202	0.1064
N	48	47	45
R_{adj}^2	60.40%	72.20%	80.20%

Note: M_1: regression analysis with outliers; M_2: regression analysis without the largest outlier; M_3: regression analysis after deleting all outliers at once

Once again, as presented in Table 2, it can be seen that R^2_{adj} increases after deleting outlier. The magnitude and the sign of regression coefficient are also different in three methods. The R^2_{adj} increases 11.8% by removing the largest outlier (M_2) and increase 19.8% by removing all outliers at once (M_3). As pointed out by Strickland (2014), Least Square estimates for regression model are highly sensitive to outlier. This is similar to the statement of Williams (2016), that including outliers in the analysis will change the regression coefficients.

Next, similar steps of analysis are conducted to the whole 25 sets of data. The number of observation on 25 data sets varied from 16 up to 72 observations and the number of predictor variable is from 2 up to 6 variables. The R^2_{adj} calculated from all data sets using the 3 methods are presented in Table 3. It shows that the mean of R^2_{adj} using the first method (M_1) is 74.39%, while M_2 R^2_{adj} = 80.72% and M_3 R^2_{adj} = 82.17%. Therefore,

removing largest outlier (M_2) increases the R^2_{adj} by 6.33% and removing all outliers at once (M_3) increases the R^2_{adj} by 7.78%. The more outliers deleted from the data, the higher the R^2_{adj}. It is also stated in Drapper and Smith (1981) that removal of outliers is increasing the precision. The nonparametric Friedman test to the 25 sets of data also shows that there are significant increase in R^2_{adj} as the result of removing outlier using 2 methods (p-value < 0.001). It also shows that deleting outlier at once gives the highest increase of R^2_{adj} .

All result is relevant to Stevens (1984) who explained that deleting outlier can emphazise the impact of few points on the analysis. Stevens stated that the more outliers in the data are deleted, the more fitted result would be. If only one outlier is deleted, the regression line will change considerably little. However, if some or all outliers are deleted, the fitted regression line will be quite different and show significant increase of R^2_{adj}. Similarly, Hordo *et al.* (2000) and Pearson (2002) also stated that deleting outliers will increase R^2_{adj}.

Table 3. The result of regression parameter estimation on complete and incomplete data

No.	Data Sources	Variables	Complete Data	Incomplete Data	
				Reduce the largest outliers	Reduce all outliers
			M_1 R^2_{adj}	M_2 R^2_{adj}	M_3 R^2_{adj}
1	Annisa, F.P,	5	84.10%	90.00%	90.00%
2	Ardianti, D.	4	93.50%	94.40%	94.40%
3	Arinayu, F. D.	3	77.50%	85.60%	98.70%
4	Arokhma, R. Y.	6	99.75%	99.80%	99.90%
5	Cahyono, F. B.	4	57.30%	63.50%	63.50%
6	Christinawati, E. L.	4	80.70%	88.90%	88.90%
7	Dewi, M. K.	2	95.70%	97.30%	97.30%
8	Dewi, R. F.	4	64.10%	71.50%	72.90%
9	Fahmi, A. R.	4	60.40%	72.20%	80.20%
10	Hadi, J	3	57.10%	63.00%	66.50%
11	Lusanti, U	5	31.90%	47.60%	47.60%
12	Megayanti, A. N.	4	93.00%	95.60%	95.60%
13	Muchtar, H.	5	74.10%	95.60%	95.60%
14	Mutiara, I. Z.	4	58.30%	68.60%	73.00%
15	Muttaqien, Z.	4	82.00%	90.70%	90.70%
16	Novitaningsih, A.	4	64.10%	66.80%	69.80%
17	Nugraheni, S.	6	95.10%	97.80%	97.80%
18	Nurcahya, H.	3	85.20%	87.10%	87.10%
19	Prasetyo, E.	3	57.80%	61.40%	63.80%
20	Pratiwi, A. D.	4	86.10%	88.60%	88.60%
21	Purwanti, P.	3	85.20%	87.10%	87.10%
22	Setio, A. W.	4	63.40%	78.80%	78.40%
23	Tomasowa, O. L. E	3	71.70%	74.70%	74.70%
24	Utami, Z. D.	3	48.50%	56.70%	56.70%
25	Wiyono, H. S.	4	93.10%	94.70%	95.40%
Mean			74.39%	80.72%	82.17%

Conclusion

The objective of the study is to examine the effect of deleting outliers on the accuracy and suitability of regression measured by the change in adjusted coefficient of determination. Based on the findings using 25 datasets of final project of undergraduate students of Brawijaya University, it can be concluded that the presence of outlier can affect the results of regression analysis, both in magnitude and sign of regression coefficient and on the adjusted coefficient determination (R^2_{adj})as one of the criteria for the accuracy of the model. The results of the analysis show that (1) deleting observation with the largest outlier from the data sets increase an average of R^2_{adj} by 6.33% and (2) deleting all outliers at once from the data sets increase an average of R^2_{adj} by 7.78%. The

hypothesis testing (Friedman test) also shows a significant increase in R^2_{adj} ($p<0.001$) after deleting of the outliers.

The findings imply that the identification should be carried out against the presence of outlier because OLS is a sensitive estimation methods to the presence of outlier. The study suggests that outliers should be removed from the regression analysus. In removing outliers, careful consideration need to be take, so that the important information of the data suspected as outliers is not lost, and it is also up to the researchers which of deleting outliers method to be used.

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Competitiveness, Sustainable Development and Import Substitution Problems in the Russian Federation

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Abstract

The article deals with the critical analysis of the scholars' works in the field of import substitution, substantiating the necessity of its orientation towards the international market. The export and import commodity structure of the Russian Federation which characterizes the increasing dependence of the country on mineral resources sales and technological equipment import is studied. The authors analyze and make adequate conclusions about the correlation between financial resources obtained through the windfall from sales of oil as the main export product of the Russian economy and the development of its own innovative import-substituting production. The principal scheme of innovative import substitution process has been developed by the researchers, its stages have been analyzed and the most problematic areas in its implementation have been singled out. Based on the analysis of empirical data obtained by the survey of target groups, the identification of factors has been provided and their significance in the import substitution potential of the region has been determined; the algorithm for the region import substitution capacity assessment has been developed

Keywords: import; export; import substitution; of import substitution potential; innovative import substitution

JEL Classification: R11; O43; O3

Introduction

Broad-ranging discussion on the strategic approaches to the formation of Russia's import substitution policy that unfolded in the contemporary scholarly literature proves the high relevance of this area of research both for Russia and for all the countries interested in the processes related to the issues of import substitution. Over the past 25 years Russia was a passive participant involved in the international division of labor and specialized in the supply of resources, especially hydrocarbons, to the external market. Own industrial production was maintained to a greater extent in those sectors that had been formed and operated since the Soviet period. Imported equipment is used to manufacture innovative products in the enterprises which were created in recent years. These circumstances contributed to the acceleration of technological backwardness of Russia from the developed countries of the West and the United States.

In this regard, further studies in the field of import substitution make it necessary to deepen them in order to identify possible prospects for the development of the Russian economy.

1. Literature review

In accordance with the geopolitical environment that has changed since 2014 and subsequent economic sanctions with simultaneous significant reduction in the oil price, Russia's economic policy needed substantial adjustment. In the context of orientation towards the natural resources sector and with regard to the current situation in the global hydrocarbon markets it is impossible to balance the Russian budget, taking into account its significant spending for defense, law enforcement and social services. In this connection, the development of the national economy based on the industrial sector with more advanced processing becomes the priority of the Russian Federation government. In this case the question is about import substitution of those goods, works and services which can be created within the country's territory with all other conditions being equal and which can be competitive in the global market. Therefore, the Russian government identified 18 priority sectors for import substitution such as: food industry, heavy engineering, oil and gas engineering, tool industry, electronic industry, healthcare industry, etc. When selecting a priority for import substitution the focus was made on the sectors which have strategic importance for economy and safety of the country and significant scientific and technological capacity. Within this framework the federal law "On the Industrial Policy in the Russian Federation" was passed at the end of 2014; it determined stimulating the stakeholders in the industry to ensure the implementation of import-substituting technologies as one of the key tasks of Russia's industrial policy.

It should be clarified that a modern approach to understanding the essential content of import substitution is already based not on the policy of reducing imports and meeting the internal demand by expanding domestic production capacity but rather on the trends to develop foreign economic activity toward increase in the positive balance of foreign trade turnover by reducing imports and increasing exports provided that the country's internal demand is satisfied in full through the manufacture of products, similar to or exceeding the substituted imports in terms of quality or performance characteristics.

The issue of the methodological problems of import substitution and evaluation of its impact on the sustainable development of the economy for the long period has not been fully worked out up to the present moment. Countries with developing economy were primarily dealing with the problems of import substitution. Representatives of the mercantilist school made recurrent attempts to justify theoretically creation of own production and to organize trade in manufactured goods instead of purchasing them abroad. Their ideas were developed by the representatives of the classical school of political economy Smith (first pub. date 1776) and Ricardo (first pub. date 1817).

Subsequently these ideas were integrated into the already formed knowledge and models in the field of import substitution. Experience of Storper (1991) is interesting in this regard. In this book he analyzes the effect of polarization on the results and the development processes as a whole. The author advances a theoretical framework for explaining the relationship between the spatial polarization of industrial activity and the processes of industrialization and national economic development in semi-industrialized countries, using Brazil as the principal illustration. His book treats the main forms of industrial-regional policy that have been used in Latin America in the 1980-1990s – especially those of import substitution.

The problems of the trade policy orientation toward external or internal markets were described by Balasubramanyam (1996), Salisu (1996) and Sapsford (1996). In their writings they empirically tested the hypothesis of Jagdish Bhagwati, according to which the beneficial effect of the direct foreign investments, in terms of enhanced economic growth, is stronger in those countries which pursue an outwardly oriented trade policy than it is in those countries adopting an inwardly oriented policy. This fact proves that the closed economy focused only on domestic consumption loses its competitiveness in the long term.

There are interesting researches of Krugman (1996) and Livas Elizondo (1996) about the impact of import substitution policy on the growth of giant metropolises in developing countries. The case study of Mexico was used to prove that the existence of huge megacities in developing countries is an unintentional byproduct of import substitution over there.

Altenburg and Meyer-Stamer (1999) explore the role of clusters and cluster policy in Latin America. In this article they write that the era of import substitution is a stage preceding the era of open economy. Therefore, it

can be concluded that the future globalization and liberalization will push the countries to abandon the import substitution policy.

Hertel, Hummels, Ivanic and Keeney (2007) developed an econometric model that focuses on estimation of a particular parameter, the elasticity of substitution among imports from different countries.

It is of great interest to study the views of Rodríguez-Clare (2007) that different policy implications emerge under a more realistic modeling of clusters. In particular, rather than distorting prices to promote clusters in 'advanced sectors' that may exhibit strong clustering possibilities, countries should focus instead on promoting clustering in current sectors, which have revealed to have the strongest comparative advantage. The author concludes that import substitution is not a proper way to achieve this.

The standpoint of Rodríguez-Clare is opposed to that of Adewale (2012). Using data generated from the World Development Indicators (WDI), an organ of the World Bank, in regression analyses the author argues that the macroeconomic policy of import-substitution industrialization contributed to the current economic developments in Brazil and South Africa. An import-substitution industrialization policy is not only appropriate to galvanize industrialization in less industrialized economies, but also augments a sustainable economic growth.

Substantial contribution to the development of import substitution ideas was made by such scientists as Cline (1982), Robinson and Nishimizu (1984), Chen and Tang (1987), Kohli (1989), Dollar and Sokoloff (1990), Shiells and Reinert (1993), Kumar and Saqib (1996), Bruton (1998), Omamo (1998), Puga and Venables (1999), Rabellotti (1999), Anderson and Neary (2003), Grilli (2005), De Lombaerde (2006), Ma and coauthors (2008), Jakobson and Sanovich (2010), Yilmazkuday (2011), Belini (2012), Tussie (2012), Gareev (2013), Wolfe (2013), Spiegelaar and Tsuji (2013), Spiegelaar and coauthors (2013), Der Heiden (2013), Yaméogo, Nabassaga and Ncube (2014), Debowicz and Segal (2014), Lim *et al.* (2015).

Accumulated international experience was the basis of modern theoretical developments of Russian scientists on issues of import substitution. The works by Frolova (2012), Grechenyuk (2015), Yuryev and coauthors (2015), Yakovlev (2015) and other scholars can be distinguished among similar studies. The need for extensive use of innovative technologies and increase in the share of innovative products in the total production of the country's industry is a key condition for the implementation of the national approach to the import substitution policy substantiated by these researchers.

The discussion of import substitution issues has begun in Russian scholarly literature since the end of the 1990s. Various models and options of import substitution oriented to application of the innovative technologies were proposed then and are offered today by the Russian scholars.

In this regard, an innovative mechanism of import substitution that is based on continuous monitoring of the level of import dependence of certain economic activities within the boundaries of the export policy of the country or a particular region generates interests (Makarov 2011). The algorithmic scheme of this mechanism developed by Makarov enables to achieve 'double' import substitution, in his opinion. On the one hand, reduction in the industry's dependence on imports is achieved by expanding own production of goods that are similar to the imported ones, and on the other hand, there is an increase in their competitiveness through the use of the new knowledge about the possibilities of changing product properties during production. 'Double' import substitution is reflected rather in the replacement of manufacturing technologies than of the imported goods alone. At the same time when constructing the model of this mechanism, the author does not consider that the application of new knowledge promotes achievement of the properties of products similar to the imported ones and emergence of new properties, which leads to their superiority over imported goods, and even the emergence of entirely new products, able to anticipate and then to create a new demand in consumers, including in the foreign markets. It is strategically important as a long-term focus of import substitution activities consists in stimulating the application of innovative technologies in the production of traditional and innovative export-oriented products in the future periods.

According to the opinion expressed by Smirnov (2015), import substitution is regarded as an ontological model of actions aimed at improving the efficiency of production and distribution of goods. In this definition, the author states that import substitution should focus not only on the expansion of domestic product manufacturing, but also on stimulating its consumption. Accordingly, the import substitution potential is a country's ability to

produce and purposefully consume the import-substituting products.

Proceeding from this, the country's import capacity building assumes not only to expand production capacity of domestic enterprises manufacturing ready-to-use innovative products, but also to intensify the activities for substitution of imported materials and purchased products with domestic ones. At the present stage of Russian industry development import substitution becomes one of the important strategic directions.

Berezinskaya and Vedev (2015) argue that in the current conditions Russian industry needs further localization of production facilities, transition from the import of finished products to the import of component part to manufacture these products in Russia, and later to the imports of parts for Russian manufacture of these components, etc. This is a strategic import substitution, in other words the process of successive replacement of imported raw materials, purchased products to the lower production levels.

It is necessary to find new approaches to the implementation of import substitution policy and, according to Neyolov (2014), the focus should be placed on the internal sources of improvements in technology based on the achievements of the best domestic enterprises and individual regions. Therefore, as Suhanova and Lyavina (2014) state, the discussion of the raised problems is relevant not only for the level of the entire national economy but also for the economy of a particular region.

Kamyshachenko and Dorohova (2014) consider that currently Russia's regions are quite self-sufficient for the effective establishment of foreign economic relations and they are real economic subjects, actively influencing the formation of foreign economic policy of the country in general with regard to its interests.

Among the considered viewpoints of scholars on the issues of import substitution their common aspect can be singled out: the sale of goods or services created (produced) as a result of import substitution should not be confined to the scope of the domestic market. Exclusive orientation towards domestic consumers in the long term leads to a significant loss of competitive advantages of goods, producers, regions and the country as a whole and, consequently, the loss of their competitiveness. The tasks in the field of import substitution should come down not only to meeting domestic demand but, what is more, to increasing the of sales in the foreign markets. The goods possessing a significant export potential will be competitive in the domestic market as well.

2. Methodology

Import substitution problem is multifaceted. On the one hand, with the help of import substitution is possible: to increase production capacity utilization and the number of employees; to increase total revenue and, therefore, the total costs, which will exert an impact on the economy as a multiplier; to develop institutions concerned with research and development, etc. On the other hand, the development of import substitution in those industries, which are beyond the specialization of the region or the country, will contribute to further lag behind the developed countries in the long term, since financial resources that could be allocated to the development of industries of the region's specialization in the global economic system will be used to develop the areas of a 'catch-up' character, which is totally irrational in the current economic conditions.

Specific features of Russian industry specialization in the world economy can be identified based on the analysis of the export commodity structure. It shows a significant increase in the share of exports of mineral products in the total exports of the country in the last 20 years (Table 1).

Table 1. Export commodity structure in Russia, in %

Commodity items	Years			
	1995	2000	2014	2016
Mineral products, including hydrocarbons	42.5	53.8	70.5	58.4
Metals, precious stones and articles made therefrom	26.7	21.7	10.6	9.8
Chemical industry products	10.0	7.2	5.9	8.3
Timber and products of pulp and paper industry	5.6	4.3	2.3	4.1
Machinery, equipment and vehicles	10.2	8.8	5.3	7.0
Food products and agricultural raw materials	1.8	1.6	3.8	6.3
Other commodities	3.2	2.6	1.6	6.1

Source: Federal State Statistics Service of the Russian Federation.

Character of changes in the export commodity structure of Russia in 1995-2016 confirms the idea that during this period the Russian economy became much more dependent on the export of raw materials, mainly of hydrocarbons. At the same time extremely negative dynamics should be stated for chemical products and machines, equipment and vehicles, exports of which reduced almost by 50%. Within the last 20 years the positive moments in the export structure are the increase in the share of food products and agricultural raw materials from 1.8% to 6.3%, and the reduction in the share of exports of metals, precious stones and articles made therefrom from 26.7% to 9.8%.

The export commodity structure shows that Russia is a raw-material-exporting country with the further trend in heavier reliance on the raw material component. To determine the level of specialization of the RF subjects, the formula can be used that determines the index of the comparative advantages offered by Balassa (1961).

$$RCA_{ij} = \frac{x_{ij}}{X_i} \div \frac{x_{aj}}{X_a}, \quad (1)$$

where RCA_{ij} is revealed comparative advantage; x_{ij} – export of product *j* from country *i*; X_i – total exports from country *i*; x_{aj} –total export of product *j* from region *a*; X_a – total exports from region *a*.

It is quite possible to use this formula for evaluation of the country's product specialization, replacing the country's values with those of more enlarged area, and the region's values – with those of the country. Substituting the above values of the indicators in formula 1 and having a share of mineral products (including hydrocarbons) at the level of 70.5% of total exports, while in the CIS countries this indicator amounts to 48.5%, the validity of the thesis of extreme commodity dependence of the Russian economy even in comparison with the CIS countries is proved again.

The study of the import commodity structure of the Russian Federation demonstrates similar dynamics typical for raw-material-producing country (Table 2). The data given in Table 2 demonstrate an evident tendency for a significant increase in the share of imports of one of the main commodity items – machinery, equipment and vehicles – from 31.4% in 2000 to 52.7% in 2008 and 47.6% in 2014. The subsequent decrease in the dependence on imports of machinery, equipment and vehicles is explained rather by the result of the introduced economic sanctions and aggravation of the crisis in the Russian economy than by the improved situation in the real sector of the economy.

Table 2. Import commodity structure in the Russian Federation, in %

Commodity items	Years			
	2000	2008	2014	2016
Machinery, equipment and vehicles	31.4	52.7	47.6	22.8
Food products and agricultural raw materials	21.8	13.2	13.9	23.2
Chemical industry products, rubber	18.0	13.2	16.2	14.5
Metals, precious stones and articles made therefrom	8.0	7.3	7.1	13.8
Mineral products	6.3	3.1	2.5	10.2
Textiles, textile products, footwear	5.9	4.3	5.7	7.9
Other	8.6	6.2	7.0	7.6

Source: Federal State Statistics Service of the Russian Federation.

Using the import intensity formula proposed by Schiff and Winters (2003), it is possible to determine the country's import dependence:

$$T_{ij}^{m} = \frac{m_{ij}}{M_{it}} \div \frac{m_{wj}}{M_{wt}}, \quad (2)$$

where T_{ij}^{m} is an import intensity index of country *i* from country *j*; m_{ij} – imports of country *i* from country *j*; M_{it} – the total imports of country *i*; m_{wj} – import of all countries from country *j*; M_{wt} – the world imports.

It should be noted that while determining the import substitution priorities in the country, it is necessary to study stable relations prevailing in foreign trade. There are different methods of evaluating and interpreting the dynamics of foreign trade relations in regional associations. Thus, Kojima (1964), and later Drysdale and Garnaut (1982) elaborated intensity index for bilateral trade flows. This index shows the degree of preference for a particular trading partner as compared to the average level of preference for other trading partners which is equal to 1. If the index is greater than 1, it means that the degree of preference for the selected partner is above average, and vice versa. The index exceeding 3 indicates a high intensity of bilateral trade flows. The intensity index is calculated by the formula 3.

$$I_{ij} = \frac{X_{ij}}{X_i} \div \frac{M_j}{M_w - M_i} = \frac{X_{ij} \times (M_w - M_i)}{X_i \times M_j}, \quad (3)$$

where: I_{ij} is the intensity index for bilateral trade flows of country *i* to country *j*; X_i – the total export of country *i*; X_{ij} – export of country *i* to country *j*; *Mj* – the total import of country *j*; M_i – the total import of country *i*; M_w – the total of the world import.

It is necessary to distinguish between the export earnings derived from the innovative products obtained through advanced processing and from export of pure raw materials. In the first case the funds received from the sale of goods will be invested in the development of R & D, innovation infrastructure, etc.; in the second case – they will be invested in development of new deposits, exploration, etc. in the best-case scenario, or they will be allocated to the payments for the current shareholders in the worst-case scenario, reducing the companies' competitiveness in the long term.

To understand the extent to which export of raw materials is linked to import s in Russia, let us analyze the indicators characterizing price dynamics of oil as the main raw material (the proceeds of its sale are the most significant source to replenish the budget of the Russian Federation) and the indicators characterizing the s of imported commodity purchase (Table 3).

Having constructed two-factor regression model with stepwise exception (to compare the data variables let us use their percentage changes to the base year of 1994) where oil cost per 1 barrel is an independent variable, and import to Russia is a dependent variable, we obtain the following data.

Regression results for the dependent variable: R = 0.98443510, R2 = 0.96911246, adjusted R^2 = 0.96756808; F (1.20) = 627.51; p <.00000, standard estimation error: 38.006.

Table 3. Total imports and oil costs in the Russian Federation (Brent crude oil) from 1994 to 2015

Years	Import, USD million	Changes, in % to 1994	Oil cost per 1 barrel (Brent crude oil), USD million	Changes, in % to 1994
1994	50,452	100.00	15.8	100.00
1995	62,603	124.08	17.1	108.23
1996	68,092	134.96	20.5	129.75
1997	71,983	142.68	19.1	120.89
1998	58,015	114.99	12.7	80.38
1999	39,537	78.37	17.7	112.03
2000	44,862	88.92	28.3	179.11
2001	53,764	106.56	24.4	154.43
2002	60,966	120.84	25.0	158.23
2003	76,070	150.78	28.9	182.91
2004	97,382	193.02	38.3	242.41
2005	123,839	245.46	54.4	344.30
2006	163,187	323.45	65.4	413.92
2007	223,084	442.17	72.7	460.13

Years	Import, USD million	Changes, in % to 1994	Oil cost per 1 barrel (Brent crude oil), USD million	Changes, in % to 1994
2008	288,673	572.17	97.7	618.35
2009	183,924	364.55	61.9	391.77
2010	245,680	486.96	79.6	503.80
2011	318,555	631.40	111.0	702.53
2012	335,771	665.53	121.4	768.35
2013	341,337	676.56	108.8	688.61
2014	270,055	535.27	98.9	625.95
2015	182,719	362.16	53.5	338.73
2016	156,763	310.72	45.9	290.51

Source: Ministry of Finance of the Russian Federation

The formula that describes the change in the value of imports depending on oil price changes for the Russian Federation with the standard estimation error equaling to 38.006 will take the following form:

$$\Delta Import = - 4.22465 + 0.90963 * \Delta Oil\ (brent)$$

This is a direct dependence, and it shows that the funds received from the oil windfall, are allocated to finance the imports. And since machinery, equipment and vehicles were dominating in the import commodity structure by the end of 2014; therefore, funds from the sale of Russian raw materials support the R & D and development of innovative production of the countries that are trade partners of Russia: Germany, Netherlands, Italy, *etc*.

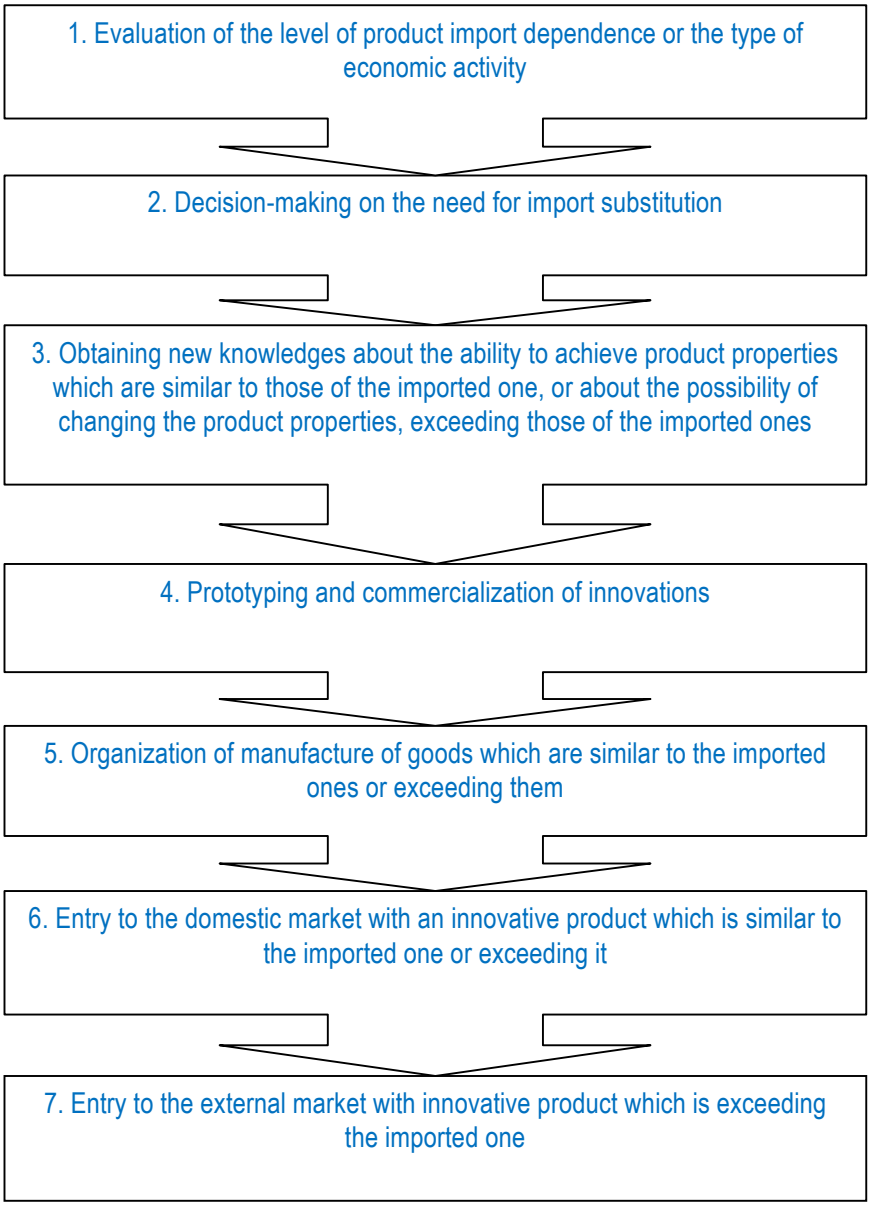
This analysis confirms the hypothesis which was put forward earlier that over the past 20 years the Russian Federation became a country with even more prevalent raw materials sector and more import-dependent on new technologies and equipment. In the immutability of economic policy, Russia risks to deepen its raw-material orientation. Based on the foregoing, the course for import substitution in strategically significant high-tech sectors is a priority one and possibly the only option for the development of the Russian economy according to the innovative type.

3. Discussion and results

The reasonable need to apply import substitution policy in the Russian economy requires forming complete concept of its implementation. Modern import substitution policy should undoubtedly be formed on the principles of innovative growth and development of subsequent export orientation of innovative products. It is likely that the schematic diagram of the innovative import substitution process can take the form shown in Figure 1.

At present the greatest problems during implementation of the provided process arise within the fourth stage when prototypes are created and innovations are commercialized. In our opinion, it is caused more by dissociation of innovative cycle, which results in violation of the necessary tightness of interrelations between the participants in innovative product development and commercialization processes. At the stage of product design and prototyping there is no interaction between design-engineering specialists and commercial structures which later should promote comprehensively design accomplishment, supervise financing and implementation of the project, bringing innovative goods to the foreign market. In the world practice such interaction is formed on the basis of application of the collaborative design method. Its use represents certain complexity for the Russian practice as traditional process of technical preparedness for manufacturing new products at Russian enterprises assumes consecutive and rather long accomplishment of each stage. On the one hand, this allows carrying out deep study of design and technological documentation, but, on the other hand, significantly extends the process in time, which contradicts the current trend of accelerating terms for commercialization of innovations.

Figure 1. The principal scheme of an innovative import substitution process



At the same time, in recent years' Russian enterprises make active attempts of reducing the innovative cycle by bringing together processes of product development and commercialization, applying international experience in this sphere. It creates the actual basis for implementation of the offered process of innovative import substitution at a high level.

To make a reasoned decision about the need for import substitution of specific product or type of activity is of special importance for achieving success of the considered process. For this purpose, it is required to carry out comprehensive assessment of the available import substitution potential of the country and the regions in the current period and for the long run. Effective use of economic potential of the subjects of the Russian Federation becomes one of the compulsory conditions for the country's development in the foreign markets by means of the implementation of the import substitution strategy based on the innovative approach. In our opinion, assessment

of import substitution potential that is available at any specific region should consider the current status and determined by the regional industrial policy promising directions for the industrial sphere improvement which is based on the existing technological and intellectual components of the region.

Analysis of special literature and scientific journalistic sources has shown that currently there is no commonly accepted and exact determination of the components or factors of import substitution potential, including the regional one. To identify the factors and extent of their influence on the formation of the regional import substitution potential the authors have conducted their own research. It is based on the results of the questionnaire in the following target groups:

- heads and specialists of large enterprises (10 organizations, 15 respondents);
- representatives of state bodies (15 respondents);
- representatives of small and medium business (10 organizations, 15 respondents);
- faculty members and students (3 universities: 15 teachers, 15 students).

The respondents had to choose from the offered versions of answers, to determine the importance and significance of the factors. In addition, they were given an opportunity to formulate and justify the importance of factors which were absent in the offered options. As a result of processing this array of information, indicators (factors) with significance level allowing mathematical determination of import substitution potential of the region have been obtained (table 4).

Table 4. Factors and their significance in the import substitution potential of a region

No.	Parameter which determines the regional import substitution potential	Significance
1	Potential possibilities of increasing share of internal and external markets for regional products	0.15
2	Status, level of development and professional composition of labor resources in the region	0.14
3	State and reserves of production capacities of industrial enterprises in the region	0.13
4	The level and range of carrying out R&D in the region	0.10
5	The degree of dependence on imports of certain types of products and activities in the region	0.09
6	The degree of institutional support for the implementation of the region's industrial policy	0.08
7	Industry and product-technological specialization of region in the country's social division of labor	0.07
8	Perspective areas of technological and innovative development of the region's industry	0.07
9	Priority areas of industrial policy and socioeconomic development of region in short and long term	0.05
10	Relationship between import and export orientation of the region and the general situation of the country in this direction	0.02
11	Other lines of activities	0.11

Based on these data the following algorithm can be proposed to assess regional import substitution potential (Figure 2).

Each element of the algorithm for assessment of regional import substitution potential is a complicated line of activity that requires special studying and developing clear guidelines for implementation. The algorithm implementation should be based on a comprehensive methodology which considers all the possible interrelations between the selected elements, eliminating duplication in the performance of multidirectional works, and ensuring the integrity of a single methodological basis for the algorithm application.

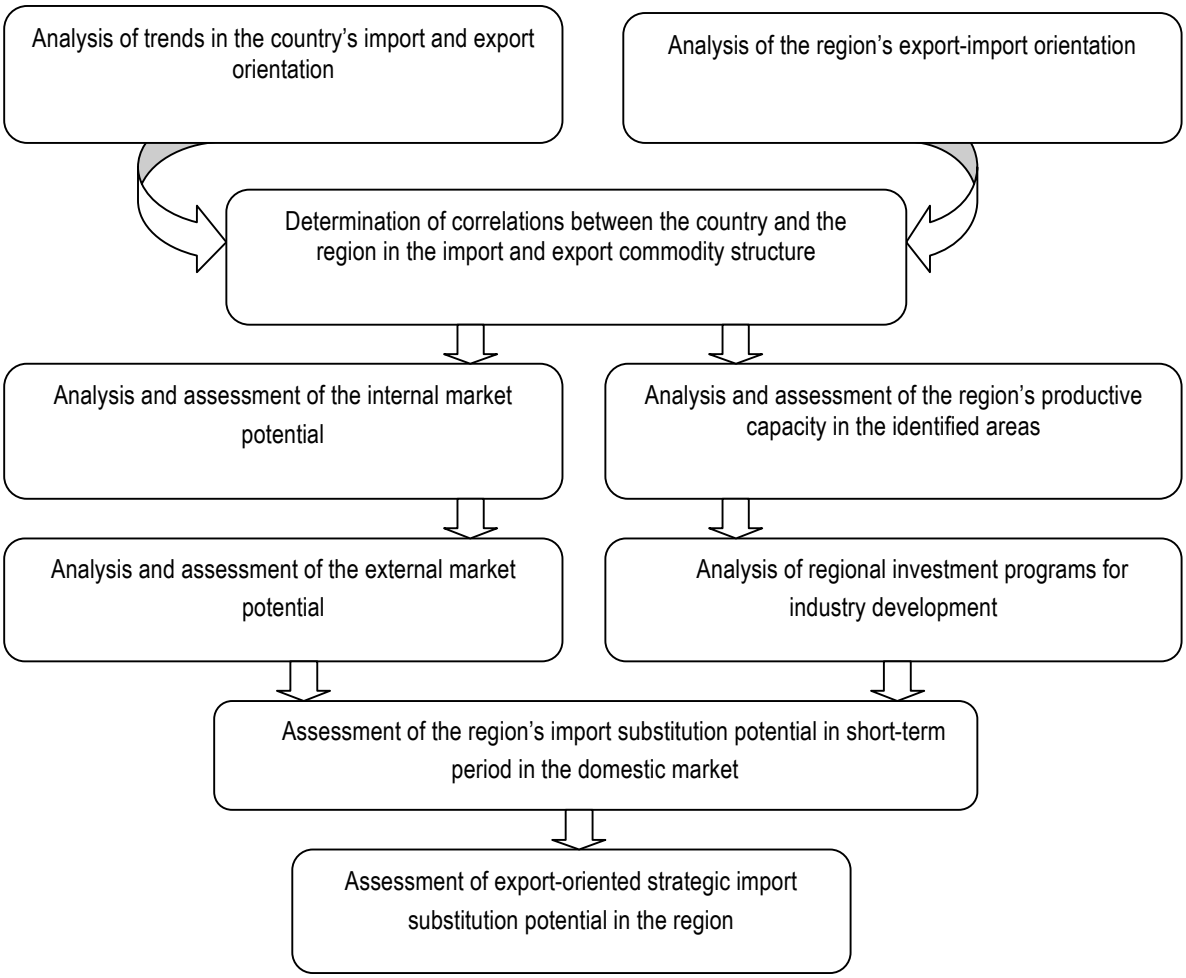
Assessment of the region's import substitution potential obtained by using the proposed algorithm will enable to provide a high level of reliability of the information on the potential of the regional industry, to implement the principles of the state policy of import substitution in the short and long term, taking into account additional possibilities of export growth in the region through the use of innovative technologies and increase in the share of innovative products in the overall of domestic product.

Conclusions

The results of conducted research led to the following conclusions:

1. Modern approach to understanding the intrinsic content of import substitution is based not on the policy of reducing imports and meeting the internal demand by expanding domestic production capacity but rather on the trends to develop foreign economic activity toward increase in the positive balance of foreign trade turnover by reducing imports and increasing exports provided that the country's internal demand is satisfied in full through the manufacture of products, similar to or exceeding the substituted imports in terms of quality or performance characteristics. Exclusive orientation toward internal consumers lead to a significant loss of competitive advantage in the long term and, consequently, to the decrease in the level of competitiveness.

Figure 2. Algorithm for assessment of import substitution potential of the region



2. The analysis of the Russian export commodity structure showed a significant increase in the share of mineral products (up to 70.5% of total exports) in the last 20 years. In general, export structure shows that the Russian Federation is exclusively a raw-material-exporting country with the further trend in heavier reliance on the raw material component.

3. The study of the import commodity structure in the Russian Federation shows the degradation of one of the most important areas of the developed economies – mechanical engineering. The share of machinery, equipment and motor vehicles in the structure of imports increased over the last 15 years from 31.4% in 2000 to 47.6% in 2014.

4. The funds received from the oil windfall were allocated rather to finance the science-based and technology-intensive imports than to develop own production in the field of innovative enterprises, R&D or other areas that economy is based on.

5. The authors have developed a principal diagram of innovative import substitution process, analyzed its stages and highlighted the most problematic areas in its implementation.

6. The researchers have identified the factors and determined their significance for the import substitution potential of the region based on the analysis of empirical data obtained through the questionnaire survey of the following target groups: managers and specialists of large enterprises, representatives of government agencies, small and medium-sized businesses, teachers and students.

7. The algorithm for assessing the region's import substitution potential have been developed, it makes possible to ensure a high level of reliability of the information about the potential of the regional industry, to implement the principles of the state policy of import substitution in the short and long term, taking into account additional possibilities of export growth in the region through the use of innovative technologies and increase in the share of innovative products in the overall of domestic product.

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The Impact of the 2008-2009 Global Crisis on Governance: A Comparison of High-Income and Low-Income Countries

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Abstract:

We examine the impact of the 2008-2009 Global Crisis on governance. We examine High-Income OECD, High-Income Non-OECD, Upper-middle Income, Lower-Middle Income, and Low Income Countries separately. As measures of governance, we use the World Bank's Worldwide Governance Indicators which includes six dimensions of governance which include "Voice and Accountability", "Political Stability and Absence of Violence", "Government Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption". We find that, from pre-crisis period to post-crisis period, the ranking of each income group does not change. Our results show that, both pre- and post-crisis, the High-Income OECD Countries have the best governance measures, the High-Income Non-OECD Countries have the second best measures, and so on, in the order shown above. Interestingly, the High-Income Non-OECD Countries performed better than the other groups after the crisis. After 2008, this group actually improved in four out of six categories. We conclude that although crises affect all income groups, the High-Income Non-OECD Countries have been more successful in alleviating the effects of crises on public governance. Most of these countries are more authoritarian and more resource-rich countries and we believe that these characteristics may explain their success in fending off the negative impacts of financial/economic crises.

Keywords governance; wgi; economic crisis; global crisis.

JEL Classification: E02; E32; E65; G01; H12

Introduction

In this study, we examine the impact of the recent Global Crisis on governance. We look into two issues: First, we look into how OECD membership affects the Global Crisis' impact on governance. Then, we look into how countries' income levels affect the crisis' impact on governance.

Previous studies like Haggard (1999), Jung (2010), and Levine (2012) examine the impact of a crisis like the 1997 Asian Crisis or the 2008-2009 Global Crisis on governance. However, they are narrower in scope because they focus on either a certain country or a group of countries. These studies also do not examine whether OECD membership or the income level of a country affects the performance of a country in the face of a crisis. Haggard (1999) examine the impact of the Asian Crisis and contends that the political regime type, the structure of business-government relations, and the design of government agencies are the main factors that determine how governance is affected by a crisis. Jung (2010), on the other hand, discusses the roles of path dependence, centralization or decentralization, politicization, coordination and coherence (or retention of power by individual ministries or agencies), and time perspective on the disruption of the stability of public administration due to crises. Levine (2012) sees the problem as a systemic failure of financial regulation, therefore he recommends the formation of a new independent institution with informed, expert staff.

In this study, we make three contributions: First, in contrast to the previous studies that focus on a particular region or on a group of countries, here, we examine the impact of the Global Crisis on all of the countries in the world (as much as our dataset allows). Second, we examine how OECD membership affects a crisis' impact on governance. Do Non-OECD countries like Saudi Arabia insulate themselves from such crises?

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Previous studies do not examine that. Third, we examine how a country's income level affects that country's performance in governance. Are richer countries better able to protect themselves from the effects of a crisis? Again, none of the previous studies deal with this issue in a methodological way.

We look into six measures of governance which are defined in the World Bank's Worldwide Governance Indicators dataset. These are "Voice and Accountability", Political Stability and Absence of Violence", "Government Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption". This dataset covers governance data for 215 countries. World Bank dataset classifies countries according to their OECD membership and also according to the country's income levels. In this study, we use their classification and focus on five groups of countries. These classifications are High-Income OECD, High-Income Non-OECD, Upper-middle Income, Lower-Middle Income, and Low Income Countries.

The paper proceeds as follows: Section 2 discusses the previous literature. Section 3 states our hypotheses. Section 4 explains our data. Section 5 shows the results. Finally, Section 6 concludes.

1. Literature review

In one of the earlier studies, Remmer (1990) examines the relation between democracy and economic crisis. According to Remmer (1990), if the magnitude of the debt burden at the outbreak of the crisis is controlled, there is no statistically significant difference between democratic and authoritarian regimes, or between new democracies and more established regimes in terms of the impact of the crisis.

Higgott (1998) examines the Asian crisis. Higgott (1998) argues that Japan had a significant role as a "long-term" and "ever-present" factor in the crisis. Higgott (1998) also explains the resistance of the Asian countries' economic development models to conform with the Western economic system.

Haggard (1999) also focuses on the East Asian financial crisis of 1997-98. Haggard (1999) examines the role of political regime type, the structure of business-government relations, and the design of government agencies, and contends that institutional weaknesses contributed to the onset of the Asian financial crisis.

Later, Li (2003) establishes a theory of relation-based governance to explain both the "East Asian miracle" and the Asian crisis. According to Li (2003), "economic development is fundamentally a process of establishing relation-based governance and subsequently making a transition to rule-based governance". Li (2003) contends that "there is little difference between East and West or between North and South other than they are at different stages of development".

Fleischer and Parrado (2010) examine the impact of the 2008-2009 crisis on executive decision-making in Spain and Germany. The authors argue that, during this period, while both countries experienced a centralization of executive decision making, this was less pronounced in Germany due to its institutional setting. Fleischer and Parrado (2010) explains that this was due to the Chancellor's authority being more limited compared to the Spanish Prime Minister's in cabinet.

Woods (2010) examines IMF's role after the crises and argues that the IMF's dependence on loans from its wealthiest members restrains it from serious reform. The author recommends IMF to get more resources, especially from emerging economies.

Jung (2010) argues that the global financial crisis that began in 2008 has had a significant impact on public administration in most countries in the world. According to Jung (2010), "Different countries, experiencing the current economic crisis in different ways, have chosen different options within these dichotomies, with varying levels of success".

Later, Peters, Pierre, and Randma-Liiv (2011) argue that countries like Germany or Sweden were at different starting points in their governance regimes when the crisis hits when compared to the US, therefore the policy and governance options available to them were very different. The authors also point out to the fact that there have been no common ideas globally about how best to govern.

Another study that examines the impact of this recent global crisis is Gieve and Provost (2012). The authors argue that policymakers' objective of keeping inflation low and stable while employing some regulation to financial markets caused a lack of coordination between monetary and regulatory policy in the subprime

mortgage market. Gieve and Provost (2012) recommend better coordination between monetary and regulatory policymakers in the future.

Levine (2012) argues that "there was a systemic failure of financial regulation and that senior policymakers repeatedly enacted and implemented policies that destabilized the global financial system". The author recommends a new independent institution with informed, expert staff which will evaluate financial regulation from the public's viewpoint.

Posner and Blöndal (2012) contends that "politics is far less predictable and decision making far more open than ever before. The magnitude of the fiscal challenges has heightened the importance of early action and foresight in fiscal policymaking". According to the author, "the best chance of effectively dealing with the fiscal forces building up is to make timely decisions that have the broad support of as many interests and actors as possible".

Kickert (2012) analyzes how the UK, Germany and the Netherlands responded to the crisis. According to the author, the crisis "resulted in the centralization of decision making in the hands of prime-minister and Finance ministers across the three nations, though the extent of prime-ministerial power differed between the countries. The subsequent stages of the crisis involved many more ministries, parliaments, politicians, parties, and social partners in deliberation and decision making". Kickert (2012) contends that economic recovery requires more politicized decision-making.

Desta (2012) examines African countries' development issues. The author argues that the development experts and policy makers suggest the application of East Asian developmental state model to African countries. The author asks why Africa is used as testing ground for a number of development models forged mainly to satisfy western donors.

Another study that examines an African country is Mgonja and Tundui (2012) study. Mgonja and Tundui (2012) examine Tanzanian government's ambitious and far-reaching reform programs to improve the socioeconomic condition of the country since 1990s. The authors contend that unless someone addresses "institutional shortfalls" within the greater system of governance, any policy or reform initiative aimed at improving good governance will ultimately fail to deliver.

Kahler (2013) argues that international cooperation was better after the 2008-2009 crisis compared to the two previous big crises (*i.e.* the Great Depression of 1929-33 and the global recession of 1981-82). According to Kahler (2013), this departure from previous responses to economic crisis are due to several different factors. The character of economic globalization was different this time (*i.e.* economic nationalism was less attractive this time due to global economic integration). Also this time, there were combined international constraints imposed by international economic cooperation. Another important factor this time was the major developing and transitional economies being more successful during the crisis. Kahler (2013) recommends that national policies should be scrutinized more closely in the future. He also recommends the international constraints to be stricter. He warns us about the role of key emerging economies, such as China, India, and Brazil on global governance.

2. Hypotheses

Some of the Non-OECD countries are more isolated, smaller countries (like Andorra, Aruba, and the Bahamas) that can better alleviate the effects of a crisis on public governance. Other Non-OECD countries are like Saudi Arabia and Bahrain which tend to be more authoritarian and more resource-rich countries. We expect these countries defend themselves more easily in the face of a crisis. Therefore, our first hypothesis is as follows:

Hypothesis 1: The impact of a financial crisis is less severe on Non-OECD countries' governance than on OCED countries' governance.

Our second hypothesis deals with the effects of a country's income level on the impact of a crisis. We expect that, due to their additional resources, higher income countries should better protect themselves from the effects of a crisis. Therefore, our second hypothesis is as follows:

Hypothesis 2: The impact of a financial crisis is much more severe on Poorer countries' governance than on Richer countries' governance.

In this study, we have High Income, Upper-Middle Income, Lower-Middle Income, and Low Income groups. We expect High Income countries to perform better than Upper-Middle Income countries, Upper-Middle Income countries to perform better than Lower-Middle Income countries, and Lower-Middle Income countries to perform better than Low Income Countries.

3. Data

In this study, in order to be able to examine the impact of the 2008-2009 Global Crisis on High-Income and Low-Income Countries' governance policies, we use World Bank's Worldwide Governance Indicators dataset. The dataset includes six measures of governance. These measures and their definitions (as given by World Bank) are shown below:

- *Voice and Accountability:* Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- Political Stability and Absence of Violence: Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
- Government Effectiveness: Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
- Regulatory Quality: Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
- Rule of Law: Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
- Control of Corruption: Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

For all six dimensions of governance, the estimate of governance (*i.e.* the score) ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. There are 215 countries in the dataset. The governance data are annual data and they are posted on the website www.govindicators.org. We examine the period from 2005 through 2011. Table 1 shows each group of countries' (based on World Bank's country income groups) governance scores from 2005 to 2011.

Table 1. Governance scores for income groups

	Year	H-OECD	H-NonOECD	Low	LowerMiddle	UpperMiddle
Voice and Acc.	2005	1.42	0.64	-0.96	-0.42	-0.02
	2006	1.33	0.66	-0.81	-0.27	0.11
	2007	1.30	0.75	-0.75	-0.30	0.09
	2008	1.32	0.73	-0.74	-0.34	0.09
	2009	1.29	0.69	-0.83	-0.32	0.06
	2010	1.26	0.69	-0.90	-0.36	0.05
	2011	1.23	0.66	-0.93	-0.35	0.03
Political Stab.	2005	0.89	0.85	-0.87	-0.60	0.06
	2006	0.95	0.85	-0.63	-0.57	0.05
	2007	0.93	0.80	-0.74	-0.47	0.15
	2008	0.94	0.76	-0.70	-0.58	0.06
	2009	0.89	0.73	-0.78	-0.52	0.11

	Year	H-OECD	H-NonOECD	Low	LowerMiddle	UpperMiddle
	2010	0.82	0.82	-0.77	-0.50	0.06
	2011	0.92	0.96	-0.79	-0.50	-0.04
Govt. Effective.	2005	1.64	0.75	-1.02	-0.67	-0.13
	2006	1.59	0.73	-1.11	-0.61	-0.18
	2007	1.59	0.66	-1.15	-0.68	-0.21
	2008	1.53	0.63	-1.08	-0.68	-0.22
	2009	1.44	0.84	-1.03	-0.69	-0.21
	2010	1.44	0.75	-1.07	-0.63	-0.16
	2011	1.41	0.80	-1.07	-0.64	-0.15
Reg. Quality	2005	1.44	0.93	-1.07	-0.57	-0.13
	2006	1.39	0.85	-0.92	-0.58	-0.15
	2007	1.45	0.80	-0.88	-0.49	-0.10
	2008	1.43	0.73	-0.84	-0.58	-0.14
	2009	1.41	0.70	-0.89	-0.59	-0.04
	2010	1.44	0.63	-0.86	-0.58	-0.04
	2011	1.40	0.63	-0.99	-0.61	-0.04
Rule of Law	2005	1.46	0.70	-1.02	-0.73	-0.27
	2006	1.50	0.73	-0.98	-0.70	-0.34
	2007	1.50	0.71	-1.02	-0.70	-0.39
	2008	1.55	0.76	-1.00	-0.65	-0.35
	2009	1.50	0.80	-1.00	-0.65	-0.27
	2010	1.57	0.79	-1.01	-0.70	-0.32
	2011	1.54	0.79	-0.99	-0.66	-0.26
Control of Cor.	2005	1.50	0.80	-0.87	-0.68	-0.32
	2006	1.44	0.80	-0.80	-0.68	-0.33
	2007	1.39	0.81	-0.79	-0.67	-0.35
	2008	1.40	0.84	-0.79	-0.63	-0.30
	2009	1.42	0.89	-0.84	-0.57	-0.32
	2010	1.50	0.85	-0.76	-0.66	-0.34
	2011	1.51	0.87	-0.77	-0.62	-0.31

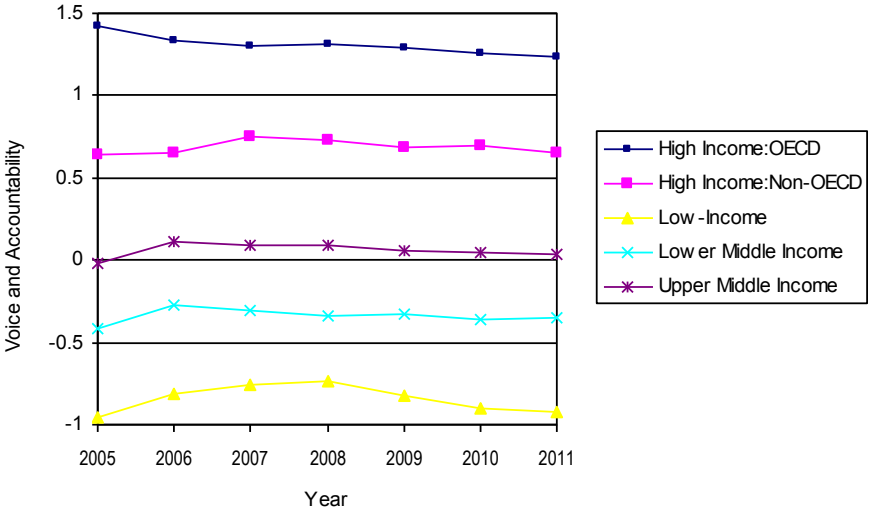
Note: H-OECD: High-Income OECD Countries; H-NonOECD: High-Income Non-OECD Countries; Low: Low Income Countries; LowerMiddle: Lower-Middle Income Countries; UpperMiddle: Upper-Middle Income Countries

Source: World Bank WGI Dataset

4. Results

Figures 1 through Figure 6 present the group governance data shown in Table 1 graphically. Figure 1 shows that, for "Voice and accountability", from 2005 to 2011, the rankings did not change. The High-Income OECD Countries has the highest ranking in "Voice and accountability". The High-Income Non-OECD, the Upper-Middle Income, the Lower-Middle income, and the Low Income Countries follow them in that order in 2005 and also in 2011.

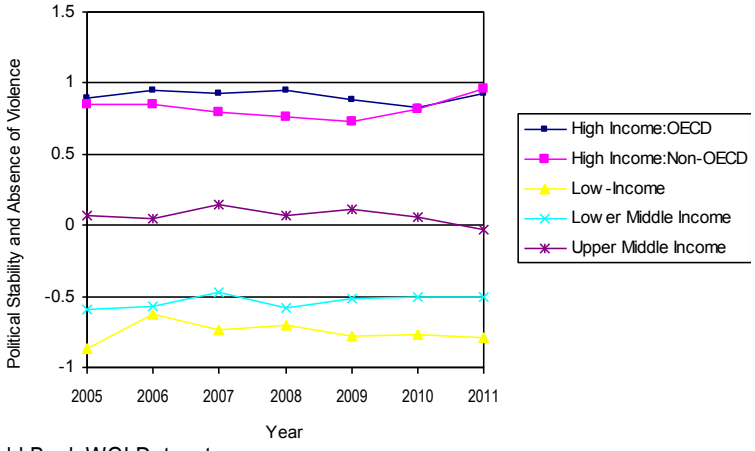
Figure 1. Voice and Accountability



Source: World Bank WGI Dataset

Figure 2 shows that, over the same time period, the High-Income Non-OECD Countries surpassed the High-Income OECD Countries in terms of "Political stability and absence of violence". The rankings of the other groups did not change.

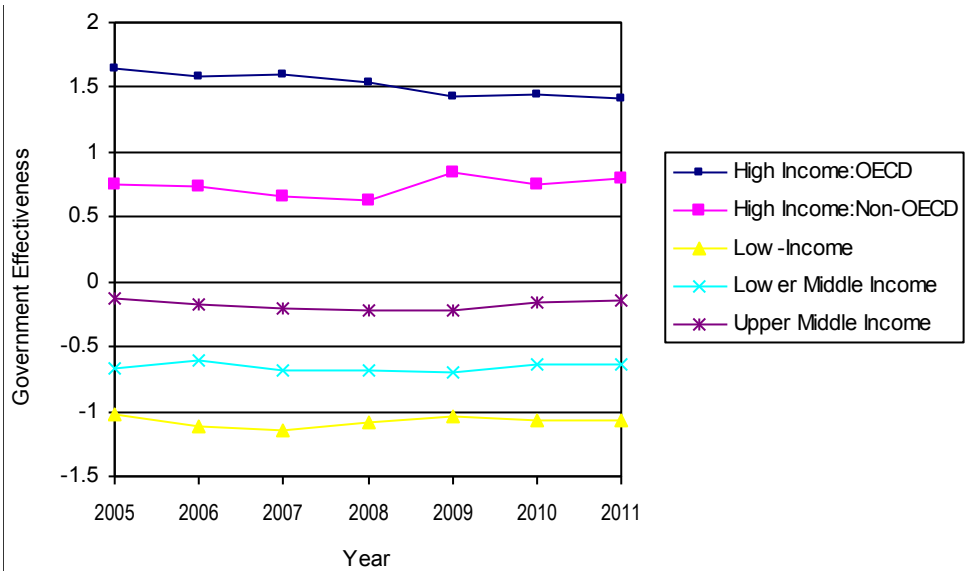
Figure 2. Political stability and absence of violence



Source: World Bank WGI Dataset

Figure 3 shows that, for "Government effectiveness", from 2005 to 2011, the rankings did not change. The High-Income OECD Countries has the highest ranking. The High-Income Non-OECD, the Upper-Middle Income, the Lower-Middle income, and the Low Income Countries follow them in that order in 2005 and also in 2011. We notice a decline in High-Income OECD Countries.

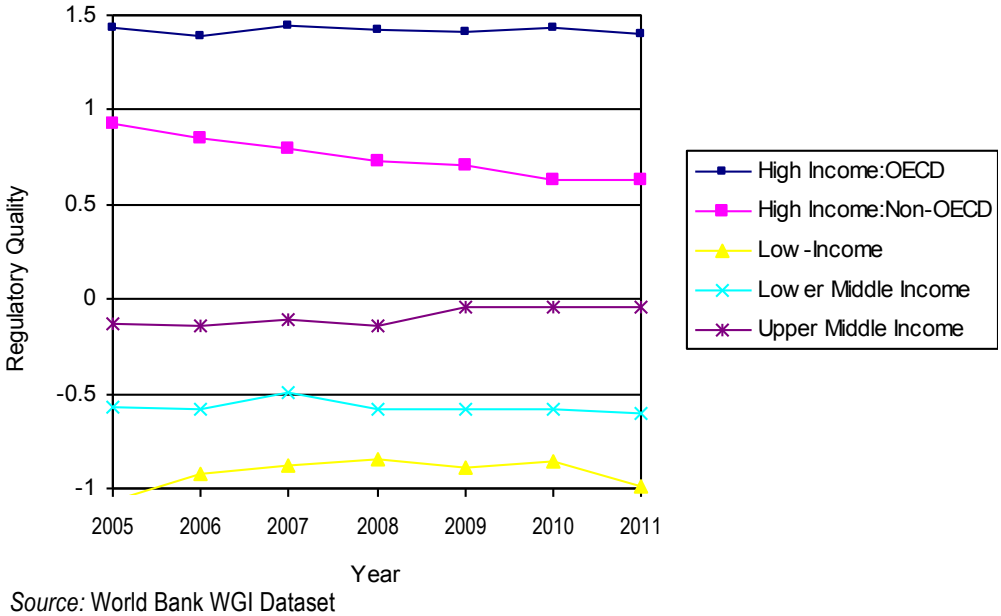
Figure 3. Government effectiveness



Source: World Bank WGI Dataset

Figure 4 shows that, for "Regulatory quality", from 2005 to 2011, the rankings did not change. The High-Income OECD Countries has the highest ranking. The High-Income Non-OECD, the Upper-Middle Income, the Lower-Middle income, and the Low Income Countries follow them in that order in 2005 and also in 2011. This time, we notice a decline in High-Income Non-OECD Countries.

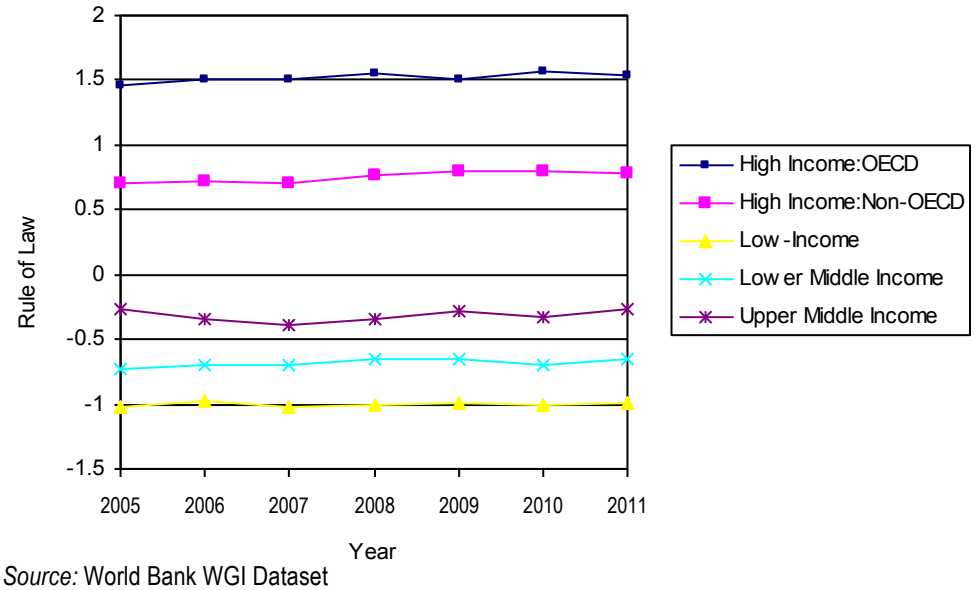
Figure 4. Regulatory quality



Source: World Bank WGI Dataset

Figure 5 shows that, for "Rule of law", from 2005 to 2011, the rankings did not change. The High-Income OECD Countries has the highest ranking. The High-Income Non-OECD, the Upper-Middle Income, the Lower-Middle income, and the Low Income Countries follow them in that order in 2005 and also in 2011.

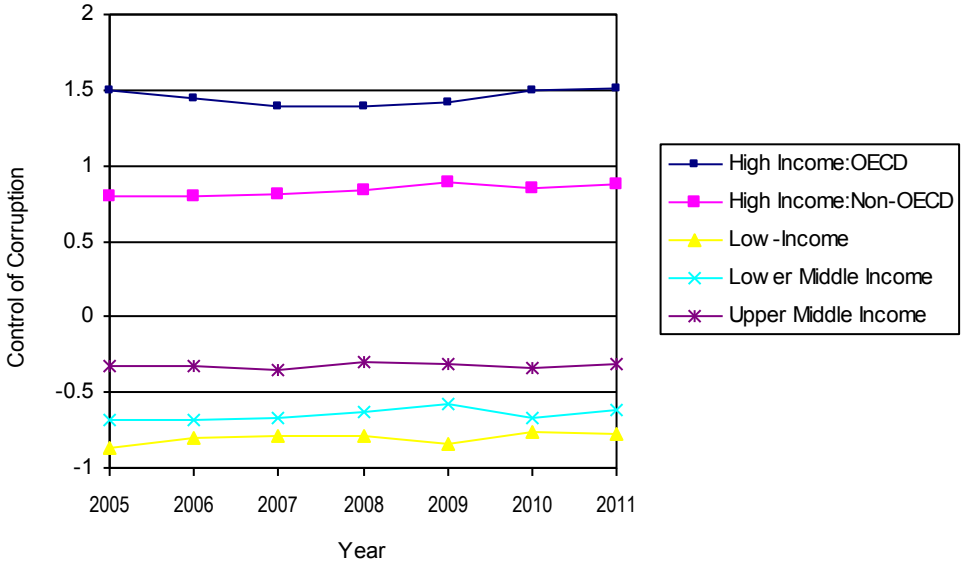
Figure 5. Rule of law



Source: World Bank WGI Dataset

Finally, Figure 6 shows that, for "Control of corruption", from 2005 to 2011, the rankings did not change. The High-Income OECD Countries has the highest ranking. The High-Income Non-OECD, the Upper-Middle Income, the Lower-Middle income, and the Low Income Countries follow them in that order in 2005 and also in 2011.

Figure 6. Control of corruption



Source: World Bank WGI Dataset

Table 2 shows the results of the empirical tests that compare the six governance variables in High Income OECD countries versus in High Income Non-OECD countries. Panel A shows the results for the pre-crisis period and Panel B shows the results for the post-crisis period.

Panel A shows that, before the crisis, High Income OECD countries had better scores compared to High Income Non-OECD countries in "Voice and Accountability", "Govt. Effectiveness", "Regulatory Quality", "Rule of

Law", and "Control of Corruption". The median values of "Voice and Accountability", "Govt. Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption" scores are 1.42, 1.64, 1.44, 1.46, and 1.50 for High Income OECD countries while the corresponding values are 0.64, 0.75, 0.93, 0.70, and 0.80 for High Income Non-OECD countries (all of the differences are significant at 1% level).

Only in "Political Stability", they do not score higher than the Non-OECD countries. The median value of "Political Stability" is 0.89 in High Income OECD countries while the corresponding value is 0.85 in High Income Non-OECD countries.

Panel B results are similar to Panel A results. Panel B shows that, after the crisis, High Income OECD countries still had better scores compared to High Income Non-OECD countries in "Voice and Accountability", "Govt. Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption". Again, all of the differences are significant at 1% level. The interesting result here is this: After the crisis, High Income Non-OECD countries had a slightly higher median score in "Political Stability" when compared to High Income OECD countries (although the difference is not significant).

When we look at High Income Non-OECD countries' scores pre- and post-crisis, we see that these countries had improved in five out of six governance variables after the crisis. For example, while the median "Voice and Accountability" score for these countries is 0.64 pre-crisis, it is 0.66 post-crisis. While their median "Political Stability" score is 0.85 pre-crisis, it is 0.96 post-crisis. Their median "Govt. Effectiveness" score is 0.75 pre-crisis; it is 0.80 post-crisis. Their median "Rule of Law" score is 0.70 pre-crisis; it is 0.79 post-crisis. Finally, their median "Control of Corruption" score is 0.80 pre-crisis; it is 0.87 post-crisis. Only their score in "Regulatory Quality" went down after the crisis. It was 0.93 pre-crisis; it is 0.63 post-crisis.

When we look at High Income OECD countries, we see that they had improved in three measures (i.e. "Political Stability", "Rule of Law", and "Control of Corruption"), and declined in three measures (*i.e.* "Voice and Accountability", "Govt. Effectiveness", and "Regulatory Quality") after the crisis (when compared to pre-crisis). Hence we conclude that while High Income Non-OECD countries improved in most categories, High Income OECD countries did not improve in half of the categories. This difference between the two groups explain how High Income Non-OECD countries surpassed High Income OECD countries in "Political Stability" after the crisis.

Table 2. High Income OECD vs High Income Non-OECD Countries

Panel A. Year 2005					
Variable	H-OECD		H-NonOECD		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	1.31	1.42	0.38	0.64	***
Political Stability	0.80	0.89	0.66	0.85	
Govt. Effectiveness	1.45	1.64	0.64	0.75	***
Regulatory Quality	1.35	1.44	0.71	0.93	***
Rule of Law	1.35	1.46	0.58	0.70	***
Control of Corruption	1.40	1.50	0.63	0.80	***
Panel B. Year 2011					
Variable	H-OECD		H-NonOECD		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	1.23	1.23	0.33	0.66	***
Political Stability	0.81	0.92	0.70	0.96	
Govt. Effectiveness	1.39	1.41	0.69	0.80	***
Regulatory Quality	1.34	1.40	0.65	0.63	***
Rule of Law	1.40	1.54	0.66	0.79	***
Control of Corruption	1.37	1.51	0.65	0.87	***

Table 3 shows the results of the empirical tests that compare the six governance variables in High Income Non-OECD countries versus in Upper Middle Income countries. Panel A shows the results for the pre-crisis period and Panel B shows the results for the post-crisis period.

Both pre- and post-crisis, we are seeing that High Income Non-OECD countries had significantly better scores in all six categories when compared to Upper Middle Income countries. In fact, most of the median governance scores for Upper Middle Income countries are negative. In all six governance categories, High Income Non-OECD countries have significantly higher scores (*i.e.* all differences are significant at 1% level) when compared to Upper Middle Income countries both pre- and post-crisis.

One point to note here: the ranking between High Income Non-OECD countries and Upper Middle Income countries did not change after the crisis in any of the six categories. In all six categories, High Income Non-OECD countries had better scores both pre- and post-crisis.

Table 3. High Income Non-OECD versus Upper Middle Income Countries

Panel A. Year 2005					
Variable	H-NonOECD		UpperMiddle		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	0.38	0.64	-0.13	-0.02	***
Political Stability	0.66	0.85	-0.03	0.06	***
Govt. Effectiveness	0.64	0.75	0.20	-0.13	***
Regulatory Quality	0.71	0.93	-0.18	-0.13	***
Rule of Law	0.58	0.70	-0.22	-0.27	***
Control of Corruption	0.63	0.80	-0.25	-0.32	***
Panel B. Year 2011					
Variable	H-NonOECD		UpperMiddle		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	0.33	0.66	-0.10	0.03	***
Political Stability	0.70	0.96	-0.07	-0.04	***
Govt. Effectiveness	0.69	0.80	-0.22	-0.15	***
Regulatory Quality	0.65	0.63	-0.21	-0.04	***
Rule of Law	0.66	0.79	-0.23	-0.26	***
Control of Corruption	0.65	0.87	-0.29	-0.31	***

Table 4 shows the results of the empirical tests that compare the six governance variables in Upper Middle Income countries versus in Lower Middle Income countries. Panel A shows the results for the pre-crisis period and Panel B shows the results for the post-crisis period.

Both pre- and post-crisis, we are seeing that Upper Middle Income countries had significantly better scores in all six categories when compared to Lower Middle Income countries (*i.e.* while most of the median governance scores for Upper Middle Income countries are negative, all of the median scores for Lower Middle Income countries are negative). In all six governance categories, Upper Middle Income countries have significantly higher scores (*i.e.* all differences are significant at 1% level) when compared to Lower Middle Income countries both pre- and post-crisis.

One important point here: the ranking between Upper Middle Income countries and Lower Middle Income countries did not change after the crisis in any of the six categories. In all six categories, Upper Middle Income countries had better scores both pre- and post-crisis.

Table 4. Upper Middle versus Lower Middle Income Countries

Panel A. Year 2005					
Variable	UpperMiddle		LowerMiddle		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	-0.13	-0.02	-0.54	-0.42	***
Political Stability	-0.03	0.06	-0.54	-0.60	***
Govt. Effectiveness	0.20	-0.13	0.63	-0.67	***
Regulatory Quality	-0.18	-0.13	-0.65	-0.57	***
Rule of Law	-0.22	-0.27	-0.59	-0.73	***
Control of Corruption	-0.25	-0.32	-0.64	-0.68	***
Panel B. Year 2011					
Variable	UpperMiddle		LowerMiddle		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	-0.10	0.03	-0.49	-0.35	***
Political Stability	-0.07	-0.04	-0.55	-0.50	***
Govt. Effectiveness	-0.22	-0.15	-0.57	-0.64	***
Regulatory Quality	-0.21	-0.04	-0.55	-0.61	***
Rule of Law	-0.23	-0.26	-0.63	-0.66	***
Control of Corruption	-0.29	-0.31	-0.61	-0.62	***

Table 5 shows the results of the empirical tests that compare the six governance variables in Lower Middle Income countries versus in Low Income countries. Panel A shows the results for the pre-crisis period and Panel B shows the results for the post-crisis period.

Both pre- and post-crisis, we are seeing that Lower Middle Income countries had significantly better scores in all six categories when compared to Low Income countries. In all six governance categories, Lower Middle Income countries have significantly higher scores when compared to Low Income countries both pre- and post-crisis. Both pre- and post-crisis, the differences between the two groups of countries are significant at 1% level in "Govt. Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption"; at 5% level in "Voice and Accountability"; and at 10% level in "Political Stability".

One important point here: the ranking between Lower Middle Income countries and Low Income countries did not change after the crisis in any of the six categories. In all six categories, Lower Middle Income countries had better scores both pre- and post-crisis.

Table 5. Lower Middle versus Low Income Countries

Panel A. Year 2005					
Variable	LowerMiddle		Low		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	-0.54	-0.42	-0.88	-0.96	**
Political Stability	-0.54	-0.60	-0.91	-0.87	*
Govt. Effectiveness	0.63	-0.67	-1.08	-1.02	***
Regulatory Quality	-0.65	-0.57	-1.05	-1.07	***
Rule of Law	-0.59	-0.73	-1.01	-1.02	***
Control of Corruption	-0.64	-0.68	-0.91	-0.87	***
Panel B. Year 2011					
Variable	LowerMiddle		Low		Mann-W.
	Mean	Med.	Mean	Med.	sig.

Panel A. Year 2005					
Variable	LowerMiddle		Low		Mann-W.
	Mean	Med.	Mean	Med.	sig.
Voice and Accountability	-0.49	-0.35	-0.88	-0.93	**
Political Stability	-0.55	-0.50	-0.90	-0.79	*
Govt. Effectiveness	-0.57	-0.64	-1.06	-1.07	***
Regulatory Quality	-0.55	-0.61	-0.98	-0.99	***
Rule of Law	-0.63	-0.66	-1.02	-0.99	***
Control of Corruption	-0.61	-0.62	-0.86	-0.77	***

Conclusion

In this study, we examine the impact of the 2008 Global Crisis on Governance while allowing for the moderating effects of OECD membership and income levels. We use World Bank's Worldwide Governance Indicators (*i.e.* WGI) dataset which includes six dimensions of governance. These six dimensions are "Voice and Accountability", "Political Stability and Absence of Violence", "Government Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption".

We examine the 2005-2011 period which allows us to compare the indicators before the crisis and after the crisis. World Bank classifies countries according to their OECD membership and also according to the country's income levels. We use their classification and focus on five groups of countries. These are High-Income OECD, High-Income Non-OECD, Upper-middle Income, Lower-Middle Income, and Low Income Countries.

We find that, from pre-crisis period to post-crisis period, the ranking of each income group does not change. Our results show that, both pre- and post-crisis, the High-Income OECD Countries have the best governance measures, the High-Income Non-OECD Countries have the second best measures, and so on, in the order shown above. Interestingly, the High-Income Non-OECD Countries performed better than the other groups after the crisis. After 2008, this group actually improved in four out of six categories.

We conclude that although crises affect all income groups, the High-Income Non-OECD Countries have been more successful in alleviating the effects of crises on public governance. Most of these countries are more authoritarian and more resource-rich countries and we believe that these characteristics may explain their success in fending off the negative impacts of financial/economic crises.

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Improving Performance of Small and Medium-Sized Enterprises of Processed Food through Competitive Strategy, Industry Environment, Innovation Capability, and Macroeconomic Factors

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Abstract

Small and medium-sized enterprises (SMEs) processed foods play a major role in the national economy but its performance is still low. The poor performance is due to many factors, but research results are still partial. This study fills the gap, with the aim of analyzing the influence of the industry environment, innovation capabilities, and macroeconomic factors on competitive strategy and the performance of SMEs of processed foods in Malang, Indonesia. Data were collected using a questionnaire of 65 SMEs of processed foods then analyzed using WarpPLS software version 5.0. The study found that the competitive strategy positively influences the performance of SMEs processed foods and competitive strategy is positively influenced by the capabilities of innovation and macroeconomic factors. Industry environment does not significantly affect the competitive strategy and macroeconomic factors do not significantly affect the performance of SMEs of processed foods.

Keywords: small and medium-sized enterprises; innovation capabilities; competitive strategy; performance

JEL Classification: E33; E51; E62; L15; O32; J31

Introduction

Processed foods are part of the processing industry and creative industry. The creative industries play an important role in the national economy because most of the enterprises are included a category for Micro, Small and Medium-Sized Enterprises (MSMEs). Data of the Ministry of Cooperatives and SMEs (2016) showed SMEs in Indonesia in 2013 as many as 57.9 million or 99.9% of total business units, absorbing 114.1 million people or about 97 percent of the workforce, accounted for about Rp5.440.007, 9 billion, or about 60% of Gross Domestic Product (GDP). One of the creative industries is culinary subsector. Culinary industry is defined as an activity related to the manufacture of foods that have characteristics such as a characteristic of a region (Departemen Perdagangan 2012). These regional characteristics make the culinary industry has a great potential as a tourism industry.

In according with tourism industry, Malang municipality has its mission as the city of industry and tourism. Malang is also famous for a city of education where there are more than 50 higher educational institutions in which college students come from various regions in Indonesia. Industry includes a wide range of small and medium industries include food processing. In the field of tourism, Malang became one of tourism destination in East Java. Tourists visiting Malang buying processed food products as souvenirs to their home areas. In 2014 as

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many as 5.8 million domestic and foreign tourists visiting Malang, then it increased to 6.4 million in 2015 and mostly to Kota Batu—the nearest tourist town with Malang (Surya Daily Online - Suryamalang.com 2016). Thus, the performance of processed foods needs to be increased.

Unfortunately, research on the performance of processed foods is limited and partial analysis. For example, Sunaryo *et al*. (2014) concerning the clusters of micro, small, and medium-sized food and drink; Kusumastuti and Nur (2014) on competency-based learning for culinary entrepreneurs; Sancoko (2015) on the business development strategy of business meals and drinks at the depot time to eat Surabaya; Wulandari and Zubaidah (2016) about culinary innovation in Malang but it is a case study on Meatballs Kebab Grill. Ramadan *et al.* (2014) formulate a model of agent-based simulation system for the culinary industry, but based on data and assumptions hypothetical so it is advisable to further research using real data to make it more accurate. Studies on the food business has not revealed a more comprehensive analysis covering competition within the industry, the ability to innovate on the existing resources and competitive strategies that can be applied to improve the performance of small and medium enterprises of the food.

This study is intended to fill this gap by analyzing the relationship between industry environment, innovation capabilities, macroeconomic factors and competitive strategy and performance of SMEs of processed foods in Malang. The results are expected to provide information on efforts to improve the business performance of processed foods.

1. Literature review

1.1. Performance of Small and Medium-Sized Enterprises of food

Small and Medium-Sized Enterprises (SMEs) in this study refers to Law No. 20 of 2008 which saw the size of the business according to net worth and annual sales revenue. However, in practice, it more easily uses criterion from the Central Statistics Agency based on the number of workers, *i.e.* 5-19 workforce categorized as small enterprises and 20-99 workers is included in medium-sized enterprises.

Performance is achievement of a company within a specific period which reflects the level of health of the company. The most widely used indicator to measure the performance of a company is the Return on Investment (ROI), which is simply the result of the income before tax to total assets (Wheelen and Hunger 2005, 286). Another view of corporate performance is expressed by Jauch and Glueck (2009), stating that the performance of a company can be seen from the quantitative and qualitative aspects. In quantitative terms, the performance of a company can be seen from the company's achievements compared to what was done in the past, or to its competitors in a number of factors such as net income, the return on capital, the return on equity, market share, and sales growth. While qualitative measures questions to determine whether or not the objectives, strategies and integrated and comprehensive plan of a company has been consistent, accurate and can run.

Performance of SMEs of food businesses in Indonesia is still low. The low performance of the food industry can be observed from the development of the food imports. Bernando *et al.* (2012) reported the results of their analysis of the development of imports of food and beverages as follows: from 2006 to 2010, the import value of food and beverages grew at an average of 20% per year. In the period from January to September 2011, imports of food reached USD 4,948.2 (increased 59.2% from the previous year). During 2011, food and beverage products from Malaysia dominated the market for food and beverages in Indonesia (24%). The low performance of SMEs is closely related to the food industry environment, innovation capabilities, macro-economic conditions, and competitive strategy adopted by small and medium enterprises.

1.2. Industry environment, innovation capability, and competitive strategy

An industry competition concept proposed by Porter (1992) and known as the Porter Five Forces that shape the competition in an industry can be used to analyze the food industry environment. The conceptual framework explains that a company will have a competitive advantage if the company is in the favorable conditions of the five factors: suppliers, substitute products, buyers, potential competitors and competition among existing firms.

Suppliers are related to the procurement of raw materials or inputs for small businesses; replacement products are other small business products acting as substitutes; buyers made up of individuals and institutions;

potential competitor is the threat of new entrants in terms of economies of scale, differences in product, brand identity (brand), a cost advantage, and access to the entire distribution. The last factor is the competition among companies that already exists in terms of service, product attributes, distribution, and promotion.

Five competitive forces reflect the fact that competition in an industry is not limited to the number of existing companies. Customers, supplier of substitution products, as well as potential new entrants are all the company's competitors in the industry. These competitive forces jointly determine the intensity of competition and the profitability. The most powerful force will be decisive and very important in determining strategy. Therefore, Porter (1992) suggests a strategy in the face of competition which is referred to generic competitive strategies.

Generic competitive strategies are based on an analysis of a company's position in the industry, whether corporate profits are above or below the industry average. A good company will have a high level of income despite unfavorable industry structure and the average industry profit level was moderate. If so, the company was able to create a sustainable competitive advantage. To achieve this, the company could have two basic types of competitive advantage, namely low cost or differentiation. The strength or weakness that is significantly owned by a company in turn is a function of the relative cost impact and differentiation.

The two basic types of competitive advantage combined with the field of activity is sought to be achieved by a company headed toward three generic competitions to achieve the performance above the industry average, the cost leadership, differentiation, and focus. Focus strategy consists of the focus on cost and differentiation focus. The concept of generic strategy emphasizes that competitive advantage is the heart of any strategy and achieving competitive advantage requires a company to make a choice. If the company wants to achieve competitive advantage, the company must choose the desired type of competitive advantage and the scope or the field to be achieved. Selecting all types will result in the company's performance which was below the industry average. It means the company does not have a competitive advantage.

Implications of Porter generic strategy is how SMEs to operate at low cost or differentiation in terms of service. According to Craig and Grant (2010), sources of cost advantage is the saving knowledge (experience), economies of scale, cost of input, processing technology, product design, capacity utilization, and managerial factors.

The implementation of the operational strategy to compete through low cost or differentiation will largely depend on the capabilities of SMEs manage resources owned specifically (Makadok 2011). Resource management is done with the conceptual framework VRIO (value, rareness, imitability, and organization) in the Resource-Based Theory (Barney Clark 2007). This theory emphasizes the role of internal factors in the company such as strategy, structure, competence, capability to innovate, and the tangible and intangible resources for success in the competition. Innovation capabilities of companies can be done through technology innovation, product innovation, market innovation and service innovation (Sutapa 2014).

1.3. Macroeconomic factors and enterprises performance

One of the external factors within the framework of environmental analysis of companies according to Porter (1992) is the economic factor, which in this case is the macro economy. Several macroeconomic factors that determine the performance of the company is the inflation rate, the government policy on taxes, government policy on minimum wage, and the availability of credit (Mankiw 2007). A very high Inflation will increase production costs and reduce the purchasing power of consumers. As a result, the company's performance declined due to the revenue and corporate profits decline.

Taxes are a burden to the company. A tax for the government is a source of income that is used for the common good (Harmana 2013). If the tax is paid by large taxpayers, the state revenue will increase. But for some companies' taxes are the costs and its benefits are not received directly, either in the form of goods, services or funds that tax expenditures should be calculated carefully.

The aims of government policy on the minimum wage is to protect workers but burdensome for employers, especially SMEs. Theoretically, the company will only pay wages in accordance with the productivity of labor, meaning that low labor productivity will receive low wages, and vice versa (Pyndick and Rubinfeld 2005). In fact, the minimum wage is much more determined by the increase in the price level compared to the increase in

productivity. In Indonesia, productivity has not become a major determinant in wage determination (Bappenas 2010, 61).

Many SMEs have difficulties in developing the business due to capital constraints. Therefore, the availability of credit with an easy procedure and the relatively small interest cost will help SMEs to develop business. One of the credit facilities provided by the government to SMEs is the People's Business Credit (KUR), a commitment of the government through Presidential Decree No. 6 Year 2007 on the Acceleration of Development of SME Sector and Empowerment.

The inflation rate, taxes, minimum wage, and the availability of credit at a certain level become a burden negatively affect the company's performance. Increased costs result in lower sales revenue and profit. Therefore, it needs the right competitive strategy. In addition, selection of cost leadership strategy, focus, or proper differentiation will improve company performance.

2. Methodology

The study was conducted in Malang Municipality on consideration of Malang as one of the favorite tourist destinations including culinary tourism in East Java, Indonesia. Travelers typically buy processed food as souvenirs when returning to their home areas. Therefore, performance of the processed food industry needs to be improved. For that, they need information about factors that determine the performance of small and medium enterprises such as the food industry environment, innovation capabilities, and external economic factors.

Data were collected from SMEs food businesses registered in the Office of Industry and Trade Malang. The research follows criteria of the Statistic Central Agency, which is 5-19 manpower for small businesses and 20-99 workers to medium-sized businesses. Number of SMEs food listed in 2015 as many as 85 units so entirely sampled. However, in the collection of data, there were eight businesses no longer in operation, 5 entrepreneurs who move addresses so hard to find, 4 employers were not willing to share data, and 3 attempt to provide data but did not qualify for the analysis. Finally, 65 units of SMEs used in this study. Respondents are the owners and/or managers of SMEs of the food.

Data were collected using a questionnaire that contains items the statement of five variables, namely the environmental industry, innovation capabilities, macroeconomic factors, competitive strategy, and performance of small and medium-sized enterprises of processed foods. The variables and operational definitions, indicators, items, and the measurement scale are presented in Table 1. All items are measured with a Likert scale of five gradations from strongly disagree (score 1), disagree (score 2), neutral (score 3), agree (score 4), and strongly agree (score 5).

Table 1. Operational definition and measurement of variables

Variable	Operational Definition	Indicator/item	Reference
Industry Environment (X_1)	The industrial structure of similar business that influence the behavior of companies in competition to achieve superior performance	1. New entrant (X_{11}) 2. Incumbent business (X_{12}) 3. Buyer (X_{13}) 4. Supplier (X_{14}) 5. Product substitution (X_{15})	Porter, 2008; Porter, 1992
Innovation Capability (X_2)	The ability to apply specific management of resources of the company to improve performance	1. Innovation technology (X_{21}) 2. Product innovation (X_{22}) 3. Market innovation (X_{23}) 4. Service innovation (X_{24})	Devenport *et al*., 2006; Teece, 2008
Macroeconomic Factor (X_3)	Macroeconomic factors that influence the use of resources in business processes	1. Credit availability 2. Government policy on taxes 3. Inflation rate 4. Government policy on minimum wage	David, 2011

Variable	Operational Definition	Indicator/item	Reference
Competitive Strategy (Z)	The action taken by the company to excel over competitors by providing great customer value, through lower prices or by providing more benefits in accordance with the pricing higher	1. Cost leadership (Z_1) 2. Focus (Z_2) 3. Differentiation (Z_3)	Porter, 2008; Porter, 1992
Performance of SMEs Food (Y)	The company's ability to control the market and goal oriented and finances	1. Growth of sales 2. Growth of profit 3. Growth of assets	Huber, 2010

Source: Compiled from various sources

The collected data were analyzed using the software program WarpPLS. According Vinzi *et al.* (2010), Sholihin and Ratmono (2013) and Hair *et al.* (2014), WarpPLS has the following advantages. First, WarpPLS is efficient on a small sample, complex model and practical because it does not require data normality. Second, WarpPLS can provide an output value of the indirect effect and the total effect along with the p value, standard error, and effect size. Output is very helpful in hypothesis testing mediating or intervening variable so it does not need to do manual counting as with Sobel test to test the significance of the indirect effect. Third, WarpPLS can provide coefficients and p-value results directly to a model with variable moderation, while others such as SmartPLS software PLS, PLS Graph, and Visual PLS should make the interaction between the variables of latent beforehand.

Evaluation of WarpPLS model consists of two phases, namely measurement model and structural model evaluation (Sholihin and Ratmono 2013). Evaluation of the measurement model is intended to evaluate the validity and reliability of the latent variables. Rules of thumb for reflective measurement model evaluation according to Hair *et al.* (2014, 107) are as follows: (1) consistency reliability of composite reliability is greater than .70; in the exploratory research of .60 up to .70 is acceptable; (2) reliability indicators: indicators outer loading greater than .70; (3) convergent validity: Average Variance Extracted (AVE) is greater than .50; (4) discriminant validity: a loading indicator is greater than the outer loading with other latent variables and the square root of the AVE is greater than the highest correlation with other latent variables.

Evaluation of structural model was conducted to evaluate the relationship among latent variables. Rules of thumb of WarpPLS structural model evaluation according to Hair *et al.* (2014, 186), among other things are (1) the coefficient of determination (R^2) for endogenous latent variables the higher the better, but generally .75; .50, or .25 respectively considered as substantial, moderate, and weak; (2) the effect size (f^2) of .02; .15; and .35 respectively indicating latent exogenous variables have the effect of small, medium, and large against endogenous latent variables; and (3) predictive relevance (Q^2) value is greater than 0 indicates that the exogenous latent variables have predictive relevance on the endogenous latent variables. In relative size, q^2 of .02; .15; and .35 respectively indicating that exogenous latent variables have small, medium, and large relevance predictive on the endogenous latent variables.

3. Results and discussion

3.1 Statistical results

Most of the respondents (60 percent) are women who running a food business (Table 2). In addition to the nature of women take care of the food in the family, many food businesses to do at home so that women do not have to leave home. The reason is understandable because the majority of respondents (58.5 percent) aged 30-45 years, the age at which women are married and have children that need the attention of a mother. Food business is done at home can be done independently so that more flexibility in managing working time. This is shown by approximately 94 percent of respondents are business owner.

The education level of the most respondents (40%) is high school graduates. There is a tendency of college graduates running food business. Most enterprises (55.4%) aged 5-10 years and less than five years (30.8 percent), classified as a business that is still relatively young. Their experience in trying the food business is

almost the same age as these businesses was established by respondents. Entrepreneurs who pursue business with good management, 10 years are enough time to try and apply a wide variety of innovations in order to improve business performance.

All variables and indicators/items have outer loading, Average Variance Extracted (AVE), composite reliability, and Cronbach Alpha greater than .60 (Table 3) and corrected item-total correlation was also greater than .60 so it can be concluded that the instrument used was valid and reliable. According to Sekaran (2003), Cronbach alpha is smaller than .60 less reliable; .70 is acceptable, and greater than .80 is good. Corrected item-total correlation is greater than 0:50 are said to be reliable or internal consistency between the indicator and items with variable (Hair *et al*. 2010).

Table 2. Characteristics of respondent of SMEs food in Malang

No.	Characteristics of Respondents		Number (person/unit)	Percentage (%)
1	Sex	a. Male	26	40.00
		b. Female	39	60.00
		Total	65	100.00
2	Age	a. Less than 30 year	5	7.7
		b. 30 up to 45 year	38	58.5
		c. 46 up to 65 year	20	30.8
		d. More than 65 year	2	3.1
		Total	65	100.00
3	Level of Education	a. Elementary School	7	10.8
		b. Junior High School	15	23.1
		c. Senior High School	26	40.0
		d. University/Vocational	17	26.1
		Total	65	100.0
4	Age of Business	a. Less than 5 year	20	30.8
		b. 5 up to 10 year	36	55.4
		c. 11 up to 20 year	5	7.7
		d. More than 20 year	4	6.1
		Total	65	100.0
5	Experience in food business	a. Less than 5 year	24	36.9
		b. 5 up to 10 year	32	49.3
		c. 11 up to 20 year	6	9.2
		d. More than 20 year	3	4.6
		Total	65	100.0
6	Ownership status	a. Private property	61	93.8
		b. Cooperation with other parties	4	6.2
		Total	65	100.0

Source: compiled from the survey

Table 3. Evaluation of Goodness of Fit Measurement model

Variable	Indicator	Validity		Reliability	
		Loading outer	AVE	*Composite Reliability*	*Cronbach Alpha*
Industry Environment (X_1)	New Entrant (X_{11})	.899	.808	.944	.920
	Incumbent (X_{12})	.776	.602	.882	.832
	Buyer (X_{13})	.770	.694	.814	.657
	Supplier (X_{14})	.886	.785	.916	.862
	Product Substitute (X_{15})	.912	.832	.908	.798

Variable	Indicator	Validity		Reliability	
		Loading outer	AVE	*Composite Reliability*	*Cronbach Alpha*
Innovation Capability (X_2)	Technology Innovation (X_{21})	.886	.785	.916	.863
	Product Innovation (X_{22})	.832	.692	.871	.777
	Market Innovation (X_{23})	.914	.835	.938	.901
	Service Innovation (X_{24})	.888	.788	.918	.865
External Economic Factors (X_3)		.828	.685	.897	.846
Competitive Strategy (Z)	Cost leadership (Z_1)	.917	.814	.815	.739
	Focus (Z_2)	.890	.792	.856	.798
	Differentiation (Z_3)	.976	.875	.891	.809
Performance of Food SMEs (Y)		.905	.819	.931	.884

Source: summarized the results of statistical analysis using WarpPLS

Table 4 shows that the structural model of goodness of fit qualifies as a good model to analyze the relationship between variables in this study, unless the average full collinearity (AFVIF). AFVIF greater than 3.3 because there are more than two latent variables were significant relationships.

Table 4. Model of Fit and Quality Indices

Model of Fit	Coefficient (p-value)	Cut-off	Information
Average Path Coefficient (APC)	.303 (.002)	.05	Significant (good)
Average R-Squared(ARS)	.876 (.001)	.05	Significant (good)
Average Adjusted R-squared (AARS)	.871 (.001)	.05	Significant (good)
Average Block VIF (AVIF)	3.042	≤ 5: acceptable ≤ 3.3: ideal	Ideal
Average full collinearity VIF (AFVIF)	37883844904.234	≤ 5: Acceptable ≤ 3.3: ideal	Due to correlation among all latent variables are significant
Tenenhaus GoF (GoF)	.800	≥ .1: Small ≥ .25: Medium ≥ .36 Big	Big
Sympson's paradox ratio (SPR)	.998	≥ .7: Acceptable 1: ideal	Ideal
R-squared contribution ratio (RSCR)	1.000	≥ .9: Acceptable 1: ideal	Ideal
Statistical suppression ratio (SSR)	1.000	≥ .7: Acceptable	Acceptable
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	≥ .7: Acceptable	Acceptable

Source: summarized the results of statistical analysis using WarpPLS

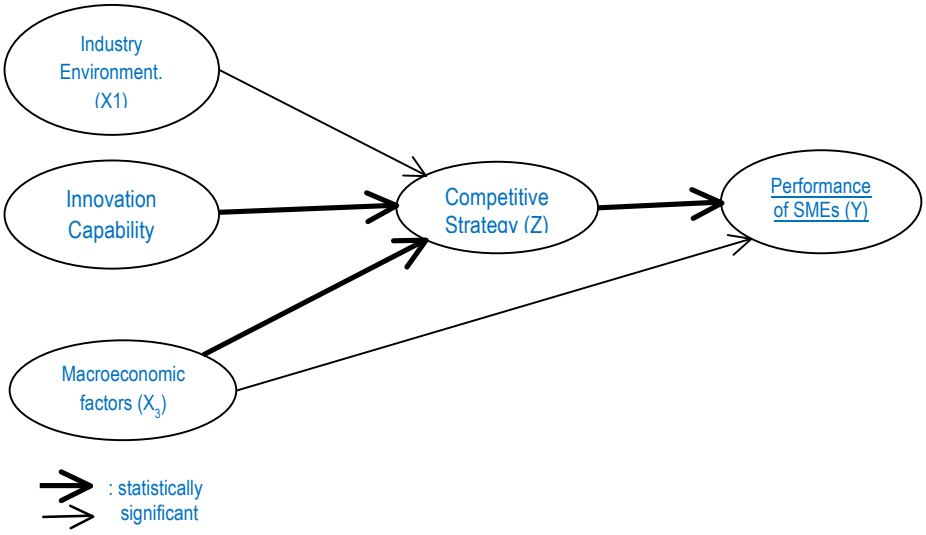
Relationships between variables in the analysis model are good in terms of the R-square (R^2), the effect size (f^2), and predictive relevance (q^2) (Table 5). The coefficient of determination (R^2) of all latent variables is greater than 80% means that the latent variables are well reflected by the indicator being used. Effect size (f^2) of most indicators (77%) has the effect of medium and large, which means that the contribution of each latent variable predictor of the latent variable criterion is quite large. All latent variables has predictive relevance (q^2) large (greater than .35) indicates each latent variable has great predictive power. Great predictive capability shown by the three significant path coefficient, namely the innovation capability on the competitive strategy, external economic factors on competitive strategy and competitive strategy on the performance of SMEs processed food (Figure 1).

Table 5. Evaluation of Structural Model

Goodness of Fit Indices	Coefficient	Cut-off	Information
R-square (R^2) for endogenous latent variables:			
a. Industry environment	.965	The bigger the better	Good
b. Innovation capability	.997		
c. Competitive strategy	.831		
Effect size (f^2):			
a. New entrant of industry environment	.364	.02: little effect .15: medium effect .35: great effect On endogenous latent variable	Great effect
b. Incumbent of industry environment	.309		Great effect
c. Buyer on industry environment	.197		Medium effect
d. Supplier on industry environment	.034		Little effect
e. Substitute product on industry environment	.063		Little effect
f. Technology innovation on innovation capability	.257		Medium effect
g. Product innovation on innovation capability	.175		Medium effect
h. Market innovation on innovation capability	.293		Medium effect
i. Service innovation on innovation capability	.273		Medium effect
j. Macroeconomic factors on competitive strategy	.180		Medium effect
k. Macroeconomic factors on performance	.007		Little effect
l. Industry environment of competitive strategy	.014		Little effect
m. Innovation capability on competitive strategy	.664		Great effect
n. Cost leadership on competitive strategy	.542		Great effect
o. Focus on competitive strategy	.276		Medium effect
p. Differentiation on competitive strategy	.341		Medium effect
q. Competitive strategy on performance	.690		Medium effect
Predictive Relevance (q^2):			
a. Industry environment	.965	.02: Little .15: Medium .35: Great	Great
b. Innovation capability	.997		Great
c. Competitive strategy	.831		Great
d. Performance	.699		

Source: summarized the results of statistical analysis using WarpPLS

Figure 2. The Relationship between Exogenous and Endogenous Variables



Source: summarized the results of statistical analysis using WarpPLS

3.2 Discussion

The results showed that the industry environment does not significantly affect the competitive strategy. Environmental industry is well reflected by newcomers, existing companies, buyers, suppliers, and substitute product. Nearly 76% of the industry environment variation is explained by the five indicators. Explanatory most to the industry environment is new entrants and existing firm. It means that intensity of competition in the industry environment is determined by competition between existing firms in the processed food industry with new entrants companies.

No significant industry environment on the competitive strategy of SMEs of processed foods indicates that the intensity of competition in the processed food industry in Malang was not strong enough. Porter's five forces framework (1992) emphasizes that the greatest strength will be decisive and to be very important in determining strategy. Competitive strategy of SMEs of processed foods in Malang is more determined by the intensity of competition in a fast food restaurant or a cafe than a processed food in packaging. In other words, the competitive strategy of SMEs of processed foods in Malang is determined by factors other than the environmental industry.

The study found that innovation capabilities significantly influence competitive strategy of SMEs of processed foods in Malang. Innovation capabilities reflected through technological innovation, product innovation, market innovation and service innovation. Variations of innovation capabilities almost perfectly explained by the four indicators used in the analysis (R-square = 99.7%). To provide more value and satisfaction to customers than its competitors, the company must operate efficiently and effectively. Some researchers found a relationship between value and customer satisfaction with the marketing aspect (Corbett and Wassenhove 1993), information technology and product quality (Ross 1996), and innovation technology and innovation capabilities of companies (Grupp 1997). Other studies analyze the relationship between the types of innovation and business performance (Garcia and Calantone 2002) and competitiveness (Chen *et al*. 2006, Cho *et al*. 2008). The results of these studies found a positive correlation between the types of innovation with business performance and competitiveness of enterprises.

The data in Table 2 indicate that SMEs of processed food in Malang have a potential to develop innovation capabilities. A large portion of business owners (59%) aged between 30 and 45 years are in productive period of age, and quite a lot of them (26%) are college graduates so it is relatively easier to develop innovation (technology, product, market, and service). Age of business and business experience of the entrepreneurs were relatively long, between 5 to 10 years, with the status of property ownership business make it possible to develop innovation capabilities optimally.

Malang as one tourist destination has the potential to develop a traditional processed food. Research from past scholars indicated that hotel in Malaysia can be the one stop centre for the local and international tourists to get the first hand information about local food specialities (Ismail *et al*. 2013). On the hindsight, very limited efforts have been put into practice on the promotions of local food especially Malay cuisines in hotels. Promotion of traditional processed foods needs to pay attention to consumer behaviour. Kim *et al.* (2009) developed a model of local food consumption to understand the local food consumption patterns at tourist destinations. The model constitutes three categories: 'motivational factors' (*i.e*. exciting experience, escape from routine, health concern, learning knowledge, authentic experience, togetherness, prestige, sensory appeal, and physical environment); 'demographic factors' (*i.e.* gender, age, and education); and 'physiological factors' (*i.e.* food neophilia and food neophobia). In short, innovation capabilities can improve the quality of traditional processed food thus improving the performance of small and medium-sized enterprises.

Besides innovation capabilities, macroeconomic factors were also significantly affecting the competitive strategy of SMEs of processed food businesses in Malang. Macroeconomic factors reflected by the rate of inflation, credit availability, government policies on taxes, government policy on the minimum wage. However, macroeconomic factors had no significant effect on the performance of SMEs of the food. It is clear that competitive strategy is not as mediation or intervening variable between macroeconomic factors and the company's performance.

Inflation within one year is relatively stable at a level of about 5% compared to other macro-economic factors. People's Business Credit (Kredit Usaha Rakyat/KUR), which is aimed at SMEs, its distribution still facing various problems. According Pratomo (2014), KUR face five (5) problems: high interest rates, the distribution is uneven; socialization is not optimal for SMEs, KUR as a means of political campaigns, and lack of funding. KUR interest rate of 22% per year is considered still very burdensome. Through the Economic Policy Package has been lowered to 12% per year but just come into force in mid-2016. Since 2007 until now, KUR covers only 8.78 million micro and medium-sized businesses, with a total fund of Rp117 trillion. The condition is not comparable with the total SME businesses which reach 56.5 million units.

One of the factors causing the lack of participation of SMEs taxpayers in the compliance of paying taxes is a tax payment procedures and a high tariff (Atawodi and Ojeka 2012). The government is urged to provide lower tax rates to MSMEs, because tax policies taken by the government affects the growth of SMEs (Mungaya *et al*. 2012). Governments also need to consider the size of the company in determining tax policy (Adebisi and Gbegi 2013). In the Global Competitiveness Report 2011, the tax rules and the tax rate is one of the factors hampering the competitiveness of developing countries such as Indonesia.

Other macroeconomic factors related to competitive strategy and performance of SMEs is the minimum wage. Theoretically, wages proportional to productivity (Pyndick and Rubinfeld 2005). Sulistiawati (2012) found that wages have a significant effect and have a correspondingly negative on employment in Indonesia. This means that if there is an increase in wages, then it has the potential to reduce employment, especially low labor productivity. Productivity is closely related to education level. Nationally more than 45% of workforces are primary school educated, whereas in this study about 33% of business owners and managers of SMEs of food are primary and secondary school education (Table 2). In Indonesia, according to Badan Perencanaan Pembangunan Nasional (Bappenas 2010), productivity has not become a major determinant in the determination of wages. More minimum wage determined by the increase in the price level compared to the increase in productivity.

This study found that the competitive strategy has significant effect on the performance of SMEs of processed foods in Malang. The results in Table 5 show that competitive strategy has a profound effect on business performance. The right competitive strategy will boost the company's performance through growth in sales, profits, and assets. The study found that the cost leadership has the greatest effect on competitive strategy, while the two other indicators have a moderate effect. Thus, it can be concluded that the competitive strategy adopted by the processed food industry in Malang is cost leadership. This is in line with the framework of the five forces analysis Porter (1992). If the company wants to achieve competitive advantage, the company must choose the desired type of competitive advantage and the scope or field to be achieved. Companies that choose all types will result in the company's performance were below the industry average, which means the company does not have a competitive advantage.

By his research on the business development strategy of business food and beverage at the Depot Time to Eat in Surabaya, Sancoko (2015) found that this enterprise have changed the strategy of cost leadership strategy that has long been implemented into the strategy to focus on specific market niche. This proves that it is not profitable for the company to apply more than one strategy at a time.

Conclusion

The performance of SMEs of processed foods was affected by the competitive strategy. Competitive strategy was influenced by innovation capabilities and macroeconomic factors. Competitive strategy applied by SMEs was cost leadership, while the innovation capabilities reflected with relatively the same effect by technological innovation, product, market, and service innovation.

Industry environment has no significant influence on competitive strategy. Five forces framework analysis according to Porter that are new entrants, existing companies, buyers, suppliers, and substitute products yet or do not have a high intensity competition for influence competitive strategy of SMEs of processed foods. Likewise, macroeconomic factors do not significantly affect the performance of SMEs of processed foods.

Based on these findings it is suggested to the government in order to optimize the innovation capabilities through various means such as training for businesses, providing information and support infrastructure to support the technology implementation. In addition, the government can also manage macroeconomic factors to be optimized through tax policy and minimum wage, controlling inflation, and credit management for SMEs. For SMEs managers and/or owners to increase the capabilities of specific resources owned thus improving business performance. Subsequent studies can analyze the environmental industry and macroeconomic factors relationship with business performance using time series data.

Acknowledgement

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Economic Effect in the Framework of Lean Production

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Abstract

From the end of the 2014 Russian economy is in crisis. Structural transformation of the industrial sector of the Russian economy is required. About 85 Russian industrial companies were analysed. Representatives of the state corporations «Rostec» and «Rosatom», the industrial group "Basic element", JSC "Russian Railways" and large Russian enterprises were involved in the analysis. A lot of companies declare their adherence to the principles of the lean production. Positively recommended concept of lean production abroad became popular in Russia in early 2000-ies. Economic effect, which is the main performance indicator of the implementation of lean production, was studied in detail. The absence of a unified concept of calculating economic effect is a problem in the context of the Russian experience of industrial development. Unified method of calculation of economic effect was proposed. The obtained results demonstrate the prospects of the further development of lean production and prove the possibility of achieving a high competitiveness of the domestic industrial sector of economy.

Keywords: modern organizational technologies; lean production; economic effect; Russian industry

JEL Classification: L15; L23; O1

Introduction

Russian economic crisis is a logical continuation of a difficult geopolitical situation in the world, formed at the end of 2014. The problems of uncertainty and rapid changes in the business environment are characteristic for this stage. Therefore, companies clearly have to generate competitive development strategies. The course of the Russian government on import substitution and structural economic changes involves the actualization of the questions of competitiveness increase of Russian industry. In this regard, it is worth to note the need to implement effective models of management of industrial enterprises and organization of business processes. World experience of development of the industry shows that along with the effectively applied technology, organizational technologies are gaining in importance. Basic concepts of creating and maintaining effective functioning of company's internal processes are implied by organizational technologies. That's why exploration and analysis of experience of introduction and application of the modern management models like lean production in the Russian industrial sector are of particular relevance.

1. Research background

Issues of genesis and development of the modern organizational technologies at the industrial enterprises are explored in the works of foreign and local authors. Among foreign researchers are Ohno (1988) and Imai (1997), who are the authors of the concept lean production, Womack and Jones (2003), who outlined the essence of the lean production as a process involving certain stages, Deming (1982), who modified the cycle (PDCA, Plan-Do-Check-Act) that is the basis of the lean production, Shingo (1992), Liker (2004), Byrne (2013), Emiliani (2014) made a significant contribution to the development of the concept and others. Among the national scientists, we should mention Kleiner (2011), Katkalo (2002, 2003), Glukhov (2012) and others. It is noteworthy that this concept has received wide recognition abroad, both theoretical and practical levels, possible methods of

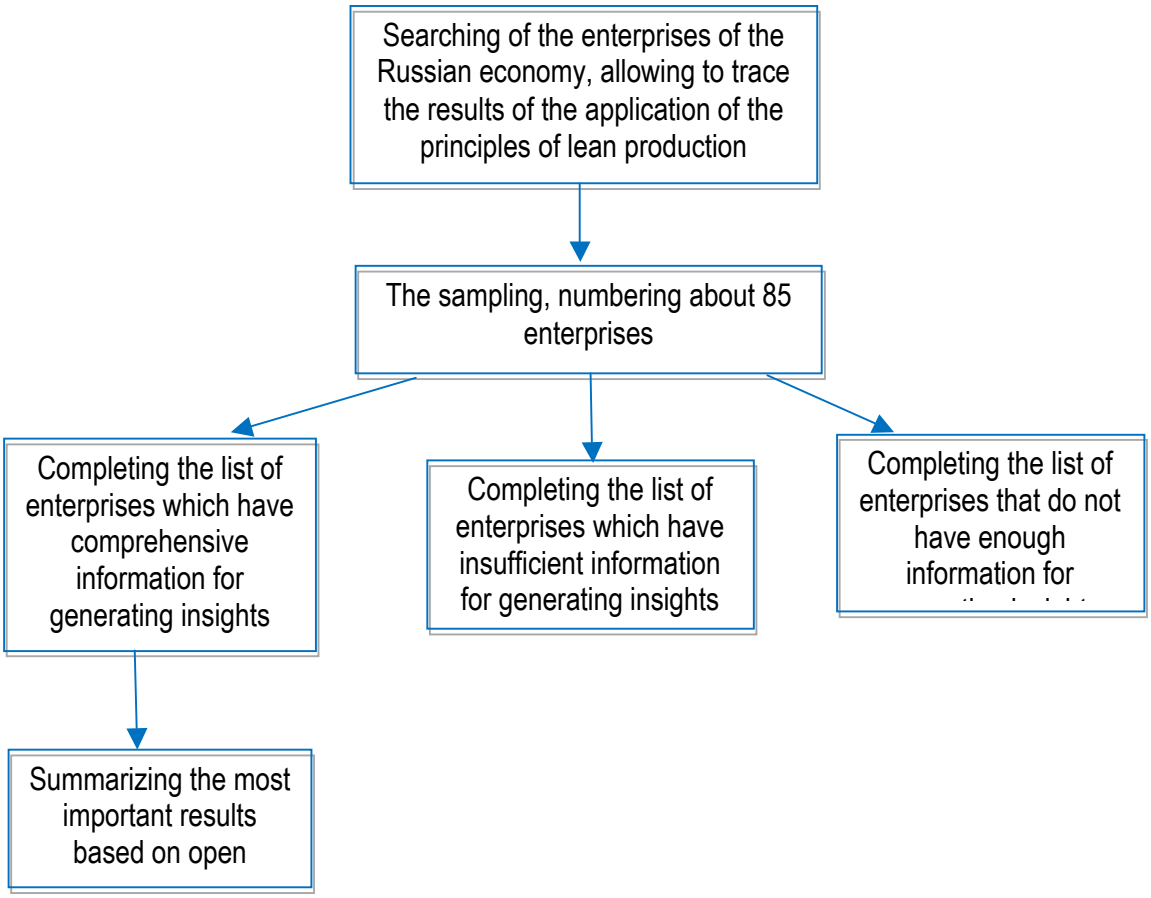
implementation are developed, the tools of lean production are analyzed. In Russia, the spread of the concept is poorly expressed. A lot of industrial enterprises declare their adherence to the principles of the lean production. But there is no comprehensive analysis of the implementation and application of this model in the Russian industrial sector of the economy. The results of the use of lean production are not clarified.

2. Methodology

About 85 companies were analyzed in the study of Russian industrial sector. There are representatives of the state corporations "Rosatom" and "Rostec", JSC "Russian Railways", industrial group "Basic element" and other major companies.

The research methodology is shown in following diagram.

Figure 1. Scheme of the methodology of the conducted research



Source: developed by the authors

The enterprises that make up the Russian economy are considered in the first iteration. At the next iteration, the selection of organizations is composed of representatives of the state corporations "Rostec" and "Rosatom", industrial group "Basic element", JSC "Russian Railways" and other major Russian companies. The possibility of building development trend of lean production (Womack and Jones 2003, Shingo 1992, Ohno 1988, Imai 1997, Deming 1982, Liker 2004) in Russia is the main criterion. Further, the enterprises are divided into three groups: possessing exhaustive information for subsequent findings; with incomplete information, which contains the interim results of implementation of the lean production; with negligible open data. It should be noted that the last group has a very small array of enterprises. The main conclusions of the study are based on the enterprises of the first two groups. Of course, the most important conclusions regarding the achieved economic

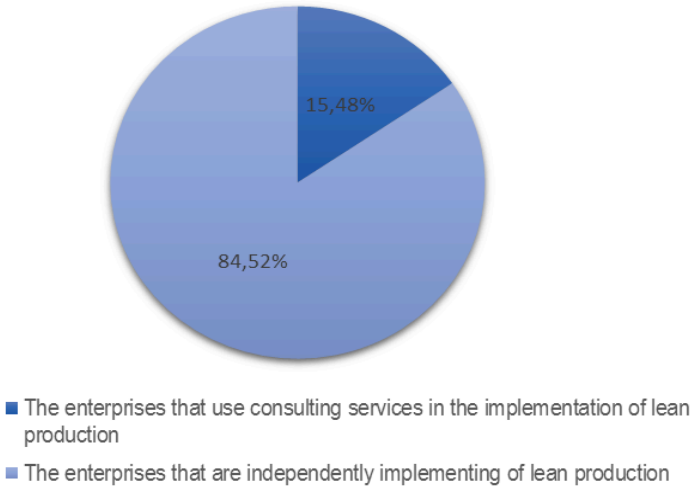
effect from the use of efficient model of resource management are added to the enterprises that have complete information. Then it should go to the research findings.

3. Demonstrations

Turning to the results of the study, the absolute superiority of the concept of lean production in the Russian industrial sector is remarkable. And it is not surprising. Practical application of lean production at the Russian industrial enterprises started in 2000-ies. The first implementation of this concept of organization of internal production processes and resource management (Katkalo 2002, 2003, Kleiner 2011, Glukhov *et al.* 2012) was carried out in 2001 at JSC «Ford Motor Company» (Vsevolozhsk, Leningrad region). This experience has remained essentially unnoticed by the public due to the high degree of closeness of the corporate culture of the company. The first 3-4 years of existence of the «Ford Motor Company» is probably the only case of the introduction of effective management model in Russia.

And, notably, increasingly companies prefer to independently interpret and develop business processes according to this concept instead of using of consulting services of foreign companies that have extensive experience in the implementation of the modern organizational technologies (Byrne 2013, Emiliani 2014), see Figure 2).

Figure 2. Percentage distribution of the enterprises according to the nature of the development of the concept of lean production



Source: developed by the authors

It is important that the path of development is not the main interest as the main criterion of the effectiveness of a particular model of management is the increase of efficiency of performance. Economic effect from implementation of activities under the selected development strategy is the main characteristic of a successful enterprise. The subjectivity of this indicator in absolute terms is high enough. Since the different key characteristics of the enterprise have different performance indicators. But, nevertheless, systematization of the results of the transformations carries an informative role. The economic effects from implementation of Lean Production in some of the analyzed Russian enterprises by the end of 2015 are presented in table 1.

Table 1. The economic effect from the introduction of lean production on the separate Russian enterprises

Name of the company	Year of introduction of the lean production	The economic effect in 2015, million rubles	Revenue in 2015, million rubles	The share of economic impact in revenue, %
PJSC "Motovilikhinskiye Zavody"	2014	205	4.197,452	4,88
JSC "TGC-1"	2011	1.229	65.173,000	1,89
JSC "Atomenergomash"	2007	354	48.600,000	0,73
ZAO "Aviastar-SP"	2008	22	6.747,033	0,33
Group "the Chelyabinsk pipe-rolling plant"	2014	182	97.184,656	0,19
Group "Novolipetsk steel"	2009	543	674.648,000	0,08
PJSC "SIBUR holding"	2011	170	285.545,215	0,06

Source: developed by the authors on the basis of the data of the companies' official sites

The absence of proper evaluation mechanism is the reason that only about 8% of the studied enterprises estimated economic effect.

Analyzed trends show that the influence of the economic effect on revenue in most cases is minor. A comparison of these values is related to the economic concept of "economic effect" that is defined as a type of effect that has a direct monetary form, that is measured in monetary or physical meters[6] and consists of additional profits. This profit, in turn, is determined by how the revenue and production costs of the enterprise will change in connection with the implementation of these actions of lean production[7]. Consequently, the key approach to calculating the economic effect of any action (including activities to optimize business processes) means to determine how much more the company will get and how much more to pay in connection with the implementation of the above activities.

At the moment, there are internal methods of calculating the economic effect of many of the enterprises that introduce modern models of management. Such enterprises as JSC "Russian Railways", JSC "KAMAZ", GK "Rosatom", which build a modern production system, are highlighted. Their methods of calculation differ in the clarity, definition and detail descriptions as well as its rational approach. The author's interpretation of the concept of calculation of economic effect from introduction of activities on optimization of the business processes is based on the methods of the above organizations. Before proceeding to the definition of economic effect, it should thoroughly study both the enterprise and the programme of activities in the framework of the production system. Thus, implemented projects and introduced offers can promote the formation of the following indicators of the effects:

- release areas;
- defect reduction;
- reduction of inventory levels;
- getting the additional volumes of products;
- reduction of both the duration of the production operations and work time of employees;
- materials' saving;
- lower operating costs, *etc*.

Further, the action programme includes the following items:

[6] The effectiveness of management. URL: http://bmanager.ru/articles/effektivnost-menedzhmenta.html (accessed January 31, 2017).

[7] Long-term target program "Implementing methods of "Lean production" in the Republic of Tatarstan in 2012-2013" (approved by the decree of Tatarstan Cabinet of 6 February 2012 No. 85).

- to calculate the costs before the implementation of activities, by defining the resource consumption in physical units and identification of the relevant costs of used resources;
- to calculate the costs after the implementation of activities, by defining the resource consumption in physical units and identification of the relevant costs of used resources;
- to calculate the resulting savings in monetary terms;
- to estimate the costs of implementation activities (one-time costs, for example, costs of labour, materials, services, internal and external contractors, transport costs *etc.*);
- to estimate the additional profit generated after the completion of activities (such as income from the sale of additional products, the revenues from the use of released resources).

Thus, the formula of calculating economic effect is following:

$$Eec. = (C0-C1)-Cimp. + Padd. \quad (1)$$

where: Eec. – economic effect, monetary units; C0 - costs before the implementation of activities, monetary units; C1 - costs after the implementation of activities, monetary units; Cimp - costs of implementation activities, monetary units; Padd. - additional profit generated after the completion of activities, monetary units.

Economic effect is very important performance indicator. And that's why application of uniform method of calculation is necessary for evaluating the effectiveness of the implementation of the concept of lean production. It gives the opportunity to compare the degree of success of the different companies.

Conclusion

Summing up the research, it is possible to formulate the main results and conclusions:

- The geopolitical situation and the absence of major structural changes in the Russian economy raise the question of implementing effective management models at the enterprises of the Russian industrial sector that can be competitive on a global level.
- Lean pproduction has received the widest spread of the modern management concepts in Russian industry, and it is noteworthy that the first successful experience of practical implementation for a long time was the only and not seen by a wide range of the public due to the lack of available information. Independent interpretation of the principles of this concept prevails in the Russian experience.
- The economic effect from the use of lean production at the enterprises of Russian industry is extremely low and vary mostly in the 1% of revenue.
- There are very few companies that have been able to calculate the economic effect from the introduction of lean production. The reason for this is the absence of unified method of calculation the economic effect in Russian practice.
- The formula of calculating economic effect which is based on the different experience of Russian and foreign companies was offered.
- It should be noted that the obtained results clearly demonstrate the potential for further development, among which it is worth first of all to pay attention to the logic and consistency of activities in the framework of lean production. The achieved economic results show the hidden potential, the identification and use of which will allow to get closer to the goal on the path of structural changes of the Russian economy and the efficiency of Russian industrial sector.

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Trade Openness and Employment: Evidence from Nigeria

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Abstract

The rate of Unemployment has been on the increase over the years in Nigeria despite all the direct labour policies that the government have implemented to no avail. Scholars have observed that trade openness is a way to address the problem of unemployment in literature. But the debate on this has been indecisive in developing economies, so it becomes necessary to investigate this relationship in Nigeria. The identified Vector Error Correction model and Granger Non-Causality are used for this purpose. Our findings show short-run, but no long-run causalities among employment, trade openness, Real Gross Domestic Product, Consumer price index, exchange rate and interest rate. Negative long-run relationship between trade openness and output has also been established. This implies that trade has been harmful to employment generation. It was recommended that the government should increase their competitiveness in the international market and make use of interest and exchange rates for trade competitiveness.

Keyword: trade openness; employment; vector error correction; short- and long-run causality

JEL Classifications: F6; J6; C3; C410

Introduction

One of the main macro-economic goals of every nation is to attain full employment. This has been the main focus of most developed and developing economies, unlike developing economies where unemployment has been the main cause of backwardness. Nigerian government had implemented various policies and programmes to improve economic growth with the aim to provide more employment opportunities. Nigerian economy had been experiencing growth for some decades before the recent economic recession, but the growth is not inclusive (Oloni, Asaleye, Abiodun and Adeyemi 2017, Campbell and Asaleye 2016, World Bank 2014). Though in literature, it has been argued that there is a positive relationship between economic growth and employment, (theoretically Okun 1962, and empirically Iwayemi 2006, Barkely 2001). However, trade has been considered as the core instrument of development strategies by Nigeria's government, because of the inherent belief that trade can create jobs, expand markets, increase income, as well as facilitating competition and disseminating

knowledge (WTO 2005). Most studies in Nigeria have focused on output and employment; following Pesaran and Shin (2001), this paper used identified Vector Error Correction Model (VECM) and Granger Non-Causality test proposed by Toda and Yamamoto (1995) to examine the relationship between trade and openness in Nigeria. The rest of this paper is organised as follows: Section II discusses literature review. Section III presents methodology of the study, which includes the theoretical framework of the study and model specification. Section IV presents the result of the analysis while Section V concludes and recommends.

1. Literature review

During the last three decades, trade liberalisation was encouraged by several developed and developing countries because of the assumed benefits that could accrue in the areas of substantial wage increase and relative labour demand. Unemployment has been on an increasing trend in Nigeria for decades. International Monetary Fund (2015) observes that unemployment figure stands at 13.1%, 13.6%, 14.8%, 13.4% and 23.9 % in 2000, 2002, 2004, 2005 and 2011 respectively. However, the Nigerian government has adopted various policies and programmes to promote growth and reduce unemployment. these policies include the Structural Adjustment Programme (SAP) between 1986 and 1989, National Rolling Plans between 1990 and1999, vision 2010, National Economic Empowerment and Development Strategies (NEEDS) (2003 to 2007), the seven point agenda (2007) and various previous National Development Plans like the First National Development Plan (1962-1968), Second National Development Plan (1970-1974), Third National Development Plan (1975-1980) and Fourth National Development Plan (1981-1985) among others.

On theoretical perceptive, Heckscher-Ohlin (1967) and Stolper and Samuelson (1948) HOS[8] show the benefit from international trade and its implication for the labour market performance. HOS stressed the benefit from trade through the comparative advantage while the new trade theory stressed benefit through the competitive advantage. Helpman and Itskhoki (2010) examine two – sector model of international trade in 'a two–country' analysis. In the scholars' model, one sector is assumed to produce homogeneous products and the other producing differentiated products. It was concluded by Helpman and Itskhoki (2010) that openness to trade increase a country's rate of unemployment if its relative labour market frictions in the differentiated market sector are low and reduces unemployment if it is high. The classical and neoclassical trade theories can be questioned concerning developing and poor countries, because the approach of both schools of thoughts to division of labour and specialisation can be argued not to have mutually benefited. The classical and neoclassical trade theories may generate increased gap between rich and poor countries, so there might be need for trade restrictions based on the infant industry argument, structural perspective, among others. Some scholars believe that developing countries were denoted outside edge in the context of trade activities while developed countries were described as industrial centres (Cypher and Dietz 2004); and import substitution industrialization, among others (Baldwin and Clark 2002). As earlier mentioned, the neoclassical theories stressed the benefit from trade through comparative advantage while the new trade stressed the benefit through competitive advantage. On this perceptive, it's worth testing the efficacy of both trade theories on developing economy like Nigeria.

On empirical review in developed economies, Chu-Ping Lo (2016) examines the relationship between Openness and Urbanisation in China. He pointed out that urbanisation usually occurs with the structural transformation driven by push and pull factors. Push from agricultural productivity growth and a pull from industrial productivity growth and vice-versa. The scholar concluded that China has experienced a structural transformation from agricultural productivity growth to industrial productivity growth, and also that other developing countries' business services intensity will follow this same path. Itskhoki and Helpman (2015) examine trade liberalisation and labour market dynamics with heterogeneous firms. They found out that gains from trade due to a reduction in the consumer price index devastates losses from wage cuts, job destruction, and capital losses of incumbent firms, and that these losses are growing in the level of labour market frictions. Autor, Dorn and Hanson (2012) investigated the effect of trade on the labour market in China and USA, the work focused on the effect of China's export on the USA's economy. Autor, Dorn and Hanson (2012) concluded that importation of

[8] The combination of Heckscher-Ohlin and Samuelson trade theories are referred to as the HOS

Chinese product into the USA's local market affects the local labour market by increasing the unemployment rate as well as lower the labour force participation in the total output, thereby reducing the wage rate.

Gorg and Gorlich (2012) examine the relationship between trade and labour market outcomes in Germany. According to the scholars, Germany is a country with an economy characterised by a high degree of trade exposure in terms of import and export. The result of the findings by Gory and Gorlish (2012) show that there was little impact of trade-related variables which could be positive or negative on labour market performance. It was also stressed by the scholars that the degree of exposure does not really affect the labour market performance in terms of wages as a result of international competition. This result from Gorg and Gorlish (2012) contradict the result of Lurwey and Uhile (2010). Most of other studies in this line concluded that the impact of trade on the labour market is either minimal or no effect (Geishecker and Gory 2011 with respect to the United Kingdom, Geishecker and Gorg 2008 in respect to Germany, and Liu and Trefler 2008 in respect to United States). Felbermayr, Prat and Schmerer (2011) examine trade and unemployment in 20 Organisation for Economic Co-operation and Development (OECD) countries; their result showed that degree of trade openness reduces unemployment in the long-run.

Mesghena (2006) examines the impact of trade liberalisation on relative wage and employment of unskilled workers in the United States; it was shown by the scholar that the increase in exports significantly raises the relative wage of unskilled labour, whereas a rise in foreign direct investment abroad and immigration both significantly reduce the relative wage of unskilled labour. The scholar result showed that an increase in exports and productivity have significant positive influence on employment of unskilled labour, whereas an increase in foreign direct investment abroad, import and immigration have a significant negative influence on employment of unskilled workers.

In developing countries, Kurihara and Fukushima (2016) findings showed that greater openness of the economy does not always mean greater economic growth in emerging and developing countries. The scholars concluded that economic conditions and market structures related to international trade must be considered carefully to achieve inclusive economic growth. Serdaroglu (2015) analysed the effects of openness on total factor productivity in Turkey. The result of the research work revealed that the impact of openness on total factor productivity is significant and positive along with the other determinants of total factor productivity specified as human capital, foreign direct investment, financial development, innovation, macroeconomics stability and governance indicators in their sample period. However, the relationship between openness and total factor productivity shows different descriptions when some periods are taken into account. The result indicates that structural policies addressing total factor productivity determinants are likely to increase the long-run possible growth rate, the development level and the welfare of Turkey.

Stefan, Marco and Michael (2013) examined the effect of trade liberalisation on employment in Switzerland. The scholar results suggest that trade liberalisation has a positive effect on employment. It should be clear, though, that the effect is likely to vary across different episodes of trade liberalisation. Olayiwola and Rutaihwa (2010) examined the effect of trade liberalisation on employment performance of textile industry in Tanzania using co-integration method of analysis. Their investigation showed that effective rate of protection and export concentration has an insignificant positive effect on demand for labour, but import penetration has a significant negative effect on employment. Also, only import penetration has a significant negative effect on wage. The impact of import penetration is greater than that of export concentration, as the rise in import competition leads to a drop in the demand for labour.

From the foregone, evidence from empirical literature have shown that impact of trade on employment differs in developed and developing economies. Theoretically, there is no consensus between HOS and the new trade on developing economies. So the question is 'what is the relationship between trade openness and employment in Nigeria'? This is the main thrust of this paper. In Nigeria, Lawal, Nwanji, Asaleye and Ahmed (2016) examine the nexus among economic growth, financial development and trade openness using the ARDL bound estimation techniques. The result of Lawal, Nwanji, Asaleye and Ahmed (2016) show that a two-way co-integration exists between economic growth and financial development, on the one hand, as well as between economic growth and trade openness, on the other hand. The scholars recommended that in order to achieve

economic growth, policymakers should pursue strong financial development and increase trade openness. Most other studies in Nigeria used cross sectional data, Kareem (2009) stressed that there is scarcity of literature between openness and employment in Nigeria, despite its importance in the economy, which motivated the scholar to examine trade flow and employment within the periods of 1981 to 2006 using Ordinary Least Square (OLS) techniques. This may be due to methodological and data problems.

This study examines the relationship between trade openness and employment in Nigeria using identified VECM approach and Granger Non-causality proposed by Toda and Yamamoto (1995). This study imposed theory-based identifying restrictions on the co-integrating vector in order to reduce the general VECM to a parsimonious representation (Pesaran and Shin 2001). To the best of our knowledge, no study has considered this, in relation to trade openness and employment in Nigeria. The Granger Non-causality approach by Toda and Yamamoto (1995) fits a standard vector autoregressive model by putting into consideration first differences, wrong identification of the order of integration among others (Mavrotas and Kelly 2001).

2. Theoretical framework and empirical model

The theoretical framework of this study is built on the competitive labour market. Considering the labour demand by Revenga (1992) in industry i and year t (L_{it}) given in the first difference form as:

$$dIn\, emp_{it} = dZ_{it}\Pi + \theta_1\, dIn\, p_{it}^{n} - \theta_2\, d\ln W_{it} + \varepsilon_{it} \tag{1}$$

where: Z_{it} a vector of observable factors that are responsible for shifting the demand for labour in industry i and year t. Π Is a vector of parameter, p_{it}^{n} is the domestic currency price of the imported goods. W_{it} is the industry wage and ε_{it} is an error term reflecting unmeasured labour demand shock. The reduced form of equation (1) at steady state can be written as:

$$d\ln emp_{it} = \gamma_1 dZ_{it}\Pi + \gamma_2\, dIn\, p_{it}^{n} + \gamma_3\, dH_{it} + v_{it} \tag{2}$$

Equation (2) represents the quasi – reduced form equation for changes in labour market (employment) and v_{it} represents unmeasured components of employment variation, which is combined of the unmeasured labour demand shock[9]. To examine the linkage between employment and openness, equation (2) was adjusted and stated in the VAR form as shown below:

$$EMP_t = \sum_{i=1}^{n}\alpha_{1i}OT_{t-i} + \sum_{i=1}^{n}\beta_{1i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{1i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{1i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{1i}INT_{t-i} + \sum_{i=1}^{n}\chi_{1i}EMP_{t-i} + \mu_{1t} \tag{3}$$

$$OT_t = \sum_{i=1}^{n}\alpha_{2i}OT_{t-i} + \sum_{i=1}^{n}\beta_{2i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{2i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{2i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{2i}INT_{t-i} + \sum_{i=1}^{n}\chi_{2i}EMP_{t-i} + \mu_{2t} \tag{4}$$

$$rgdp_t = \sum_{i=1}^{n}\alpha_{3i}OT_{t-i} + \sum_{i=1}^{n}\beta_{3i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{3i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{3i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{3i}INT_{t-i} + \sum_{i=1}^{n}\chi_{3i}EMP_{t-i} + \mu_{3t} \tag{5}$$

$$CPI_t = \sum_{i=1}^{n}\alpha_{4i}OT_{t-i} + \sum_{i=1}^{n}\beta_{4i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{4i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{4i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{4i}INT_{t-i} + \sum_{i=1}^{n}\chi_{4i}EMP_{t-i} + \mu_{4t} \tag{6}$$

$$XD_t = \sum_{i=1}^{n}\alpha_{5i}OT_{t-i} + \sum_{i=1}^{n}\beta_{5i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{5i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{5i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{5i}INT_{t-i} + \sum_{i=1}^{n}\chi_{5i}EMP_{t-i} + \mu_{5t} \tag{7}$$

$$INT_t = \sum_{i=1}^{n}\alpha_{6i}OT_{t-i} + \sum_{i=1}^{n}\beta_{6i}rgdp_{t-i} + \sum_{i=1}^{n}\lambda_{6i}CPI_{t-i} + \sum_{i=1}^{n}\psi_{6i}XD_{t-i} + \sum_{i=1}^{n}\sigma_{6i}INT_{t-i} + \sum_{i=1}^{n}\chi_{6i}EMP_{t-i} + \mu_{6t} \tag{8}$$

[9] Revenga (1992) considered both the labour demand and supply, in which wages (W) was considered in the labour supply. This paper focused on the demand side; therefore, wages (W) was removed from the equation.

where OT_t, CPI_t, $rgdp_t$, XD_t, INT_t are trade openness, consumer price index, economic growth, exchange rate and interest rate respectively at time t. The observable factors are represented by RGDP, CPI, XD and INT and trade openness is represented by OT. It is assumed that μ_{it} where $i = \{1, 2, ..., 6\}$ are uncorrelated.

The research technique used for this analysis includes investigating the properties of the data for stationarity and co-integration through the use of Augmented Dickey Fuller (ADF) and Philips Perron (PP) for the unit root test and Johansen approach for the Co-Integration test. Based on the resulted presented in the next section, the study estimated the VECM. The joint long and short-run – causality was tested through the estimation of the system of the VECM by the least square method and WALD test respectively. For the long-run relationship, this study follows Pesaran and Shin (2001) to impose long-run structural identified restriction on the cointegrating vectors. Though, the most common approach for identification is the Johansen's statistical approach which has been criticised as a pure mathematical convenience rather than an economical approach by Pesaran and Shin (2001). The lag selection is based on the Akaike Information Criterion (AIC) and the estimated VAR was subjected to diagnostic checking.

The Granger Non-Causality approach proposed by Toda and Yamamoto was used to test the causality between trade openness and employment. The basic idea of the Granger non-causality test is to correct VAR order. Given K by the maximal order of integration, say d_{MAX}, if this is done, $(K + d_{MAX})^{th}$ order of VAR is estimated and the coefficient of the last lagged d_{MAX} vectors are not considered (Wolde-Rufael 2004, Rambaldi 1997, Zapata and Rambaldi 1997). This approach ensures that the test statistic for Granger causality has the standard asymptotic distribution (compared to the previous method of Granger causality) where valid inference can be done (Toda and Yamamoto, 1995). The model is specified below:

$$OT_t = \alpha_0^* + \sum_{i=1}^{K} \alpha_{1i}^* OT_{t-i} + \sum_{j=k+1}^{d\max} \alpha_{2j}^* OT_{t-j} + \sum_{i=i}^{k} \phi_{1i}^* E_{t-i} + \sum_{j=k+1}^{d\max} \phi_{2j}^* E_{t-j} + \lambda_{1t} \quad (9)$$

$$E_t = \beta_0^* + \sum_{i=1}^{k} \beta_{1i}^* E_{t-i} + \sum_{j=k+1}^{d\max} \beta_{2j}^* E_{t-j} + \sum_{i=1}^{k} \partial_{1i}^* OT_{t-j} + \sum_{j=k+1}^{d\max} \partial_{2j}^* OT_{t-j} + \lambda_{2t} \quad (10)$$

The data used for the empirical analysis are obtained from Central bank of Nigeria's statistical bulletin and Nigeria National Bureau of Statistics. The degree of openness (OT), the employment rate (EMP), Real Gross Domestic Product (rgdp, is in log form); consumer price index (CPI), exchange rate (XD), interest rate (INT), are our variables of interest. Trade openness is computed by summing of trade inflows (export and import) divided by GDP.

4. Estimation and presentation of results

This section presents the estimation and presentation of results. Firstly, the test for Stationarity was conducted. Then followed by Co-integration test and the Vector Auto-regression and Granger causality estimations were conducted.

4.1 Presentation and discussion of results

4.4.1 Test for stationarity

Most economic variables are usually non-stationary. It is therefore significant to test for Stationarity before generalising any relationship to avoid spurious regression. The Argument Dickey- Fuller (ADF) test and the Philips Perron (PP) test were conducted for the variables in the model to test for the presence of a unit root in the data. The two types of unit root tests were conducted to show that the data is actually stationary as one will be complimenting the other. The ADF tests are sensitive to whether an intercept and/or a time trend is/are included (Dickey and Fuller 1979, 1981). The PP test is sensitive to the structural change in the mean of a stationary variable which are captured in the test in order to avoid bias in the usual unit root test towards non-rejection of the null of unit root (Perron 1989). Table 1 below shows the result of the ADF and PP unit root test.

Table 1. Unit root test for Augmented Dickey Fuller and Philips Perron test results

Series	ADF at Levels	ADF at First Difference	Order of Integration	PP at Levels	PP at First Difference	Order of Integration
OT	-3.054119	-8.443403	I(1)	-3.039320	-10.01863	I(1)
EMP	0.635177	-6.431402	I(1)	0.835255	-6.391498	I(1)
Rgdp	0.080907	-5.602885	I(1)	0.164809	-5.602812	I(1)
CPI	0.604494	-6.415443	I(1)	-0.457349	-6.466610	I(1)
XD	-0.202051	-5.377034	I(1)	-0.202051	-5.377034	I(1)
INT	-2.947660	-6.386385	I(1)	-2.841270	-7.930789	I(1)

Source: Author's computation

From the Table 1 above, it can be observed that OT, EMP, rgpd, CPI, XD and INT were not stationary at level at 5 percent level of significance for Augmented Dickey Fuller and Philips Perron respectively, where we found that all the variables are integrated of order (1).Thus the null hypothesis of the presence of a unit root is rejected at first difference as the absolute values of the calculated ADF test statistics and Philips Perron test statistics were greater than the critical values at 5% level of significance.

4.2. Summary of Johansen CoIntegration test results

The Johansen co-integration is explained using the Unrestricted Cointegration Rank test (Trace) and Unrestricted Cointegration Rank test (Maximum Eigenvalue). The trace indicates three (3) cointegrating equations and the maximum eigenvalue also indicates three (3) cointegrating equations both at five percent level of significance. This means that the variables used for this study are cointegrated in the long-run, based on this result the Restricted VAR model (known as VECM) would be applied. According to Engel and Granger (1987) the vector error correction has co-integration relations that are incorporated with its specification that restricts the long-run behaviour of the endogenous variables to converge their co-integrating relationship while allowing for short-run adjustment dynamics.

4.3. Presentation of the VECM result

Table 2. Summary of Short and Long Run Joint Causality from VECM

Long Run Joint Causality				
Coefficient Value: C(1)	No of Co-integrating equation(s)	No of Lags	Probability Value	Evaluation of Hypothesis
0.160787	3	2	0.5370	Accepted
Short Run Joint Causality (Wald Test)				
Null Hypothesis C(4):C(15) = 0	Chi-Square Value	df	Probability Value	Evaluation of Hypothesis
	53.35318	12	0.0000	Rejected
Transmission Mechanism (Output to Employment)				
Null Hypothesis C(6) = C(7) = 0	Chi-Square Value	df	Probability Value	Evaluation of Hypothesis
	1.602718	2	0.4487	Accepted
Transmission Mechanism (Trade Openness to Employment)				
Null Hypothesis C(10) = C(11) = 0	Chi-Square Value	df	Probability Value	Evaluation of Hypothesis
	5.357112	2	0.0687	Accepted

Note: *Estimation Result from Eviews 9.5 in appendix
Source: Author's Computation

In Table 2 above, C(1) is the coefficient of cointegrating equation (long-term causality), there is no evidence of joint long run causality between E and other variables as the coefficient of C(1) is positive and the probability is more than 0.05, which shows that the variable is not significant at 5% level, so the null hypothesis of no joint long causality is accepted. Also, the table presents the joint short-run causality between E, the lags of both the dependent variable and other variables; C(4) to C(15) are the coefficients of cointegrating equation (short-term causality). The probability of Chi-square is less than 0.05 which therefore shows that there is joint short-run causality, the null hypothesis is rejected. The null hypotheses that C(6) = C(7) = 0 and C(10) = C(11) =0 are both accepted, which means that there is no transmission mechanism from output to employment and likewise, from trade openness to employment in the model.

Table 3. Variance decomposition of employment

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	7.678805	4.918047	15.03029	80.05167	0.000000	0.000000	0.000000
2	8.864784	16.14398	11.32809	61.59700	6.923081	1.180750	2.827108
3	9.228378	18.90704	10.50364	57.85829	7.047635	3.025118	2.658277
4	11.06998	30.96044	14.08439	40.23914	6.428687	6.062407	2.224927
5	13.04185	44.08817	10.97228	29.47831	8.285078	5.104948	2.071214
6	14.45674	46.69230	11.07220	25.71770	7.827216	5.064244	3.626334
7	16.41254	51.48583	11.87297	20.83358	8.317735	4.203241	3.286646
8	18.03166	53.11352	11.45848	19.97930	8.449100	3.513201	3.486392
9	19.38844	52.43525	10.60557	21.20448	8.969353	3.040731	3.744618
10	20.21190	52.65744	10.61451	20.95736	9.243969	2.847421	3.679301

Source: Author's computation

Variance Decomposition of Trade Openness is presented in Table 3 for 10-year period horizons. The most exogenous variables are INT and RGDP, the long-run relationship is more pronounced for these variables. At the end of the 10 year, the forecast error variance of trade openness (OT) explained 3.6% variation in employment while it explained about 21% of its own self. An alternative way in which the information with regards to the relationships among the variables included in the variance decomposition of trade openness analysis is through generalized impulse response function.

4.4. Structural Long Run Cointegrating Vectors

This study denotes three cointegrating vectors associated with $X_t = (GDP, R, OT, EXC, CPI, E)^1$ as β_1^*, β_2^* and β_3^* explaining the following variables GDP, OT and E respectively.

Table 4. Structural Long Run Cointegrating Vectors

GDP		R	O	EXC	CPI	W
β_1^*	β_{11}	β_{21}	β_{31}	β_{41}	β_{51}	β_{61}
β_2^*	β_{12}	β_{22}	β_{32}	β_{42}	β_{52}	β_{62}
β_3^*	β_{13}	β_{23}	β_{33}	β_{43}	β_{53}	β_{63}

Source: Author's computation

Exact identification for this structural equation requires imposing three restrictions per vector, accomplished by one normalisation restrictions each. Specifically, this study excludes CPI (since it does not have any real effect on output in long run). And normalise on RGDP when negative sign restriction is imposed on EMP

(since in the long run as a result of substitution effect from labour to capital; when output increases, employment decreases). OT is normalised and exclusion on RGDP and INT (since to increase the degree of competitiveness in international market, XD and CPI are vital variables). Finally, normalised on EMP and exclusion on OT and CPI while a negative restriction on INT (since there is a trade-off between unemployment and inflation). The structural long run equation is given below:

$$RGDP_t = -0.389936INT_t - 2.806888OT_t + 0.206881XD_t \quad (11)$$
$$(0.012249) \quad (0.16954) \quad (007942)$$
$$[-3.18348] \quad [-16.5557] \quad [2.60492]$$

$$OT_t = -0.242281XD_t + 0.147236CPI_t + 0.307042EMP_t \quad (12)$$
$$(0.02611) \quad (0.01812) \quad (0.02720)$$
$$[-9.27952] \quad [8.12712] \quad [11.2886]$$

$$EMP_t = -10.10618RGDP_t - 0.200064XD_t \quad (13)$$
$$(0.22941) \quad (0.01307)$$
$$[-44.0536] \quad [-14.6352]$$

Equations 11 to 13 present the result of the long run cointegrating vectors of trade openness and employment equation, the chi-square value is 3.057359 and probability value is 0.080372. Equation 11 explained the GDP equation, it shows that interest rate elasticity is negative and significant; the coefficient of trade openness is negative and significant, also the elasticity of the exchange rate is positive and significant. The economic implication of this result is that in the long run as interest rate increases, the economic growth rate decreases; it's worth to mention that this sign is in line with the theory. Also, from the result trade openness have a negative impact on the Nigerian's economy.

Equation 12 explained the OT equation; the coefficient of XD is negative while CPI and EMP are positive. Equation 13 presents the EMP equation; the coefficients RGDP and XD are negative. All the variables in the model are significant at the level of five percent. Despite EMP have a positive relationship with OT in equation 12; there is negative relationship between EMP and GDP. This explained why the increase in economic growth before the recent recession era in Nigeria has not reduced unemployment rate in Nigeria as suggested by Okun's law. The general conclusion that can be drawn is that trade openness have not improved Nigerian's economy as proposed by the neoclassical trade theory. This result was in line with the study of Kurihara and Fukushima (2016) and contrary to Geishecker and Gory (2011); Geishecker and Gory (2008), and Felbermayr, Prat and Schmerer (2011). In order to maximise the benefit from trade in the long-run and promote growth that is inclusive, Nigeria needs to increase the degree of competitiveness as proposed by the new trade theory.

4.5 Result of Causality test

Table 5. Causality test between OT and E

Dependent Variable: OT							
Excluded	Null Hypothesis	dmax	Optimal Lag Used	Chi-square Value	$(K+D_{MAX})^{th}$	Probability Value	Evaluation of Hypothesis
E	E does not granger cause OT	1	6	11.52642	7	0.0734	Accepted
ALL		1	6	11.52642	7		
Dependent Variable: E							
Excluded	Null Hypothesis	dmax	Optimal Lag Used	Chi-square Value	$(K+D_{MAX})^{th}$	Probability Value	Evaluation of Hypothesis
OT	OT does not granger cause E	1	6	14.47219	7	0.0248	Rejected
ALL		1	6	14.47219	7		

Source: Author's Computation

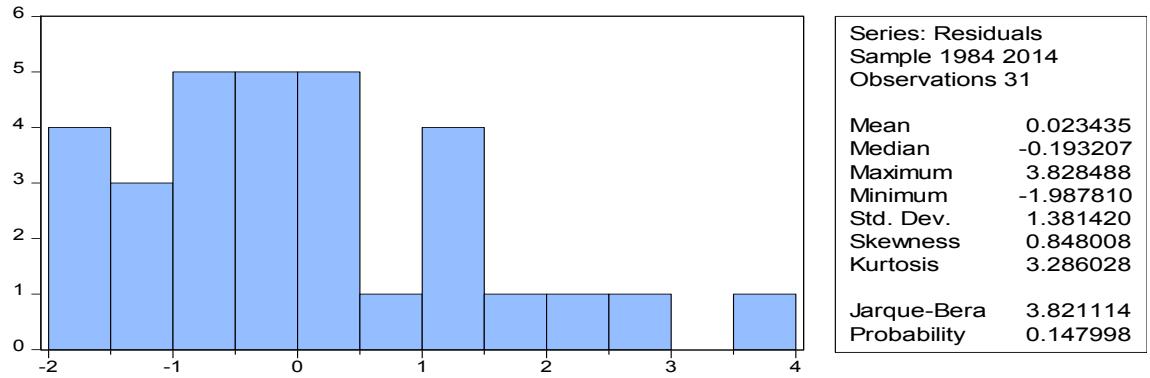
Table 5 above presents the result of the causality test; the null hypothesis that E does not granger cause OT and OT does not Granger cause E is tested. The optimal lag used is six and the order of integration is one. The significance of the ρ-values for the Wald statistic reveals if the hypothesis will be rejected or accepted. The probability values are 0.0734 and 0.0248 for E and OT respectively. The hypothesis is accepted in the first and rejected in the second; there is unidirectional relationship from OT to E with 5% significant level without any opposite causality effect appeared. The implication of the result is that, Nigeria government can maximise the benefit from trade in long-run with the right policies framework and consistence.

4.6. Residual and stability diagnostics

This sub-section presents the diagnostic check on the system of equations; this is to access whether the model is correctly specified. For a model to be correctly specified, it must satisfy the following conditions: residual of the model must be normally distributed; model should capture the autoregressive conditional heteroskedasticity (ARCH) effect; model must not have any serial correlation and finally; must satisfy the stability condition.

4.6.1 Normality test

Figure 1. Histogram Normality Test



Source: Author's computation

Figure 1 above shows the histogram normality test; from the figure it can be depicted that the residual is normally distributed since the probability of Jarque-Bera Statistics is more than 5%. Hence, the null hypothesis that residuals are normally distributed is accepted.

4.6.2 Serial Correlation Test

Table 6. Serial Correlation LM Test

Breusch – Godfrey Serial Correlation LM Test			
F-statistic	1.321304	Prob. F(2,14)	0.2981
Obs R –squared	4.922355	Prob. Chi – Square (2)	0.0853

Source: Author's computation

In Table 6, the null hypothesis that there is no serial correlation is tested. The probability value is higher and hence the null hypothesis is accepted, means that there is no serial correlation.

4.6.3. Heteroskedasticity Test

Table 7. Heteroskedasticity Test

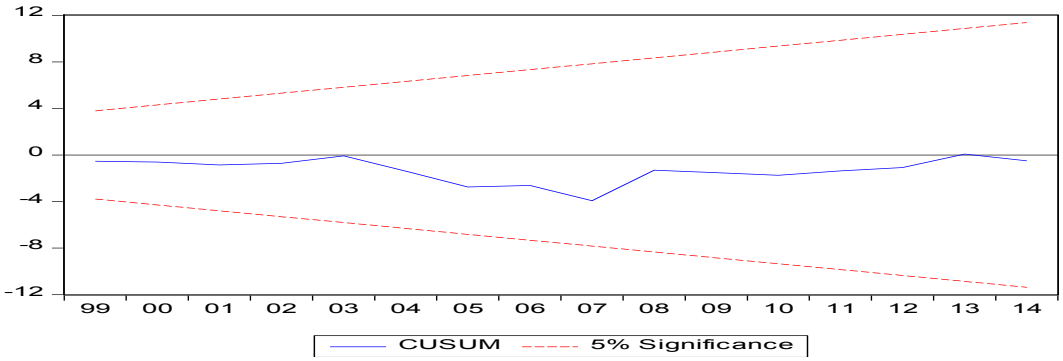
Heteroskedasticity Test ARCH			
F-statistic	0.401622	Prob. F(2,26)	0.6733
Obs R –squared	0.869076	Prob. Chi – Square (2)	0.6476

Source: Author's computation

In Table 7, the null hypothesis that there is no ARCH effect is tested and the result from the table indicates the Probability of the Chi-Square is greater than 0.05. Hence, the null hypothesis is accepted, which means that there is no ARCH effect.

4.6.4 Stability Test

Figure 2. Stability Diagnostics for EMP

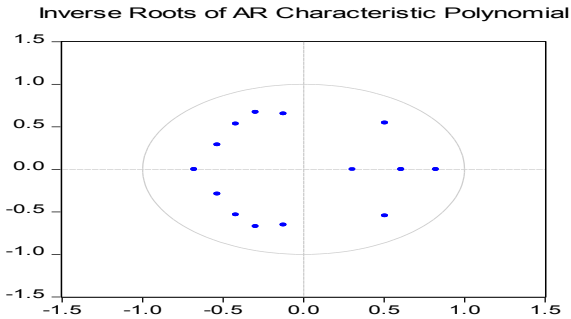


Source: Author's Computation

The Figure 2 presents the stability test using the CUSUM test. From the figure, it is shown that the model is stable; as line is in-between the upper and lower boundaries at 5% level of significance. Hence the model satisfies the stability condition.

4.6.5 VAR Stability Test

Figure 3. Stability Diagnostics for EMP



Source: Author's Computation

Figure 3 presents the stability test for trade openness and employment model it can be shown that the model satisfies the stability condition.

Conclusion

This study investigated the relationship between trade openness and employment in Nigeria, this was motivated by the fact that the unemployment rate in Nigeria has been on increasing trend despite various attempts by Nigerian government to curb the situation. The paper uses both Augmented Dickey-Fuller and Phillips-Perron to test for the presence of unit root. The unit root test reveals that the variables are nonstationary and were made stationary after the first difference. Johansen's co-integration was used to test for cointegrating vectors; the trace and maximum eigenvalue indicate three co-integrating equations at five percent level. The result suggests that the set of cointegrated time series have an error-correction representation, which reflects the long run adjustment mechanism. Based on the result, the VECM was estimated following Pesaran and Shin (2001) to impose restrictions for identification. The result of the VECM reveals that there is no joint long run causality with the dependent (employment) and other variables (economic growth, interest rate, exchange rate and consumer price

index). However, there is an existence of joint short run causality. The structural long run identified equations show that interest rate elasticity is negative and significant; the coefficient of trade openness is negative and significant, also the elasticity of the exchange rate is positive and significant. The economic implication of this result is that in the long run as the interest rate increases, the economic growth rate decreases, and openness has not improved the economic performance in Nigeria. The result of the causality test following Toda and Yamamoto (1995) approach to causality showed that there is unidirectional relationship from trade openness to employment. The variance decomposition shows that the contribution of trade openness to employment is minimal from the short-run to long-run.

The models are subjected to diagnostic tests; for a model to be correctly specified, it must satisfy the following conditions: residual of the model must be normally distributed; model should capture the autoregressive conditional heteroskedasticity (ARCH) effect; model must not have any serial correlation and finally; must satisfy the stability condition. The model for this study satisfies all the stated condition. The overall conclusion that can be drawn from the results is that trade Openness has negative impact on employment in Nigeria. The result has clearly shown that the growth rate experienced within the periods of 1981 to 2014 has been jobless. It is also shown that exchange rate; interest rate and consumer price index are variables to be considered in stimulating growth in the employment in the short run. Based on the findings, the study suggested restrictive measures to maximise the benefit of trade openness in the long run; this is in congruence with the tenet of the new trade theory in order to increase the degree of competiveness.

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Appendix

Table 1. Unrestricted Cointegration Rank (Trace)

Series: EMP RGDP INT OT CPI XD	Lags interval (in first differences): 1 to 2			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.900542	162.3343	83.93712	0.0000
At most 1*	0.768679	90.78554	60.06141	0.0000
At most 2*	0.611531	45.40314	40.17493	0.0136
At most 3	0.264292	16.09136	24.27596	0.3730
At most 4	0.162424	6.576778	12.32090	0.3693
At most 5	0.034309	1.082244	4.129906	0.3468

Note: Trace test indicates 3 cointegrating equ (s) at the 0.05 level; *Denotes rejection of the hypothesis at the 0.05 level; *Mackinnon-Haug-Michelis (1999) p – values

Table 2. Unrestricted Cointegration Rank (Eigenvalue)

Series: EMP RGDP INT OT CPI XD	Lags interval (in first differences): 1 to 2			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.900542	71.54874	36.63019	0.0000
At most 1*	0.768679	45.38240	30.43961	0.0004
At most 2*	0.611531	29.31178	24.15921	0.0092
At most 3*	0.264292	9.514582	17.79730	0.5375
At most 4	0.162424	5.494534	11.22480	0.4107
At most 5	0.034309	1.082244	4.129906	0.3468

Note: Max-eigenvalue indicates 3 cointegrating equ (s) at the 0.05 level; *Denotes rejection of the hypothesis at the 0.05 level; *Mackinnon-Haug-Michelis (1999) p – values

Table 3. Variance Decomposition of RGDP

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	0.052400	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.307461	55.65620	12.45741	1.183473	30.06857	0.297459	0.336882
3	0.452351	37.22254	8.642124	27.19395	15.79527	4.969372	6.176748
4	0.538552	34.35907	6.251516	36.05736	12.14417	6.814770	4.373120
5	0.615461	35.88719	4.798678	39.42523	9.508150	6.917516	3.463235
6	0.720705	41.57883	3.528792	38.02577	7.888742	6.351572	2.626297
7	0.798467	46.63843	2.875626	34.83196	8.073216	5.417432	2.163333
8	0.834054	48.23984	2.689272	34.06493	7.917326	5.022639	2.065991
9	0.860916	49.40714	2.556902	33.37792	7.977585	4.724534	1.955918
10	0.882043	49.31216	2.963616	33.12992	8.078787	4.505434	2.010088

Table 4. Variance Decomposition of INT

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	4.963371	17.04860	82.95140	0.000000	0.000000	0.000000	0.000000
2	6.430233	25.97957	70.53568	0.845561	0.300368	2.252268	0.086555
3	7.247308	22.37328	65.50782	6.370608	2.899308	2.764970	0.084015
4	8.433770	20.71309	68.41151	4.704333	3.091569	2.324634	0.754862
5	9.365555	18.55309	68.58592	4.493165	4.634810	2.927000	0.806012
6	10.06791	16.40242	66.53906	6.635956	6.312439	3.360112	0.750016
7	10.73596	15.21801	66.89372	5.842176	7.372414	3.090981	1.582692
8	11.34378	14.32211	67.16155	5.250127	8.432937	2.974034	1.859245
9	11.91659	13.26491	67.22616	4.950286	9.871861	2.843505	1.843275
10	12.56023	12.77538	67.38564	4.501420	10.68173	2.600461	2.055369

Table 5. Variance Decomposition of OT

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	7.678805	4.918047	15.03029	80.05167	0.000000	0.000000	0.000000
2	8.864784	16.14398	11.32809	61.59700	6.923081	1.180750	2.827108
3	9.228378	18.90704	10.50364	57.85829	7.047635	3.025118	2.658277
4	11.06998	30.96044	14.08439	40.23914	6.428687	6.062407	2.224927
5	13.04185	44.08817	10.97228	29.47831	8.285078	5.104948	2.071214
6	14.45674	46.69230	11.07220	25.71770	7.827216	5.064244	3.626334
7	16.41254	51.48583	11.87297	20.83358	8.317735	4.203241	3.286646
8	18.03166	53.11352	11.45848	19.97930	8.449100	3.513202	3.486392
9	19.38844	52.43525	10.60557	21.20448	8.969354	3.040731	3.744618
10	20.21190	52.65744	10.61451	20.95736	9.243969	2.847421	3.679301

Table 6. Variance Decomposition of CPI

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	16.70916	32.69232	20.59541	0.002843	46.70943	0.000000	0.000000
2	22.46074	22.55225	17.18634	17.75683	30.24167	5.499218	6.763700
3	26.42203	22.01644	12.74750	24.88446	26.14359	8.935320	5.272694
4	29.75867	27.57901	10.04946	25.61544	22.80524	9.720330	4.230523
5	36.32185	40.71623	7.322715	20.63250	19.54008	8.816631	2.971849
6	43.35524	50.81650	5.582554	14.77006	19.83123	6.700837	2.298824
7	48.10419	53.93309	5.802368	12.07185	19.56554	5.637560	2.989589
8	52.80229	56.43260	5.686476	10.50906	19.75310	4.687592	2.931162
9	57.04636	58.07346	5.221942	9.728954	20.23690	4.033886	2.704851
10	60.68918	58.71397	4.726329	9.171522	21.24102	3.611089	2.536071

Table 7. Variance Decomposition of XD

Period	S.E	RGDP	INT	OT	CPI	XD	EMP
1	7.561935	5.551410	10.20235	11.08008	20.76080	52.40536	0.000000
2	15.84533	58.26115	2.364030	2.567813	19.79166	15.90760	1.107757
3	24.11988	56.04475	2.254843	4.679959	22.11521	7.892330	7.012909
4	31.26449	59.99488	2.020688	4.435948	23.45060	5.071673	5.026213
5	37.39725	60.63616	1.515406	5.053400	24.35060	3.951022	4.487037
6	42.82240	59.61510	1.172100	5.700335	25.91015	3.349221	4.253088
7	46.99926	60.04796	1.206061	5.099093	26.11324	3.468648	4.065003
8	51.84096	61.05367	1.092057	4.655872	26.01838	3.438773	3.741243
9	56.81664	62.02643	1.087808	4.155474	25.56767	3.639820	3.522800
10	62.26195	63.06695	1.326746	3.593420	24.90032	3.746071	3.366501

Table 8. Structural Long-run Cointegration result

Sample (adjusted): 1984 2014 Included observations: 31 after adjustment Standard errors in ( ) & t-statistics in [ ]			
Cointegration Restrictions: B(1,1)=1, B(1,5)=0, B(1,6)=-1, B(2,1)=0, B(2,2)=0, B(2,3)=1, B(3,5)=0, B(3,6)=1, B(3,3)=0, B(3,2)=0 Maximum iterations (500) reached Restrictions identify all cointegrating vectors LR test for binding restrictions (rank =3): Chi-square (1) 3.057359 Probability 0.080372			
Cointegrating Eq:	CoinEq 1	CointEq 2	Coint Eq 3
RGDP (-1)	1.000000	0.000000	-10.10618 (0.229411) [-44.0536]
iNT (-1)	-0.389936 (0.12249)	0.000000	0.000000
OT(-1)	-2.806888 (0.16954) [-16.5557]	1.000000	0.000000
XD(-1)	0.206888 (0.07942) 2.60492	-0.242281 (0.02611) [-9.27952]	-0.2000064 0.01367 -14.6352
CPI (-1)	0	0.147236 (0.01812) [8.12712]	0
EMP(-1)	-1.	0.307042 (0.02720) [11.2886]	1

Determinants of Debt Maturity Structure in Shariah and Non-Shariah Firms in Pakistan: A comparative Study

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Abstract

Despite the global emergence of Shariah-complaint firms and the resulting interest of investors and policy makers, the research on these companies is still at an embryonic stage. This paper addresses this issue by investigating the capital structure decisions of Shariah compliant firms in comparison with the conventional or non-Shariah firms. Using the theories of corporate debt maturity structure, we carried out the empirical analysis of firm-level factors influencing the debt maturity structure among Shariah firms in Pakistan. Since Shariah compliance entails some specific firm characteristics such as lower debt ratio, lower liquidity, and higher tangibility, we argue that the debt maturity structure of Shariah and conventional firms would differ significantly. Our purpose, therefore, is to explore how Shariah compliance translates into debt maturity structure decisions of these firms. Our results show some significant variations among the impact of various determinants of debt maturity among the Shariah and conventional firms. Our most striking finding is that the debt maturity among Shariah firms is significantly shorter than conventional firms. Amid the dearth of studies investigating the relationship between Shariah compliance and firm's choice of financial decisions, our study would be a source of unfolding the debate and understanding the nature of capital and debt maturity structure of Shariah firms. The research findings are also expected to benefit large and growing clientele of the Shariah firms by providing better insights on the capital and debt maturity structure of these firms.

Keywords: debt; debt maturity structure; Shariah-compliant firms; Non-Shariah firms

JEL Classification: G3; G32

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Introduction

Unlike conventional finance, Islamic finance puts Islamic guidelines of doing business ahead of modern market-based economic rationalities. The Islamic guidelines are mainly based on the moral and ethical values that Islam propagates to attain the objective of economic well-being or *Falah* for all human beings (Sarker 1999). The Shariah law requires the capital market transactions to be free of usury (*riba*), gambling (*mayisir*), and ambiguity (*gharar*) (Bacha 1999). Shariah law is thus the binding set of principles that govern the economic, social, ethical and religious aspects of an Islamic society (Iqbal 1997).

The emergence of Shariah compliant firms in recent years has been a welcome development in world financial markets. Complying with religious and ethical investment requirements, Shariah firms have attracted a large chunk of religious (especially Muslims) and ethical investors to invest in stock markets (Elgari 1993, Omran 2009). The increasingly growing interest of these investors in Shariah compliant firms has resulted in special clientele for these firms and has thus created the need for deeper understanding of Shariah firm's financial policies. Despite this, however, there appears a paucity of research on Shariah firms, in general, and their financing decisions, in particular. This paper is an attempt to investigate the capital structure decisions of Shariah companies with a specific focus on their debt maturity structure.

The advances in corporate finance theory have enhanced our understanding of the capital structure and its related issues. In recent years, optimality of term structure of corporate debt has gained considerable attention for its importance in maximizing firm value. Previous research entails that an ideal or optimal capital structure consists of such a composition of debt and equity that minimizes the cost of capital and maximizes the value of the firm (Bevan and Danbolt 2002; Sayılgan, Karabacak and Küçükkocao 2006). The capital structure theory further suggests that devising an optimal debt policy is not restricted only to optimizing the debt-to-equity ratio; it also involves determining appropriate maturity structure of debt within the capital structure (Stephan, Talavera and Tsapin 2011). Having an optimum mix of long and short term debt is desirable for several reasons ranging from reducing agency cost of debt (Myers 1977), enhancing monitoring effectiveness (Jensen 1986), signaling financial muscle to the outsiders (Flannery 1986), reducing liquidity risk to avoid forced liquidation (Diamond 1991, 1993, Sharpe 1991), and forestalling refinancing risk (Jun and Jen 2003).

The literature on debt maturity structure abounds in conventional finance setup; however, according to the best of authors' knowledge, this study is the first study focusing on the debt maturity structure of Shariah firms. Shariah compliance alters some of the essential firm characteristics, such as leverage ratios, liquidity, and tangibility. The extant debt maturity theories predict the major influence of these firm characteristic over corporate term structure of debt. This paper, thus, attempts to establish a link between Shariah compliance and debt maturity choice of firms. We argue that Shariah firms, for their typical characteristics, possess significantly different debt maturity structure than non-Shariah firms. Using five-year data from one of the important developing markets of the Muslim world, we show noticeable differences among the debt maturity structures of Shariah and non-Shariah firms. First, conforming to what this study hypothesizes; Shariah firms have a greater concentration of short-term debt than conventional firms. This suggests that an average Shariah firm borrows for significantly shorter duration than an average conventional firm. The paper also finds that as a consequence of Shariah compliance the strength of firm-level determinants varies considerably among Shariah and non-Shariah firms.

The paper contributes in several ways. Though, some studies (Gunn *et al.* 2014) have recently attempted to analyze the impact of Islam as a religion on the capital structure of Muslim countries at the macro level, to the best of our knowledge no previous study has focused on this issue at the firm level. Our study, thus, attempts to explicate the how Shariah compliance translates into corporate financing decisions and show that Shariah firms have greater tendency for short-term debt than their non-Shariah counterparts. Secondly, our comparative approach facilitates to highlight some of the unique features of Shariah firms that distinguish them from their conventional counterparts. Finally, our findings may also prove valuable for the Shariah firm clientele to make better investment decisions. The paper is organized as follows. Section 2 contains literature review. Section 3 presents the implication of Shariah compliance on firm's capital and debt maturity structure and develops testable

hypotheses for various firm-level determinants of debt maturity choice. Data and methodology are discussed in Section 4. Section 5 reports empirical results and analysis of findings. Section 6 concludes the study

1. Related literature

Debt maturity has remained an important topic in financial economics the seminal work of MM (1958). However, more focused theories on debt maturity emerged during the 1980s and 1990s[12]. Broadly speaking, the theories of debt maturity are based on asymmetric information, agency costs, and tax hypotheses. Signaling and Agency cost based theories favor the use of short-term debt[13], while tax hypothesis sides long-term debt (Brick and Ravid 1991). A brief review of these theories is presented next.

Modigliani and Millller (1958) built the theoretical foundation for firm's choice of short or long term debt. The irrelevance argument of MM applies to debt maturity in the same way as on the debt ratio. Accordingly, it states that under certain assumption firm value is unaffected by the length of it borrowing. Later research mainly attempted to relax these assumptions and investigated the impact of market frictions emanating from the asymmetric information, agency issues, and taxes.

The debt maturity models based on information asymmetry assume that borrowers have a superior assessment of their expected changes in default risk (Flannery 1986, Kale *et al.* 1991, Noe and Rebello 1996). Hence, information asymmetry models predict debt maturity as a trade-off between information effect of future news and the refining risk firm faces. Information asymmetry models are categorized either as signaling models or adverse selection models.

The signaling models maintain that debt maturity choice has a signaling value for investors and markets which firms can use to convey good or bad prospects. As compared to the long-term debt the short term debt is less sensitive to under-pricing. Accordingly, firms with under-priced liabilities tend to issue short-term liability, while those with overpriced debt would prefer longer term maturities. The high-quality firm would issue short-term debt because of lower financing risk, whereas long-term debt would be preferred by low-quality firms to avoid refinancing risk (Diamond 1991)[14]. Flannery (1986) argues that short-term debt issues are more likely to be followed positive changes in firms stock returns, better ratings, and positive change in unexpected earnings. Those firms whose credit quality is better tend to issue debt with call and conversion feature to separate themselves from the low-quality firm (Robbins and Schatzberg 1986).

In adverse selection models, on the other hand, maturity is chosen to minimize the effect of the cost of privately held information on costs of financing. Given that there is favorable private information which would possibly exert a positive impact on the credit quality of the firm, the firm would be more to shorten its borrowing maturity. The firm would borrow for a shorter period to materialize the benefits of improved credit risk later to keep the refinancing costs lower when the actual credit quality is revealed to markets. In contrast, firms with unfavorable information would prefer issuing debt with longer terms to evade the increasing refinancing costs and liquidity risk after the bad news about their credit quality arrives on the market. According to Lucas and McDonald (1990), firms expecting good news, which can increase share prices in the near future, would most probably delay the debt issue until the news is spreading in the market. However, firms expecting bad news in near future would issue debt of longer maturity instantly.

The explanations based on agency cost hypothesis assume that debt is a source of curbing the agency problems between the management and the shareholders when managers are not the owners of the firms (Jensen 1986). Myres (1977) relates this proposition to the debt maturity structure of the firm by contending that

[12] See for example: Barnea, Haugen, and Senbet (1980), Brick and Ravid (1985), Flannery (1986), Lewis (1990), Diamond (1991).

[13] See Flannery (1986) and Kale and Noe (1990) for signalling models; Myers (1977); Barnea *et al.* (1980) for agency models.

[14] Low-grade firms have also problems raising long term debt, though, which might suggest that the short term debt market are accessed by only two types of borrower, one with very high credit quality and others with poor quality. Medium quality firms hence are more likely to issue long term debt (Diamond 1991).

optimal maturity alleviates the "under-investment" problem of the firm, in which managers are tempted to forgo some positive NPV projects if they benefit creditors more than the shareholders. More specifically, Myers (1977) argues that disincentive to invest (underinvestment problem) can be eliminated if firm times its debt in such a way that it matures before the growth option is exercised. This signifies that firms should borrow for shorter-term if the growth opportunities abound. Hart, Aghion, and Moore (1995) show that at optimal level of firm debt maturity structure the incentive for management to invest in expensive projects are minimized. They argue that in the absence of long-term debt in capital structure firms managers may be encouraged to invest in negative NPV projects for their own perquisites, which might lead firm to the overinvestment problem. Hart and Moore suggest that an optimal level of debt maturity can be arrived by weighing the cost and benefits from the short-term debt. In a similar vein, Barnea *et al*. (1980) contend that because short-term bond prices are relatively less sensitive to shifts in risk of underlying assets, short-term debt could be the source of reducing the incentives for risky asset substitution. Hence, the agency cost or contracting cost perspective on debt maturity structure suggest that firms whose value is largely dependent upon investment or growth opportunities (as against those whose value is determined mainly by assets in place) would find short-term debt preferable to long-term debt.

The crux of the tax based explanation of debt maturity structure is that there exists an optimal level of debt maturity structure where firms reap up tax related advantages (Lewis, 1990). The tax hypothesis argues that when the slope of term structure of is positive, companies would issue debt instruments for a longer period (Bricks and Ravid 1985). This said, the profitable firms would find longer term debt more attractive as it would reduce their tax burden.

2. Hypotheses development

2.1. Shariah compliance and debt maturity

Firms screened as Shariah-compliant have certain characteristics which differ from other companies (Katper, Madun, & Syed, 2015). In contemporary finance literature, some of these distinguishing features of a Shariah firm have been recognized as important factors influencing debt maturity choice. For example, Shariah compliance obligates firms to maintain a limited debt ratio not exceeding a certain level[15]. This limit on having debt in capital structure has a substantial impact on debt maturity structure of the firm. Towards this end, the past literature shows that level of leverage is positively related to the length of maturity of firm's debt (Morris 1992, Leland 1996). According to liquidity risk hypothesis firms with higher debt level offset higher probability of liquidity crisis by borrowing on longer term maturities (Deesomsak, Paudyal and Pescetto 2009). Empirical evidence in conventional firms' case suggests high levered firms borrow more on a longer-term basis than low-levered firms (Cai *et al.* 2008). The implication for this limit leads to the hypothesis that the debt maturity in Shariah firms would tend to be shorter than non-Shariah firms.

Another marked feature that distinguishes Shariah firms from conventional firms is the limit on liquid assets. Shariah compliance requires firms to maintain most of its asset structure in tangible form, with liquid assets not exceeding the certain limit as imposed by the Shariah screening criterion[16]. The maturity matching hypothesis suggests that firms match their liabilities maturities with their asset maturity structure to reduce agency costs. Matching borrowing maturity to asset maturity relieves management of more complicated debt repayment arrangements and hence brings down agency costs of refinancing and restructuring capital structure. The matching principle thus implies that firm with a higher concentration of long term assets in asset structure would borrow long-term debt more if it follows maturity matching principles. For Shariah firm, however, matching principle applies until its borrowing capacity is below the level of maximum debt ratio that it can avail as per Shariah screening guidelines. Therefore, we hypothesize that in comparison to Non-Shariah firms, asset maturity structure would be less influential for the debt maturity choices of the shariah firms.

[15] Depending upon their Shariah screening mechanisms, the maximum debt ratio limit may vary from country to country. However, in most of the case, it hovers around 40%. In Pakistan, the maximum debt ratio that a firm can have is 37% to be qualified as Shariah compliant firm.

[16] In Pakistan, the minimum level for illiquid assets is 20%.

2.2. Determinants of debt maturity

With all these theoretical underpinnings, this research empirically investigates the debt maturity structure of Shariah firms in comparison with non-Shariah firms. Based on the theories of debt maturity choice of firm described in section 2, following hypotheses are developed for empirical analysis.

Growth (GROW). Myers (1977) argues that in typical investment situation when the lion's share of the benefits from a project goes to lenders equity holders might be uninterested in investing in even a positive NPV project. The rejections of such projects create a serious underinvestment problem within a firm. Arguably, firms having greater investment or growth opportunities suffer relatively more from the problem of underinvestment, and as a result, the conflict between equity-holders and bondholders rises. According to Myres (1977), shortening debt maturity, whereby debt maturity falls before the option of the investment opportunity is exercise, can markedly reduce the disincentive to invest and so checks otherwise rising agency conflicts between owners and creditors of the firm. Agency theory, in the presence of underinvestment problem, predicts negative relation of growth opportunities of the firm and the maturity of its debt. According to liquidity hypothesis, if a firm is growing it could be risky. Hence, additional risk caused by growth or new investment could be lowered by long-term debt. This means that liquidity hypothesis predicts a positive relationship between growth and debt maturity structure. Therefore, the testable hypothesis for the possible impact of growth in debt maturity is as follows.

H1: Growth has a positive/negative effect on debt maturity structure of the Shariah and non-Shariah firms

Size (SIZ). Ownership of smaller firms is relatively more concentrated than larger one increasing the agency costs of these companies as managers with more share in ownership tend to be less risk averse. Another reason why agency costs of smaller firms grow up is the larger investment opportunities (Whited 1992). Larger firms issue information about themselves through various ways regularly, hence gathering information about these firms is relatively much easier and cheaper for investors. Large firms also have the advantage of having lesser bankruptcy risk, which enables them to enter long term financial markets like debt and equity more conveniently and successfully (Chittenden, Hall and Hutchison 1996). Moreover, large public issues require sizable floatation costs and involve scale economies that suit larger firms only (Titman and Wessels 1988). For all these reasons, size is expected to be positively related to debt and debt maturity. Therefore, the size hypothesis of debt maturity is as follows.

H2: Size has a positive effect on debt maturity structure of the Shariah and non-Shariah firms

Tangibility (TANG). Greater tangibility lowers bankruptcy costs by allowing higher collateral (Kirch *et al.,* 2012). Therefore, tangibility has a positive effect on debt maturity of firms.

H3: Tangibility has a positive effect on debt maturity structure of the Shariah and non-Shariah firms

Profitability (PROF). A profitable firm has higher taxable income which results in a positive relationship between profitability and debt maturity. Taxability can influence firms' debt maturity because choosing long-term debt over short-term debt can create tax timing option to repurchase and re-issue debt.

H4: Profitability has a positive effect on debt maturity structure of the Shariah and non-Shariah firms

Risk (RISK). Assuming manager's inherent edge over knowledge about the firm, if the company has any secret good (bad) news, then its securities are under-priced (overpriced) in the capital markets[17]. The nature of news (good or bad) determines firm's quality, of which markets are unaware of owing to the presence of asymmetric information. Diamond (1991) showed that good quality firms borrow on a shorter term basis. Flannery (1986) demonstrated that with positive transaction costs, riskier firms unable to pay repetitive rollover cost of financing short-term debt would resort to longer term debt, whereas, low-risk firms will opt for short-term debt. In Kale and Noe (1990), this argument is held up even when the transaction costs do not exist. One plausible reason why good firms are more likely to choose shorter maturity is that they would expect markets to factor in

[17] Note this applies to both debt and equity securities.

their yet unknown news liable to increase their credit quality once it is made public. This account of theoretical reasoning leads to the following relational hypothesis about firm's creditworthiness or quality with debt maturity.

H5: Risk has a positive effect on debt maturity structure of the Shariah and non-Shariah firms.

Asset maturity (ASSM). Matching principle is a popular corporate finance strategy to avoid liquidity risk. Synchronizing cashflows (inflows and outflows) relives firm of complicated refinancing processes, reduces the risk of forced liquidation, and hence increases firm's credit quality. According to Barnea, Haugen and Senbet (1980), tailoring maturity structure of debt to asset maturity structure also helps mitigate agency costs of underinvestment and risk-shifting. If true, firms with a larger base of long-term fixed assets are expected to have a higher proportion of long-term debt in their financing patterns. The relationship between asset maturity and debt maturity is expected to be positive, as firms tend to match the maturity structure of assets and liabilities to reduce the agency costs of debt. The hypothesis develops as follows.

H6: Asset maturity has a positive effect on debt maturity structure of the Shariah and non-Shariah firms.

However, as we argued previously, the impact of asset maturity on debt maturity structure would be less pronounced in case of Shariah firms. *Tax rate (TAX).* Tax hypothesis on debt maturity choice favors longer maturity of debt in capital structure f firm. Depending on the shape of yield curve, tax saving value of long-term debt payments increases if the yield curve slopes upward (Kane, Marcus and McDonald,1985) (Brick and Ravid 1985, Kane, Marcus and McDonald 1985). In another model based on option valuation model in multi-period setting, Kane *et al.* (1985) showed debt maturity as a direct function of floatation costs, and an inverse function of tax-shield advantage (*i.e.* effective tax rate) and the volatility of firm value. This produces tax hypothesis for debt maturity as follows.

H7: Tax rate has a negative effect on debt maturity structure of the Shariah and non-Shariah firms.

Non-Debt tax shield (NDTS). Non-debt tax shield is substitute to debt-related tax shields. The size of a tax shield benefit that a firm receives by issuing long-term debt depends on the size of its non-debt related tax deductible items, such as depreciation amortization and tax credits. The higher the size of these NDTS items, the lesser the taxable income and hence lesser the tax benefits from using long-term debt. Hence, NDTS affects debt maturity negatively.

H8: Non-debt tax shield has a negative effect on debt maturity structure of Shariah and non-Shariah firms.

3. Data and methodology

3.1. Sample

This study employs data from Pakistan, an important emerging market in the South Asian region with the majority of Muslim population. Karachi Stock Exchange (KSE), the premier stock exchange in Pakistan, has been one of the best-performing markets not only in the region but the world[18]. Apart from its main benchmark index dubbed KSE100 index, KSE runs KMI30 index[19] designed to track the performance of Shariah-compliant firms in Pakistan. For the period covering 2009 to 2013, we extracted the financial data for non-financial firms in Pakistan from the *Financial Statements Analysis Of Companies (Non-Financial) Listed at Karachi Stock Exchange (2008-2013)*, published by the *State Bank of Pakistan* (SBP), the central bank of the country. Following our main

[18] The performance of KSE, has been in the limelight over the last decade. Business Week reported KSE as the leading stock market for the year 2002. The market stood 1st and 3rd in terms in terms of turnover ratio in 2003 and 2006 respectively (Global Stock Markets Factbook, 2004; 2007). More recently in 2015, Bloomberg has put KSE 100 index at third on the list of best performing markets since 2009, with colossal stock returns of 26% in the US$ terms.

[19] Karachi Stock Exchange introduced the KSE Meezan Index (KMI-30), the index for top 30 Shariah compliant firms in Pakistan, in collaboration with Al-Meezan Investment Bank. The index was made functional since 2009 and firms were categorized as Shariah-compliant or non-Shariah according to criteria set by Shraiah Board of the Al-Meezan Investment Management Ltd, which also serves as a guideline for the construction of the KMI-30 Index.

objective of analyzing capital structure of Shariah and non-Shariah firms, we dropped the financial firms (including banking and insurance companies) for their typical financial and capital characteristics and the excessive use of leverage in their capital structure (Rajan and Zingales 1995). The firms were categorized as Shariah and non-Shariah based according to the list issued by the Shariah Board of the Al-Meezan Investment Management, which also serves as a guideline for construction and periodic revision of KMI 30 index.

For the five-year period from 2009 to 2013, we found nearly 100 firms meeting the requirements of Shariah compliance. One approach would have been to select all the firms that met Shariah compliance during the period of study. However, this approach would have resulted in the inclusion of firms which had made the Shariah compliance list only accidentally or by chance. To avoid this fallacy, we, therefore, resorted to the second approach according to which we selected for our Shariah sample only those firms which consistently appeared on the Shariah compliance list for the whole period of study. We expect this approach would enhance the credibility of our sample as a true representative of Shariah compliant firms. Following this procedure, the final sample comprised 68 Shariah and 75 non-Shariah firms for 5 years covering 2009 to 2013 and yielding 340 and 375 firm-year observations for the Shariah and non-Shariah sample respectively.

3.2. Model

Based on the above discussion, we construct the following model

$$DEM_{it} = \beta_0 + \beta_1 GROW_{it} + \beta_2 SIZ_{it} + \beta_3 TANG + \beta_4 PROF_{it} + \beta_5 RISK_{it} + \beta_6 ASSM_{it} + \beta_7 TAX_{it} + \beta_8 NDTS_{it} + \varepsilon_{it} \quad (1)$$

Several proxies have been used for debt maturity *(DEM*). For example, Ozkan (2000) used the ratio of debt maturing in five and one year to the total debt. Barclays and Smith (1995) used 3 year debt ratio to total liabilities. Due to data constraints, this study uses long-term debt to total debt as a measure of *debt maturity* (Renato, Terra, Amal, Svensson and Renato Soares Terra 2011). *Growth* is measured as percentage change in annual sales, which is considered a better measure the agency cost of debt (López-gracia and Mestre-barberá 2011) Following Dang (2013) this study applies natural logarithm of assets as a proxy for firm *Size*. Asset maturity is ratio of Net fixed assets over depreciation (Ozkan 2000). We use standard deviation of last five years ROA as a measure of *Risk* or volatility following (Friend and Lang 1988). *Tax rate* is effective tax rate for firm worked out as ratio of tax bill and taxable income (Cai, Fairchild and Guney 2008). We use a five-year average of returns on assets as proxy to *Profitability*. We use the ratio of net property, plant, and equipment to book assets as a proxy for *Tangibility*. Tax shield in *Non-debt tax saving* as a ratio of depreciation to total assets

4. Findings and discussion

4.1. Descriptive statistics

The descriptive statistics for the variables are reported in Table 1 for the whole sample and the subsamples of Shariah and Non-Shariah firms. The overall mean of debt maturity is 0.32 in for the whole sample. We however find that the mean debt maturity is lower in the Shariah sample (0.30) than the Non-Shariah sample. This indicates that Shariah firms on average borrow on relatively short term. We also find similar picture on the debt ratio which is higher for our Non-Shariah sample. Both these findings are expected owing to the shariah compliance. We test these relationships more formally in the next section,

Table 1. Descriptive Statistics

Variable	DR	DEM	SIZ (PKR ml)	TANG	PROF	RISK	LIQ	GROW	NDTS	ASSM	OPCY	TAX
All Firms												
Mean	0.21	0.32	22700	0.44	7.88	6.87	0.46	45.49	0.2	392.35	4.72	0.36
Std. Dev.	0.27	0.24	50800	0.25	12.57	9.53	0.23	649.57	2.7	4336.05	16.42	10.47
Min	0	0	9.001	0	-19.85	0	0	-145.92	0	0	-0.07	-139.27
Max	0.99	1	414000	0.87	105.47	164.76	1	17144.38	57.93	60143.25	362.54	232.94
Non-Shariah Firms												
Mean	0.25	0.34	13,900	0.47	5.15	6.35	0.43	63.2	0.34	724.27	3.09	-0.24
Std. Dev.	0.33	0.23	35,000	0.23	11.05	6.2	0.21	896.42	3.72	5966.9	5.11	7.42
Min	0	0	93.326	0	-17.46	0.03	0	-145.92	0	0.01	-0.07	-139.27
Max	0.99	1	279,000	1	55	59.24	1	17144.38	57.93	60143.25	75.07	21.27
Shariah Firms												
Mean	0.17	0.3	32500	0.4	10.87	7.44	0.49	26.26	0.03	25.07	6.54	1.04
Std. Dev.	0.18	0.25	62500	0.26	13.44	12.16	0.24	88.92	0.04	37.02	23.13	13.02
Min	0	0	9.001	0.01	-19.85	0	0.05	-87.9	0	0	0	-4.77
Max	0.99	1	414000	1.5	105.47	164.76	1	955	0.55	439.96	362.54	232.94

4.2. Univariate Analysis: Tests of equality of means of debt maturity among Shariah and Non-Shariah firms

We have argued that debt maturity structure of Shariah firms differs from non-Shariah firms in that the non-Shariah firms have longer debt maturity than Shariah firms. This argument has been tested at country level (Gun *et al.* 2014) with conforming evidence. However, we extend this argument to firm level and test whether; an average Shariah firm is likely to have shorter debt maturity than non-Shariah firms. Table 2 reports the results from test the equality of means hypothesis using two sample t-test. Consistent with the previous findings (Gunn 2014), there is a significant difference in the maturity periods of Shariah and non-Shariah firms. Non-Shariah firms on average have 34.25% of long term debt in their total debt as compared to only 30.16% for Shariah firms. This yields the difference of almost 4%. This difference is not too high in absolute terms, however, it is highly significant at 5% level statistically supporting the hypothesis that Shariah firms have shorter debt maturity structure than their Non-Shariah equivalents.

Table 2. Test for the Difference of Means in Debt Maturity structure of Shariah and Non-Shariah samples

		N	Mean	Diff	p-Value	Sig
Debt Maturity	Non-Shariah	375	0.3425	0.0409	0.0226	**
	Shariah	340	0.3016			

Note: ** Significant at 5% level

4.3. Univariate Analysis: Tests of equality of mean debt maturity for characteristic quartiles for Shariah and Non-Shariah samples

Our initial findings based on simple univariate tests on the nature of debt maturity of Shariah and Non-Shariah firms are reported in Table 3. We divided both samples into quartiles based on their specific firm characteristics (such as size, growth *etc.*) considered, in previous literature, as important factors to influence debt maturity choice of companies. We applied the t test to find the statistical significance of the difference between the mean

debt maturities in the low and high quartiles. In most of the cases, the change in debt maturity across the characteristic quartiles is meaningfully significant.

Larger firms with broader asset base have inherently greater ability to raise longer term debt and enter long term public maturity. Size is usually considered an important factor in dictating firm's debt maturity choice. Size facilitates borrowing capacity through better collateral and easier access to debt markets. Our results for the non-Shariah sample confirm this hypothesis as we see the tendency of longer maturity of debt at higher quartile. For example, average debt maturity of a firm at lower tail of the quartile is 33% while the same for highest size quartile (representing largest firms in the sample) over 40%. This suggests that debt maturity is increasing with the size of the firm. Shariah firms, in contrast, show different picture of size and maturity relationship. An average Shariah firm in highest quartile borrows for briefer period than its counterpart in the lowest quartile, suggesting an inverse continuum of debt maturity with size. This contrast is supported more emphatically in the extended analysis involving the 37% or lower levered non-Shariah firms sample, where the result for the non-Shariah sample continues to show positive relation now even significant at 1% level. The result for the Shariah firm affirms liquidity risk hypothesis.

The next important contrasting result is that of growth. The non-Shariah sample suggests that high growth quartiles also tend to have higher proportion of longer term debt with difference between the fourth and first quartiles statistically significant at 5% level. The Shariah firms on the other hand depict a negative trend on the growth opportunities quartiles, however, the results are statistically insignificant. High growth firms have greater tendency to rely on shorter term debt to lessen their agency costs problems like underinvestment, risk shifting and substitution, arising from growth (Myers 1977). Growth also entails severer information asymmetry costs. This develops theoretically negative relationship between maturity and firm's growth. The findings about Shariah firms confirm this relationship, though at lower than desirable statistical significance. In contrast, the results about the non-Shariah firms conform to the liquidity risk hypothesis, which suggests that a growth firm is more likely to borrow at longer spectrum of maturity if it conceives the growth option of new investments risky. Long term debt lowers liquidity risk of reshuffling debt frequently.

Business risk is the third contrasting result between the Shariah and the non-Shariah samples. Riskier non-Shariah firms tend to borrow short term debt more often. Additional risk or volatility diminishes the optimal level of debt. Therefore, firms experiencing higher earnings volatility are likely to have more of short term debt in their capital structure (Kane *et al.* 1985). Shariah firms, on the other hand, have debt maturity higher when the risk factor is higher. This is however not significant.

Our findings on tax and debt maturity indicate higher tax firms maintain shorter maturity of debt. The result is consistent with tax hypothesis, which predicts debt maturity relates tax rate inversely (Kane *et al.* 1985). If marginal tax rate increases, firm is more likely to relocate their capital more often, and hence they prefer debt with shorter maturity. Finally, low profitability quartile has higher maturity than in high profitability quartile firms, indicating the pecking order of leverage and maturity (*i.e.* lower and shorter) for profitable firms (Myers 1984).

Table 3. Univariate Analysis

The table reports mean debt maturity across the quartiles of various firm characteristics for the Shariah and Non-Shariah firms (all and controlled sample with less than 37% debt ratio). The difference between the mean debt maturity of the highest and the lowest quartiles are reported in column Diff(Q4-Q1) along with the associated p-values and sig level of the t –test.

Firm Characteristics	Shariah (SH) / Non-Shariah (NSH)	Characteristics Quartiles				Diff (Q4-Q1)	p-Value	Sig
		1 (smallest)	2	3	4 (largest)			
Growth	NSH	0.3158	0.3230	0.2978	0.3819	0.0661	0.0307	**
	NSH (<37%)	0.2588	0.2532	0.2646	0.3223	0.0635	0.0454	**
	SH	0.3518	0.2438	0.2685	0.3399	-0.0119	0.7764	
Size	NSH	0.3306	0.3109	0.3466	0.4046	0.0740	0.6310	
	NSH (<37%)	0.2377	0.2563	0.2928	0.3475	0.1097	0.0000	***
	SH	0.3529	0.2587	0.2652	0.3306	-0.0223	0.0277	**
Tangibility	NSH	0.2276	0.2348	0.3581	0.5184	0.2908	0.0000	***
	NSH (<37%)	0.1741	0.2159	0.3131	0.4255	0.2514	0.0000	***
	SH	0.1896	0.2131	0.3559	0.4883	0.2988	0.0000	***
Profitability	NSH	0.3956	0.3139	0.3316	0.3079	-0.0877	0.0124	**
	NSH (<37%)	0.2521	0.2568	0.3087	0.2772	0.0251	0.4754	
	SH	0.3713	0.3315	0.2709	0.2627	-0.1087	0.0111	**
Risk	NSH	0.3491	0.3618	0.3451	0.2980	-0.0511	0.1572	
	NSH (<37%)	0.2781	0.2909	0.2944	0.2044	-0.0738	0.0264	**
	SH	0.3043	0.2792	0.3023	0.3186	0.0143	0.7338	
Asset Maturity	NSH	0.2902	0.2861	0.3202	0.4572	0.1670	0.0000	***
	NSH (<37%)	0.2342	0.2495	0.2340	0.3733	0.1390	0.0002	***
	SH	0.2106	0.2811	0.3646	0.3596	0.1490	0.0002	***
Tax rate	NSH	0.4019	0.4000	0.2737	0.2619	-0.1400	0.0001	***
	NSH (<37%)	0.2674	0.3574	0.2560	0.2190	-0.0484	0.1497	
	SH	0.3993	0.3791	0.2736	0.1917	-0.2076	0.0000	***
Tax Shield	NSH	0.3734	0.2951	0.3188	0.3875	0.0141	0.7256	
	NSH (<37%)	0.2867	0.2424	0.2658	0.3115	0.0249	0.5110	
	SH	0.2599	0.2196	0.3242	0.3958	0.1359	0.0007	***
Leverage	NSH	0.1002	0.1931	0.3827	0.5781	0.4779	0.0000	***
	NSH (<37%)	0.1002	0.1931	0.3827	0.5400	0.4398	0.0001	***
	SH	0.0500	0.2482	0.4425	0.6280	0.5780	0.0000	***
Liquidity	NSH	0.5387	0.3733	0.2652	0.1326	-0.4061	0.0000	***
	NSH (<37%)	0.4359	0.3264	0.2469	0.0989	-0.3371	0.0001	***
	SH	0.5442	0.3819	0.2362	0.1079	-0.4363	0.0000	***

Note: *, ** , *** Significant at 10%, 5%, and 1% level respectively.

Our analysis provides an identical outcome for the relationship of debt maturity with asset maturity, tangibility, leverage, and liquidity. Firms (both shariah and non-shariah) have longer debt maturity when they belong to the highest quartiles of asset maturity, tangibility, leverage, and liquidity. Maturity matching principle suggests that higher costs of agency and monitoring could be avoided by aligning the timing of inflows from the project with outflows of the debt. This suggests asset maturity correspond with a maturity of debt in the firm. In the same vein, more tangible assets provide the firm with the ability to borrow more and for a longer period (Myers 1977). Similarly, high levered firms tend to have longer-term debt. The results of liquidity are identical conforming to the liquidity risk hypothesis. High business risk firms face higher agency costs related problems, which could be avoided by issuing short-term debt. If liquidity position betters, firm tends to issue more likely the long-term debt.

4.4. Multivariate analysis

The results from the pooled OLS regression for the Shariah (SH) and Non-Shariah samples are reported in Table 4. We discuss our findings to highlight the key differences in factors affecting the debt maturity choice among the two types of firms.

For the sample of Shariah firm, growth variable is positive and significantly correlated which shows some importance of growth opportunity in the choice of corporate debt maturity. The debt maturity increases with growth opportunity of the firm. The results suggest that the growing Shariah firms use longer-term debt to avoid immediate principal repayments. For the sample of non-Shariah firm the growth variable has a positive but insignificant relationship with dependent variable. This indifferent behaviour of growth for debt maturity decision is also documented in other studies[20]. Similarly, our results support to Hart and Moore's (1995) overinvestment argument that firms tend to use long-term debt to control managers' incentives to invest in negative NPV projects. It maybe that underinvestment problem is of a less concern for the firms in our sample than overinvestment inefficiencies. Overall, these findings support Diamond's (1991) theory predicts that growth opportunities are positively related to debt maturity.

Size enters positive and significant in both Shariah and non-Shariah samples, suggesting that regardless of the firm's Shariah compliance, larger firms tend to have longer debt maturities. Empirically these findings are in favour of agency theory based on moral hazard problems, which construe that smaller firms are more likely to issue short term debt as they are already exposed to higher agency costs, hence issuing long term debt could exacerbate this exposure even further[21]. Similar pattern of relationship emerges between the relationship of tangibility and debt maturity. Higher asset tangibility enhances borrowing capacity at relatively lower cost and also reduces bankruptcy related costs (Kirch and Terra 2012). Likewise, higher tangibility results in the lower agency and information asymmetry costs which lead to a positive relationship with duration of debt contracts. Our findings on size are consistent with Barclay and Smith (1995), Guedes and Opler (1996), and Cai *et al.* (2008 and support both agency and asymmetric information view on debt maturity.

We added profitability in the model to test the agency and signaling theories. These theories hypothesize a positive impact of profit on debt duration. In both of our samples, profitability returns with a positive but insignificant coefficient. Hence, our results support agency and signaling view regarding direction of the relationship. Our result regarding Risk is different in both samples. For the Shariah firms, results of risk variable are positive and significant showing the substantial relationship with the dependent variable debt maturity. This finding is consistent with Krich *et al*. (2012) suggesting the positively and significantly correlated with the debt maturity. However, in Non Shariah firms result is positive but insignificant suggesting no relationship with debt maturity structure. Guedes and Opler (1996) find that debt maturity is negatively correlated to earnings volatility. Likewise, Stohs and Maur (1996) suggest that debt maturity is negatively related to earnings volatility.

For the Shariah firms our results show positive but insignificant coefficient of variable of asset maturity. It suggests that assets have indifferent behaviour for the debt maturity structure of the firm. In contrast to this result,

[20] Billett *et al.* (2007), Kim *et al.* (1995) and Stohs and Mauer (1996) for US firms and by Cai *et al.* (1999) for Japanese firms.

[21] In finance literature, agency cost of long term debt is considered higher than short term debt.

in Non Shariah firms we find positive and significant relationship between asset maturity and debt maturity structure. It provides the evidence that firms with long-term asset maturity tend to have long-term debt. Thus the results for our sample of non-Shariah firms are consistent with that of Myres (1977), Stohs and Mauer (1996), Korner (2007), Khemaies (2010) and Shah and Khan (2009) and Cai *et al.* (2008) Guedes and Opler 1996), (Antoniou *et al.* 2006). These findings support the matching principle hypothesis.

Table 4. Determinants of Debt Maturity Structure in Shariah and Non-Shariah Samples

Variables	Shariah sample		Non-Shariah sample	
	Coefficient	t-values	Coefficient	t-values
GROW	**0.000**	**(3.25)****	0.000	(1.39)
SIZ	**0.029**	**(4.48)****	**0.024**	**(3.47)****
TANG	**0.473**	**(9.63)****	**0.475**	**(10.48)****
PROF	0.037	(0.42)	0.131	(1.91)
RISK	**0.006**	**(4.69)****	0.002	(0.89)
ASSMAT	0.000	(0.33)	**0.000**	**(3.10)****
TAX	-0.001	(1.02)	0.002	(1.34)
NDTS	0.538	(1.57)	0.007	(1.94)
_cons	**-0.416**	**(3.92)****	**-0.265**	**(2.32)***
R^2	0.37		0.31	
N	330		361	

Note: *, **, *** Significant at 10%, 5%, and 1% level respectively.

However, as we argued, the asset maturity turns insignificant for the shariah sample. Hence, the findings support our hypothesis.

4.5. Pooled OLS using Shariah dummy

We carried out further analysis of the determinants of debt maturity in shariah and Non-Shariah firms using the Eq. 2 with Shariah dummy for Shariah firms. The dummy equals 1 if a firm is Shariah compliant and 0 otherwise. For each firm characteristic, we use the interaction term with Shariah dummy and test the model, whereby the significance of the interaction term leads to the support for the hypothesis that there exists a significant difference in the determinant(s) of the Shariah and non-Shariah firm debt maturity structure.

In order to test whether there exists such difference which is statistically significant too, the slope dummy variable approach was applied. The following appended version of Eq. 2 with Shariah dummy interaction with determinants of debt maturity was estimated for the sample using OLS regression.

$$DEM_{it} = \beta_0 + \beta_1 GROW_{it} + \beta_2 SIZ_{it} + \beta_3 TANG + \beta_4 PROF_{it} + \beta_5 RISK_{it} + \beta_6 ASSM_{it} + \beta_7 TAX_{it} + \beta_8 NDTS_{it} + \beta_9 DSH * GROW_{it} + \beta_{10} DSH * SIZ_{it} + \beta_{11} DSH * TANG + \beta_{12} DSH * PROF_{it} + \beta_{13} DSH * RISK_{it} + \beta_{14} DSH * ASSM_{it} + \beta_{15} DSH * TAX_{it} + \beta_{16} DSH * NDTS_{it} + \varepsilon_{it} \quad (2)$$

Table 5. Determinants of Debt Maturity Structure in Shariah and Non-Shariah Firms using Shariah Dummy

Variables	Coefficient	t-values
GROW (β_1)	0.000	(1.65)
SIZ (β_2)	**0.011**	**(2.55)***
TANG (β_3)	**0.456**	**(11.00)****
PROF (β_4)	0.050	(0.78)
RISK (β_5)	**0.017**	**(9.57)****
ASSM (β_6)	0.000	(0.21)
TAX (β_7)	0.000	(0.38)

NDTS (β_8)	**0.046**	**(13.85)****
DSH*GROW (β_9)	ROW	(1.47)
DUM*SIZ (β_{10})	0.002	(0.81)
DSH*TANG (β_{11})	**-0.168**	**(2.92)****
DSH*PROF (β_{12})	-0.180	(1.81)
DSH*RISK (β_{13})	**-0.012**	**(5.54)****
DSH*ASSM (β_{14})	0.000	(0.81)
DSH*TAX (β_{15})	-0.001	(0.63)
DSH*NDTS (β_{16})	**1.604**	**(5.49)****
Constant	-0.252	(3.64)**
R^2	0.61	
N	691	

Using non-Shariah firms as reference category in regression estimates, we test the hypothesis whether slope coefficients for the various firms characteristics for the various firm-level determinants of debt maturity differ significantly between the Shariah and non-Shariah firms.

The results are summarized in Table 5. Results show that coefficients of Shariah dummy interactions with tangibility, risk, and non-debt tax shield are significantly different from zero. Tangibility shows positive relationship with debt maturity in case of non-Shariah firms, and so is the case with Shariah firms in our sample. However, the significance of Shariah dummy interaction with tangibility indicates that the economic impact of tangibility on Shariah firms' debt maturity is relatively less pronounced than non-Shariah firms *(β_{13} = -0.168).* This suggests that tangibility has relatively less effect on debt maturity of Shariah firms than on non-Shariah firms. Another firm characteristic whose impact on Shariah firms' debt maturity is different from non-Shariah firm debt maturity is non-debt tax shield. The coefficient for the interaction term *DUM*Risk (β_{15} = 0.012)* is negative and statistically significant. Finally, the results show that in case of Shariah firms, the impact of non-debt tax shield *(β_{16} = 1.604)* is stronger than the non-Shariah firms in our sample.

None of the other characteristics is found to have significantly different impact on the Shariah and Non-Sahriah firm debt maturity. These results could be interpreted that although there appears homogeneity among firm-level determinants of debt maturity among Shariah and non-Shariah firms, the relative importance of some characteristics vary given the type of firm at hand.

Conclusion

Debt maturity gains importance for issues like financing flexibility, cost of financing, and refinancing risk. Although this issue has gained much attention in conventional corporate finance in both theoretical and empirical literature, rarely has it been addressed from the perspective of Shariah compliance and resulting effects on the debt maturity structure of these firms. This study fills that gap by empirically analyzing the irm-level factors influencing the debt maturity structure among Shariah firms in Pakistan

We applied univariate and multivariate analysis to investigate whether debt maturity structure varies across Shariah and non-Shariah firms. We also studied how firm level characteristics affect debt maturity choice of Shariah firms in contrast with the non-Shariah firms. The descriptive statistics indicated that Shariah firms had relatively shorter debt maturity structure than non-Shariah firms. The significance of t test result rejected the null hypothesis that the two groups have common debt maturity choice, supporting our first hypothesis that Shariah firms are likely to have shorter maturity than non-Shariah firms. This conforms to the earlier findings that firms usually having lower debt ratios tend to borrow on shorter term basis. Based on this argument one can argue that restricted use of debt owing to Shariah compliance yields shorter debt maturity structure for these firms.

Next, the study tested various firm level determinants of debt maturity structure among Shariah and non-Shariah firms and compared the findings. In a univariate analysis, we first sorted firms on all the possible

influencing firm level determinants drawn from debt maturity structure theories and divided the Shariah non-Shariah sample into equal quartiles and compared the debt maturity structure of each characteristic quartile for Shariah and non-Shariah sample separately. Our findings reveal some notable differences among the Shariah and non-Shariah firms sample especially for size and growth. As for size, Shariah firms tend to have shorter debt maturity as their size quartile increases, while non-Shariah firms have longer maturity for larger firms. Being significant, these results show contrasting empirical facts about the two types of firms. The similar tendency but with lack of statistical significance was emerged in case of growth quartile indicating that higher growth non-Shariah firms borrow on longer term basis, while higher growth firms in Shariah camp tend to have lower debt maturity. On other variables, our results showed similarities of varying patterns of debt maturity across various quartiles of these variables. Asset maturity, tangibility, tax shield, and leverage showed positive and increasing trend of longer term maturity in higher quartiles of these characteristics. While risk, tax rate, and profitability showed the inverse pattern of debt maturity pattern in their quartiles.

Amid the dearth of studies investigating the relationship between Shariah compliance and firm's choice of financial decisions, our study would be a source of unfolding the debate and understanding the nature of capital and debt maturity structure of Shariah firms. The research findings are also expected to benefit large and growing clientele of the Shariah firms by providing better insights on the capital and debt maturity structure of these firms.

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Evaluation Method for Efficiency of Financial and Innovative Activities in Commercial Organizations Based on Stochastic Modelling

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Abstract

The research revealed financial instability at the internal level of commercial organization development, which allowed confirming that quantitative assessment in the system of their financial management is preferable. Nonconventional method was developed to provide for assessment of the efficiency of financial and innovative performance in commercial organizations in the system of their financial management; the method provides for determination of the modified projected value of financial results and considers risk profile of commercial organizations, as well as of the anticipated efficiency of financial and innovative development.

The method is grounded in both: Monte Carlo approach and special author's software product. Its application is notable by a universal character; it allows the following: expanding the list of the evaluation financial and innovative indicators that are risk inclusive; create a tool kit to provide a multiple set of scenarios in projected financial and innovative performance development; thus, developing risk-oriented vector for the system of financial management. Approbation of the method was carried out in systems of financial management in the following corporation: SevKavNIPIgaz PJSC, Anda Technology LLC, "C-Soft Rostov-on-Don" NPJSC.

Key words: financial and innovative performance; efficiency; projected financial result; scenarios; risk oriented vector; evaluation.

JEL Classification: O10; O31

Introduction

In the environment of economics instability, limited state support to development of innovations in commercial corporations, and lack of financial provisions the system of corporations' financial management should ensure

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such setting for shaping financial interrelations of commercial corporations that evolve innovation processes in economics. Transition to the intensive path of development that reinforces innovative component of commercial organizations predetermines the need for development of an innovative trend in the system of their financial management.

1. Literarture review

However, development of such tend in the modern conditions is complicated with a lack unified position regarding the nomenclature applied for financial and innovative relations (precisely the concept of "financial and innovation performance"). Application of financial methods for evaluating financial and innovative performance remains understudied in the economics science; those in contrast to the existing innovative methods of evaluation allow generate indicators that imply vagueness of the profits with commercial organizations. Scientifically substantiated recommendations are out of place for evaluating efficiency of financial and innovative performance of commercial organizations in the uncertain context for the systems of their financial management.

Thus, with regards to financial interactions of organizations the following approaches to define innovation are distinguished: costs reduction oriented - ensured by implementation of innovations in various modifications (national legislator in retrospect and current conditions - Main Policy Trends of the Russian Federation for Development of Innovation System for the period up to 2010, Fundamentals of the Policy of the Russian Federation in the field of Science and Technology Development for the period up to 2010 and further, and Development Strategy for Science and Innovations in the Russian Federation for the period up to 2015, Galkina and Nazarova (2010), Ogoleva (2004); distinguishing financial and economic component of innovational performance in various modifications (international legislators - Oslo Guidelines (2010), and Russian legislators - Federal Law No. 127-FZ as of August 23, 1996 "On Science and National Science and Technology Policies", Gokhberg (1998), Zasimenko (2007), Novikov (2010), Chistyakova (2010), Krasnikova, Evgrafova (2011), Ivasenko, Nikonova and Sizova (2009), Zharikov, Zharikov, Odnolko and Evseichev (2009), Surin and Molchanov (2008); considering the ultimate goal of innovations' application - Avagumyan (2015), Vinokurov (2005), Morozov (1997), Tikhonov (2003), Khomkina (2009).

However, connection between innovational activity of commercial organizations carried out in the frame of main performance of financial management system and financial result most fully characterizes the term "financial and innovation performance", the efficiency evaluation of which is underscored in financial and innovation literature, that in the end shapes methodological approach to the matter.

The goal of the research is focused at development of a scientifically based toolkit for assessing the efficiency of financial and innovational performance of commercial organizations in the financial management system and substantiation of the trends for its practical implementation. Fulfilment of the goal required to accomplish the following tasks: formulate the author's attitude to the term "financial and innovative performance of a commercial organization", assess the efficiency of financial and innovation performance on the basis of the Form 4 - Innovation "Entity's Innovational Performance Data", based on the stochastic modeling develop a method to assess efficiency of financial innovation performance of commercial organizations, test the method in the field. The works of the Russian and foreign scientists and practitioners laid theoretical and methodological basis for the study, also there were legislative and regulatory documents of the Government of the Russian Federation, the Oslo Guidelines used, as well as periodicals devoted to development of priority innovative trends in financial management of commercial organizations. Methodological basis of the research: system, logical, situational, process scientific approaches to studying the evaluation of the effectiveness of financial and innovation activities of commercial organizations. A method for evaluating the efficiency of financial and innovation performance of commercial organizations based on simulation modeling was developed and approved. General scientific methods were used, such as: inductive, deductive, analysis, synthesis, detailing and generalization, grouping, analogy, system thinking, analytical, graphical, comparative, economic-statistical, economic and mathematical, as well as expert assessment methods, coefficient analysis, authoring software General MS Excel and special Excel-VBA. The method will indicate the main areas for application of the assessment and its results.

The working hypothesis of the research is based on the necessary creation of a modern scientifically grounded toolkit for assessing the efficiency of financial and innovation performance of commercial organizations based on stochastic modeling in the system of their financial management, which is aimed at increasing the efficiency of their performance if the economy develops innovatively. Theoretical significance of the research is called to expand and deepen scientific approaches to formation of toolkit for assessing the efficiency of financial and innovation performance of commercial organizations in the system of their financial management, which will be aimed at developing a priority intensive innovative path in the national economy. Practical significance of the research lays in development and application of specific methods, models, practical recommendations that create methodological and practical basis for development of modern tools for assessing efficiency of financial and innovational performance of commercial organizations in the system of their financial management. It will also determine the grounds for introducing new financial and innovative methods and tools that ensure development of a priority innovative trend in financial management system of commercial organizations.

2. Method

2.1. The study of the category terminology for building and implementing financial and innovative performance of organizations

Study of the essence and content of the concept "innovative activity of organizations" - Table 1.

Table 1. Study of the essence and content of the concepts "innovative", "financial and innovative activities of organizations"

Source	Characteristics
Approach focused on reduction of expenses resulted from implementation of innovative activity of various types	
▪ Main trends of the Russian Federation policies in the field of innovation development for the period up to 2010.	▪ Arrangement of works and (or) services aimed at development and manufacture of products (goods, works, services) - brand new or updated with new consumer characteristics; ▪ Creation and application or upgrading of available methods (technologies) for the entity's production, the latter increase and application; ▪ Usage of structural, financial and economic, personnel, information and other innovations in the production and sales of products (goods, works, services) that make an input into cost savings or appropriate conditions for that.
Appendix to the project "Fundamentals of Russian policies in the field of science and technology development for the period up to 2010 and beyond"	▪ A type of activity to reproduce works in research, fundamentals (necessary part) and practical investigations, projects and development works, marketing activities to introduct the results into the civil-law for sales as innovative products; ▪ The single process within the national and private sector is the aggregated scientific, technological, organizational, financial, investment, operational and marketing process by means of which the ideas and technologies are transformed into technologically innovative products (services) and processes (updated outputs) with commercial value (commercial demand and market needs) and in new ways of application of available innovative products and services, in the formation of innovative markets.
Galkina A. V., Nazarova V.S. (2010)	▪ Activities aimed to apply and commercialize the results of the researches and projects that increase and update the list of the produce and improve the quality of products, improve the way the latter are manufactured and further introduced in the market and effectively sold in the domestic and international markets.
L.N. Ogoleva (2004)	▪ The process of creation and the formation of innovation, expressed as a max innovation perspective, necessity and commercial endeavors.
The approach that distinguishes financial and economic component in the innovation activity in various modifications	
Oslo Guidelines (2010)	▪ Permanent activity that includes scientific, technological, organizational, financial and commercial actions, including investments into knowledge, factual or projected, leading to emerging of technologically new (modernized) products

Source	Characteristics
	or processes; ▪ Types of innovational activities: successful, ongoing, and discontinued.
B.V. Zasimenko (2007)	▪ Implementation of a complex scientific, technical, technological and organizational changes emerging in the process of applying innovations and innovative technologies that determine the outcome of new economic relations between the operational process players: the founders of the innovation, resources providers and consumers.
V.S. Novikov (2010)	▪ Complex of scientific, technological, organizational, financial, and commercial areas mainstreamed to innovation development includes new knowledge, technology, methods leading to anticipated result that are of high demand with the society; ▪ Joint work of all employees is aimed at creation and implementation of innovations; ▪ A composition of areas focused at creation, introduction, assimilation, release, diffusion and commercialization of innovations integrated into a single logical chain.
O. V. Chistyakova (2010)	▪ A set of scientific, technological, organizational, financial and commercial procedures tend to commercialize accumulated knowledge, technologies and equipment; ▪ Its outcome is new or secondary goods / services or goods / services with new properties.
Federal Law №127 as of 23.08.1996 "On science and state scientific and technical policy"	▪ Scientific, technological, organizational, financial, commercial activities steered to sales of innovative projects, formation of innovative infrastructure and its exploitation.
L.M. Gokhberg (1998)	▪ Activities aimed at introduction of new ideas, scientific knowledge, technologies, types of products and other ways to manage, works in the organization considering the context of its economics sector.
E. O. Krasnikova, I. Yu. Evgrafova (2011)	▪ Scientific and technical, organizational, financial and commercial activities set up the most important component for innovations promotion, that includes instrumental ground and productional settings (purchase of production machinery and tools, upgrade of equipment and operations, methods and normatives and quality control of the new product after invention of a new technological process); ▪ Production start-up and pre-production development containing product and process improvements, retraining of workers on new technologies and equipment, and experimental production, if innovation demands a follow up works; ▪ Initial market research, adaptation of the product to special markets, advertising; Purchase of unrealized technology from other entities in the form of patents and licenses; ▪ Operational planning (preparation of projects and drawings to establish operational activities, technical documents, operational parameters), etc.
A. G. Ivasenko, Ya. I. Nikonova, A. O. Sizova (2009)	▪ Scientific, technical, organizational, financial and commercial activities setting up the most important component for promotion of innovations to consumers; Activities focused on implementation of accumulated scientific and technical achievements in order to obtain new goods (services) or goods (services) with new properties.
V. V. Zharikov, I.A. Zharikov, V. G. Odnolko, A. I. Evseichev (2009)	▪ R & D or technological works to create innovative product; ▪ Cumulative scientific and technological target planning and target programming, constructional, normative and legal support of works on creation of an innovative product (including financial support of innovation activities) and on creation and sales of new and modernized innovative product, etc.

Source	Characteristics
A. V. Surin, O. P. Molchanova (2008)	▪ Activities to organize and implement innovative processes; ▪ Application of scientific research results and other innovations to create new (modernized) product sold in the market, new (modernized) technological process used in practice, its expansion, as well as provision of related educational, consulting, financial and other services; ▪ Interconnected set of actions for creation and promotion of innovations
Target based approach for innovations implementation	
A. Avagumyan (2015)	▪ Profitable application of new technologies, technics, products, processes in innovative activities
V. I. Vinokurov (2005)	▪ Incorporation of scientific, technological, organizational, financial and commercial activities aimed at creation of a new (modernized) product and its introduction to the market, creation of a new (modernized) practically applied technological process, or a new (modernized) organizational and economic model that creates obligatory economical and (or) the public benefit.
Yu. P. Morozov (1997)	▪ Practical application of scientific and technological results and intellectual potential for obtaining brand new or powerfully improved products and approaches to their production, compliance with the solvent demand of consumers for high-quality goods and services, and improvement of social services.
A. N. Tikhonov (2003)	▪ Indicators ncorporating initial commercial applicaton of new products and processes, rather than indicators of their initial experimental development.
K. A. Khomkin (2009)	▪ Application of new knowledges for income generation
Authors' position (financial and innovational performance)	▪ Invention of innovations and practical actions (creation, mastering, dissemination and application of innovations) to ensure positive financial result and (or) achievement of the other beneficial effect.

Source: compiled by the authors

In our opinion, in the Russian Federation it is reasonable to differentiate commercial organizations that implement financial and innovative activities within the context of their economics sector. Hence, financial and innovational activity is considered by the authors as an input in the form of innovation and practical actions (creation, mastering, dissemination and use of innovations) to ensure positive financial result and (or) to achieve other beneficial effects in the financial management system of commercial organizations. It is clear that the lack of a well-developed toolkit for evaluation of financial and innovation performance in the area of financial relations of commercial organizations complicates their implementation.

2.2. The results of assessing the efficiency of innovational activities in commercial organizations

A company that invents an innovation is always at risk initially, but if innovation turns to be a success, the company is compensated for the risk with increased profit from the innovation. The system of corporative financial management accepts and hosts those innovations that in turn should serve its changes, improvements and development. The financial effect from the implementation of financial and innovational activities in corporate financial management system should be probable or actual (real and commercial).

The subjects for the research were identified to be the companies that show financial and innovative activity within their main area of business:

SevKavNIPIgaz PJSC - the main type of economic activity: scientific and technical, production; types of financial and innovation activities as part of the main type of economic activity: various R & D, research and development in the field of natural and technical sciences;

Anda Technology LLC - the main types of economic activity are the following: research and development in the field of natural and technical sciences; types of financial and innovation activity as a part of the main type of economic activity: development and implementation of technologies for processing semiconductor materials

(silicon) and sapphire for the creation of innovative products in microelectronics, optoelectronics, solar energy, nanotechnologies, production of innovative, super-bright LEDs, hybrid electro mopeds; semiconductor materials.

Anda Technologies NJSC - the main type of economic activity: activities related to computer technology and information technology, research and development, the provision of other types of services; types of financial and innovation activities in the main type of economic activity: activities related to the use of computers and information technology, research and development.

Based on the innovational outcomes in the financial management system of commercial organizations their financial and innovation performance should be evaluated in terms of monetary value by the following criteria: the level of uncertainty in the acquisition of a real economic effect, the degree of investment risk in innovation, etc. In accordance with the Form 4 - Innovation "Entity's Innovational Performance Data" innovational activities of the researched commercial entities were defined as successful during the researched period as follows: successful if introduced innovations is a result (not necessarily advantageous from the commercial point of view); continued if the activity is still developing.

Thus, the assessment of the impact of the innovational activities results on the development of the researched commercial organizations (Table 2, Appendix A, Table A. 1) indicates that in 2013-2014, in "SevKavNIPIgaz" PJSC innovational outcomes in the area of diversification of goods, works and services, and improvement of their quality highly influenced development of the corporation. In 2014, a significant positive impact was achieved by means of capacity improvement, achievement of compliance with the latest technical regulations, rules and standards.

In 2012-2014, in "Anda Technologies" LLC innovational activities were highly influenced by diversification of produce and improvement of quality of goods, works and services, enlarging the scope of sales markets in Russia, improvement of employment policies, elimination of environment pollution, promotion of goods, works, services to the new markets exploring new consumers' groups and new geographic markets.

In "C-Soft Rostov-on-Don" PJSC, innovative development of the organization is greatly influenced by improvement of the quality of goods, works and services, improvement of production energy efficiency, compliance with modern technical regulations, rules and standards.

Practical value of non-formalized (logical) assessment methods as provided for by the Federal Monitoring Toolkit for innovational activities is limited, and therefore it calls for the urgent introduction of the value based financial and innovation indicators since they could diminish subjectivity of assessments as follows:

- subjectivity of expert assessment method since there is a need to constantly upgrade knowledge, experience and intuition of the persons conducting it;
- it does not describe strict analytical dependencies, does not reflect the effect of creation and application of innovations (whereas some definitions of innovations indicate the final result of their invention);
- there is a lack of quantitatively measured indicators, since it is mainly intended to collect quantitative indicators, whereas use of the latter without additional calculations brings an incomplete estimate.

General evaluation of the level and dynamics of financial and innovational activities of commercial organizations, as well as its identification, and specification of trends is carried out through a set of separate differentiated evaluation indicators; objectivity of the evaluation is ensured by the correct choice of indicators. According to paragraph 23 of the Oslo Guidelines (2010), information needs of analysts and politicians were built into the basis of the system of indicators and organization of the procedure for collecting information on innovation activity.

Table 3 (Appendix A, Table A. 2) represents indicators characterizing the state of financial and innovation performance of commercial organizations.

Table 2. Assessment of the innovations influential degree onto development of "SevKavNIPIgaz" PJSC. Form 4 - Innovation (fragment)

YY	Degree value: 1 – low; 2 – middle; 3 – high; 4 – out of place											
	Diversification of goods, works, services	Preservation of traditional markets	Sales markets growth	In Russia	In CIS countries	In EU countries and non-EU*	In the USA and Canada	Other countries	Upgrade of the quality of goods, works, services	Replacement of obsolete products	Employment growth	Increased flexibility in production
2009	2	2	2	2	2	4	4	4	3	4	4	1
2010	2	2	2	2	2	4	4	4	3	4	4	1
2011	2	2	2	2	2	4	4	4	3	4	4	1
2012	2	2	2	2	2	4	4	4	3	4	4	1
2013	3	3	2	2	2	4	4	4	3	4	1	2
2014	3	2	2	2	2	4	4	4	3	4	2	2
											Marketing	
	Increase of operating capacity	Reduction of wages funds	Decrease of material costs	Increase of energy efficiency (reduction of consumption or leaks of energy resources)	Improvement of working environment and labor protection	Cutting down the time for connections with clients and suppliers	Motivational growth to innovative activities	Upgrade of informational relations within entity or with other companies	Elimination of environment pollution	Compliance with modern technical regulations, rules and standards	Promotion of goods, works, services to the new markets exploring new consumers	Promotion of goods, works, services to the new geographical markets
2009	1	1	1	2	4	4	1	1	1	3	4	4
2010	1	1	1	2	4	4	1	1	1	3	4	4
2011	1	1	1	2	4	4	1	1	1	3	4	4
2012	1	1	1	2	4	4	1	1	1	3	4	4
2013	2	4	1	1	1	4	1	2	1	2	2	2
2014	3	4	2	1	1	4	2	2	2	3	4	4

Note: non - EU countries, Albania, Bosnia and Herzegovina, Iceland, Kosovo, Liechtenstein, Macedonia, Norway, Serbia, Turkey, Black Sea, Switzerland

Source: compiled by the authors V. V. Manuylenko and A. A. Mishchenko as per the data of Form 4 – Innovation "Entity's Innovational Performance Data"

Table 3. Indicators characterizing financial and innovation performance of SevKavNIPIgaz in the financial management system (fragment)

Indicators	YY						Variations (+,–)
	2009	2010	2011	2012	2013	2014	
1. Revenue (in thousand rubles)	275704	360044	486056	545720	735355	670798	+395094
2. Scientific and technical revenue (thousand rubles)	256405	340057	468122	528315	724665	660926	+ 404521
3. Revenues resulted from innovative goods, works and services (thousand rubles)	33076	46928	65537	77976	192114	223912	+ 190836
4. Increase of revenues resulted from innovative goods, works and services, %	–	+ 41,9	+ 39,7	+ 19,0	+ 146,4	+ 16,6	– 25,3
5. Proportion of revenues resulted from innovative goods, works and services within the science and technical revenue, %	12,9	13,8	14,0	14,8	25,5	33,9	+ 21,0
6. Innovational level of goods, works and services, %(line 3 /line 1)	12,0	13,0	13,5	14,3	26,1	33,4	+ 21,4
7. Costs price of sales (thousand rubles)	183026	240287	324335	337675	409196	397062	+214036
8. Costs price of sales of innovational goods, works, and services (thousand rubles)	21780	29315	40542	43355	129556	133063	+111283
9. Share of cost price of sales of innovative goods, works, services in the general cost price of sales, %	11,9	12,2	12,5	12,8	31,7	33,5	+21,6
10. Intensity of innovative costs,% (line 8 / line 1)	7,9	8,1	8,3	7,9	17,6	19,8	+11,9
11. Gross profit (loss) (thousand rubles)	+ 92678	+119757	+161721	+208045	+326159	+273736	+181058
12. Gross profit (loss) of innovational activities (thousand rubles)	+ 11296	+ 17613	+ 24995	+ 34621	+ 62558	+ 90849	+ 79553
13. Efficiency of financial and innovation development, % (line 12 / line 11)	+ 12,2	+ 14,7	+ 15,5	+ 16,6	+ 19,2	+ 33,2	+ 21,0
14. Gross profitability (unprofitability) of sales, % (line 11 / line 7)	+ 50,6	+ 49,8	+ 49,9	+ 61,6	+ 79,7	+ 68,9	+18,3
15. Gross profitability (unprofitability) of sales of innovative goods, works and services, % (line 12 / line 8)	+ 51,9	+ 60,1	+ 61,7	+ 79,9	+ 48,3	+ 68,3	+ 16,4
16. Organization value, thousand rubles	485870	544756	586917	748595	879396	947397	+ 461527
17. Organization value growth, %	–	+ 12,1	+ 7,7	+ 27,5	+ 17,5	+7,7	– 4,4

Source: compiled by the authors V. V. Manuylenko and A. A. Mishchenko as per the data of Form 4 – Innovation "Entity's Innovational Performance Data" and financial reporting of "SevKavNIPIgaz" PJSC

Given that, development of financial innovation component that improves quality of performed works and provided services in"SevKavNIPIgaz"PJSC forms the basis of the priority areas, as per grading of Anshina, and Dagaeva (2007) in 2010-2011. In 2013 there is rapid growth of financial and innovational activities (innovative revenue growth - more than 20%; and in 2012, 2014 - a very high growth (10% -. 20%) During the retrospective period there is a steadily increased share of revenue from innovative products, works and services in scientific

and technical sales (Scientific and technical activities are grounded in financial and innovational activity) and their innovational degree highest values in 2014 - 33.9% and 33.4% respectively, but the value of the latter meets only criteria of the follower's strategy (≤ 40%). It should be noted that the results of scientific and technical activities, which are «probable» («potential») innovations, might contain a significant element of scientific novelty. Financial and innovational activities represent a broad concept, one component of which is scientific and technical activity.

At the same time, the share of the cost price of sales of innovative goods, works, services in the total cost of sales increased by 21.6%. If consider that according to the estimates of the leadership of innovation-active organizations, the cost of innovation should be in average 14% of the revenue then a significant increase of innovational costs to 19.8% by 2014 is a positive moment (a strategy of advanced innovation capacity).

As a result, the efficiency of innovations implementation has steadily increased from 12.2% in 2009 to 33.2% in 2014. During 2009-2012 gross profitability of sales of innovative goods, works, and services exceeded gross profitability of sales and in 2013 the situation changed to the opposite direction, and in 2014, the gap is insignificant, which in general can be evaluated as a positive trend.

The corporation of Anda Technology showed rapid growth of financial innovation since 2010, innovation revenue growth was significantly higher than 20%, but with a downward trend. A high level of innovative activity increased by 35.3%, the share of innovative costs of sales for innovative goods, works, and services in a total cost of sales was substantial ranging between 89.4% - 98.5%. Corporation is distinguished by an excessively high level of intensity for innovation expenditures. The effectiveness of financial and innovative development in 2010, in 2012 was negative. Gross innovational return of sales only in 2011-2013 exceeded total sales return and in 2014, there was a reverse situation.

In the corporation C-Soft Rostov-on-Don PJSC the share of revenues from innovative products, works and services in the overall returns varies between 0-24,5% (ranging 40% ≤ - in the follower strategy criterion), in 2011, and in 2013-2014 the corporation does not show an innovative revenue. The level of innovation activity in 2009-2010, 2012 is 19.7%, 19.3%, 7.8%, respectively. The share of innovative products cost of sales, works and services in the total cost of sales was quite insignificant, and in 2009-2012 varies in the range of 0.03% -2.1%, %; in 2013-2014 the intensity of innovative cost was 0. Innovations monetary input in the gross profit of 2012 dropped compared to 2009-2010, and in 2011 showed negative result (the function of intensive development is not performed). Positive trends were reflected in the fact that in 2009 - 2010, and in 2012 the gross margin of sales of innovative products, works and services exceeds the total return on sales, and in 2011 there was 100% loss-making sales, in 2013-2014 it turned 0. Gross profit from financial-innovation activity per employee in 2012 is lower than in 2009-2010, and in 2011 it showed loss of 3.4 thousand rubles, and in 2013-2014 turned to 0.

From the standpoint of strategic development, implementation of certain financial and innovative strategies had a consistently positive impact on the activities of corporation SevKavNIPIgaz JPSC, whereas in corporation C-Soft Rostov-on-Don SPSC there was a drop of value in 2011, also in Anda Technology LLC in 2010, 2012 and in 2014. That means that financial and innovational activity of Anda Technology LLC has not yet become profitable from a commercial point of view.

Thus, the economic effect of the invention of innovations is most apparent only in the corporation SevKavNIPIgaz JPSC. Linear inter-dependence of the corporations' performance results and corporate success of financial innovation business is not tracked, which may be obstructed with a number of additional circumstances. Given that the estimation of periods of break off regarding previous and current expenditures on innovation that ensure formation of financial and innovation potential is extremely difficult it is true that when certain indicators for financial innovations decrease development of innovations in the unsteady economic period worsens. All the above confirms the need to view innovations as the corporation financial management subsystem that also ensures complex efficient corporations' innovational and financial performance.

So, attributable to the synergy of informal evaluation methods provided by the Russian Federal toolset for review of innovational activities, as well as down to introduction of the authorial evaluation-wise financial and innovational indicators characterizing the financial and innovational activities of corporations in the system of corporate finance management it was found that the innovational processes are affected by the key factor which is lack of financial resources. The latter is a determining factor of financial and innovation development at macro-

and micro levels including those in internationally wide. Unstable influence of this factor on financial and innovative activity of organizations necessitates development of efficiency evaluation method for financial and innovation activities of commercial organizations based on stochastic modeling, thus forming the next stage of our research. Accordingly, the assessment of risk and uncertainty indicators is a key component in the financial management system of commercial organizations. It is the vagueness of financial and innovation activity proves the use of non-traditional methods of assessing its effectiveness, correctly taking into account uncertainties.

2.3. Characteristics and implementation of the stages for development of evaluation method on efficiency of financial and innovation activities of commercial organizations based on simulation modeling

Since in modern conditions innovations are characterized with high uncertainty level and associated high risks, it is important to use methods that consider those in evaluating financial and innovation activities of commercial organizations in the financial management system. Therefore, Oslo Guidelines highlight uncertainty among those signs of innovation (2010) that influence success of innovations results. Formalized description of uncertainty in the system of corporate risk management that depends on the random values within parameters of the risk should be carried out using the method of statistical tests of Monte Carlo based on building simulation models. Stochastic modeling is a procedure by which a mathematical model for determining any financial indicator undergoes simulation runs in a computer. This simulation represents in complex potential outcome of the financial and innovation activity implementation and the result of the simulation may significantly modify all previous assessments

Stages of the method's implementation in the financial management system of commercial organizations:

- Stage 1 (preliminary): creation of a prognostic model (indicator selection) capable to forecast efficiency of financial and innovation activities, comprehensively describing probabilistic assessment of the magnitude, content, directions of future development of innovations. Because of the high variability of the financial and innovation development efficiency index from period to period (Table 3, A.2), it is fair to assume it a random value, since there is a nonzero probability for not to reach an acceptable value. However, this indicator in the complex reflects the results of financial and innovation activities, which in turn determines its predictive nature.
- *Stage 2:* identification of key factors; *i.e.* those variables that have the most significant impact on the results of financial and innovation activity ensuring their probability. The cycle of simulation modeling is based on selection of indicators, the set of which is formed to build a model of financial and innovation activity. It is important to present the key variables that affect the risk of financial and innovative activities and permit to calculate the measure of its effectiveness. Application of simulation models for risk assessment determines how certain basic variables influence efficiency of financial and innovation activity. Changes in the role of an individual factor lead to the indirect influence of all others, which can increase costs and cover up future benefits. Simulation models set-up inter-relations of all variables more or less influential as well as determine all possible outcomes. Number of deterministic and risk-prone variables may vary depending on the purpose of the assessment. At the same time, in the simulation analysis, the indeterminate variables are viewed in complex taking into account their inter-relations. After that, an algorithm for computer processing of information is created. Moreover, in simulation modeling, it is necessary to prepare a large amount of data for carrying out simulation experiments, as well as to establish actual level and interdependence vectors between the variables characterizing the cash flows. The process of constructing a model of financial and innovative activity depends on its scale, number and types of involved variables and magnitude of innovation. In the study, the baseline for calculating a random variable is the financial result from financial and innovation activity (FRFIA), the value of which predetermines the value of the indicator for financial and innovation development efficiency. The risk is characterized as the possibility to deviate the FRFIA indicator below its maximum value achieved in the retrospective period, FRFIA for SevKavNIPIgaz PJSC >= 33.2%; "Anda Technologies LLC ">= 128,6%; "C-Soft Rostov-on-Don" NJSC >= 159.4%. The effective observation period is 12 months. A risk situation is distinguished by the following: a random nature of the event determining which of the possible outcomes will be implemented; availability of alternative solutions; possibility to determine probable outcomes and expected results; probability of losses or additional profits.

- Stage 3: Probability distribution based on the probability rule for distribution of key factors-variables. Total losses occurring from any risk will represent a random value with a normal distribution. Preparation of hypotheses on distribution of probabilities necessitates the use of all necessary information, including analysis and study of the history of similar studies, statistical data, as well as an emphasis on the knowledge and intuition of evaluators. Each set of input data in stochastic models represents the exact probability distribution of random events in the researched process. In order to practically apply such models, it is important to ensure that each state of an individual element of the system corresponds to the probability of its reference to a given state. When calculating the probability distribution of key factors, the limits of the range of values of variables are set; initially those are the minimum and maximum values that absorb key factors with subsequent forecast of the types and parameters of probable distribution within given boundaries. Taking into account initially presented constraints almost all information will be at the disposal of the appraiser of financial and innovation activities, which makes it possible to form a set of scenarios taking into account the given restrictions on the initial variables.
- Stage 4: identification of correlative dependencies between variables - conditions for correlation of variables, relation of correlated variables are determined. Calculation of the modified indicators of FRFIA and IFID is carried out on the basis of the author's software Excel-VBA authorized software in VBA programming language "Software to determine the impact of financial innovation of commercial organizations" under conditions of uncertainty (Manuylenko and Mishchenko 2016).
- Stage 5: simulation runs (experiments), which mean generation of a random set of scenarios based on suggested assumptions, and feasible at given constraints. The goal of the stage is modeling financial and innovation activities to obtain information on their performance that determines various efficiency levels in future. During the simulation, consecutive scenarios (simulation models) are formed with application of initial data - uncertain, random variables are considered in the process of analysis, - scenarios for development of financial and innovation activities were implemented in the researched organizations. The simulation process is carried out so that random selection of values from certain probability distributions should not violate the existence of known or assumed correlation ratios among variables. Based on imitation, various variants of financial and innovation efficiency are identified with the subsequent choice of appropriate management methods. The simulation results are statistically collected and analyzed for further evaluation of the risk measurement, which determines the content of the next stage.
- Stage 6: statistical analysis of the results of modeling efficiency. It is important to note that the advantage of the Monte Carlo method is receipt of "interval" rather than "point" characteristics of the performance indicators for financial and innovation activity, whereas the lack is absence of unambiguous criteria to make decisions based on the results of the simulation analysis. Procedure for obtaining the empirical distribution function of a random variable - Appendix B. Based on the analytical results of 10,000 Monte Carlo experiments, the values of the IFID indicator are modeled (Figure 1, Appendix B, Figures B.1 - B.2).
- Stage 7: approbation of the method in "SevKavNIPIgaz" PJSC, "C-Soft Rostov-on-Don" NJSC, "Anda Technologies" LLC. In order to increase the objectivity of the assessment, financial analysts and technical experts-innovators should participate in the modeling process, which ensures the correct choice of the modeling variant.
- Stage 8: Comparison of FRFIA values and IFID indicators (actual and forecast); coordination of results, identification of trends for subsequent financial and innovative development of organizations.
- Stage 9: Formation of a reasonable conclusion based on the evaluation results.

3. Results and discussion

In theoretical field of research:

- scientific definition of "financial and innovation activity" is provided and represents investment of innovations and implementation of practical actions in order to ensure a positive financial result and (or) achievement of other beneficial effect.

In analytical field of research:

- comparison of FRFIA, IFID values (actual and forecast) is carried out – Table 4. It is focused on development of risk-oriented innovation strategies in the financial management system of commercial organizations. When FRFIA and IFID modified indicators exceed their actual values it indicates that the buffer of protection against risks in the conditions of uncertainty is included in the performance indicators of financial and innovation activity (insurance fund);
- financial management system of commercial organizations was improved by adding indicators that take into account the level of risk in the implementation of financial and innovation activity calculated through the resulting modified FRFIA based on Monte Carlo simulation - table 5, Appendix B, Table B.1.

Buffer stock is accounted in terms of gross profitability (loss) of sales of innovative goods, works, services adjusted for risk, gross profit (loss) from financial and risk accounted innovation activities per each attracted employee. As a result, planned future results of the activities of commercial organizations are taken into account. The presented method is an objective measure of potential financial and innovation risk in the financial management system of commercial organizations.

Figure 1. Process of determining modified financial result of financial and innovation activities; financial and innovation development efficiency indicator for "SevKavNIPIgaz" PJSC

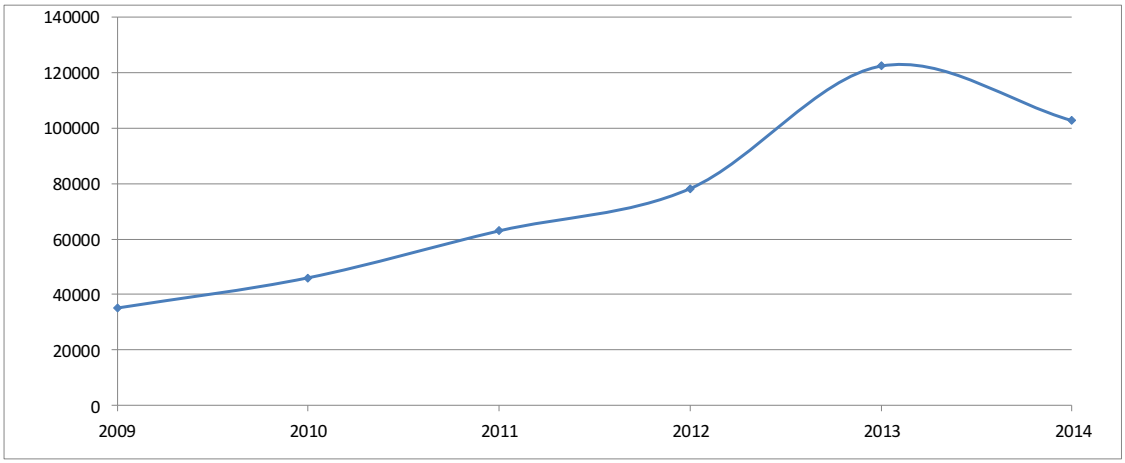

Table 4. Comparison of financial results from financial innovation activity, performance indicator for financial and innovative development (actual and projected) in corporations

YY	Financial result from financial and innovative performance			Performance of financial and innovative development, %		
	Actual (in thousand rubles)	Modified (in thousand rubles)	Ratio of modified to actual FRFIA, %	Actual, %	Modified, %	Difference between modified and actual indicators FRFIA, %
SevKavNIPIgaz PJSC						
2009	+ 11296	+ 35052	+ 310,3	+ 12,2	+ 37,8	+ 25,6
2010	+ 17613	+ 45987	+ 261,1	+ 14,7	+ 38,4	+ 23,7
2011	+ 24995	+ 62957	+ 251,9	+ 15,5	+ 38,9	+ 23,4
2012	+ 34621	+ 78226	+ 225,9	+ 16,6	+ 37,6	+ 21,0
2013	+ 62558	+ 122551	+ 195,9	+ 19,2	+ 37,6	+ 18,4
2014	+ 90849	+ 102877	+113,2	+ 33,2	+ 37,6	+ 4,4
C-Soft Rostov-on-Don SJSC						
2009	+ 40045,9	+ 62118	+ 155,1	+ 106,2	+ 164,8	+ 58,6

2010	+ 39200,7	+ 40379	+ 103,0	+ 159,4	+ 164,2	+ 4,8
2011	– 500	+ 45310	– 9062	– 1,8	+ 163,8	+ 165,6
2012	+ 19691	+ 93591	+ 475,3	+ 34,5	+ 164,0	+ 129,5
2013	0	+ 112800	0	0	+ 163,8	+ 163,8
2014	0	+ 168640	0	0	+ 163,9	+ 163,9
Anda Technology LLC						
2009	– 9186	– 21229	+ 231,1	+ 97,0	+ 224,1	+ 127,1
2010	– 375	+ 2779	– 741,1	– 18,1	+ 133,8	+ 151,9
2011	+ 4060	+ 4207	+ 103,6	+ 128,6	+ 133,2	+ 4,6
2012	+ 113	– 139	– 123,0	– 182,3	+ 224,1	+ 406,4
2013	+ 3870	+ 4859	+ 125,6	+ 106,0	+ 133,1	+ 27,1
2014	+ 6662	+ 10424	+ 156,5	+ 85,1	+ 133,1	+ 48,0

Source: calculated by the authors V. V. Manuylenko, A. A. Mishchenko

Table 5. Individual modified indicators characterizing financial and innovational activities of SevKavNIPIgaz PJSC (fragment)

Indicators	YY					
	2009	2010	2011	2012	2013	2014
1. Modified financial result of financial and innovative performance (thousand rubles)	+ 35052	+ 45987	+ 62957	+ 78226	+122551	+102877
2. Production costs for innovative goods, works and services (thousand rubles)	21780	29315	40542	43355	129556	133063
3. Number of workers involved in financial and innovational activities (persons)	231	244	257	268	153	179
4. Gross margin (gross loss) of the sales of innovative goods, works, services versus risks, % (line 1 / line 2)	+ 160,9	+156,9	+155,3	+ 180,4	+ 94,6	+77,3
4.1. Gross margin (gross loss) of the sales of innovative goods, works, services in fact, %	+ 51,9	+ 60,1	+ 61,7	+ 79,9	+ 48,3	+ 68,3
5. Gross margin (gross loss) of financial and innovative activities to a single worker involved with adjustment to risk (thousand rubles), line1 / line 3)	+ 151,7	+ 188,5	+ 245,0	+ 291,9	+ 801,0	+ 574,7
5.1. Gross margin (gross loss) of financial and innovational activities to a single worker involved, (fact in thousand rubles)	+ 48,9	+ 72,2	+ 97,3	+ 129,2	+ 406,3	+ 507,5

Source: compiled by the authors V. V. Manuylenko, A. A. Mishchenko

In methodological field of research:

- the subjectivity of non-formalized methods for evaluating the innovation activity of commercial organizations is proved, it is manifested in the absence of strict analytical dependencies and quantitatively measured indicators, which allowed to argue the expediency of introduction of additional indicators in order to assess efficiency of financial and innovation activities in the financial management system; main areas for using the results of integrated assessment are outlined.
- innovative method to evaluate efficiency of financial and innovation activities of commercial organizations is developed based on stochastic modeling.

Practical value of the method to evaluate efficiency of financial and innovation activities of commercial organizations on the basis of simulation is as follows. In the system of financial management of commercial organizations, this method allows to:

- establish the desired value of any of its indicators, as well as to form an "inevitable future";
- compile a full range of possible scenarios for the development of financial and innovation activities, taking into account decision-making on the whole set of assessments, to analyze and evaluate various

"scenarios" for the implementation of financial and innovation activities, showing the most accurate results of risk assessment;
- simultaneously consider a variety of options for the implementation of financial and innovation activities as unified with values of indicators set aside;
- adequately reflect multiple uncertainties and risks inherent in forecasting;
- monitor the impact of financial and innovation activities and other additional conditions presented in the forms of qualitative data and equations, inequalities on performance indicators.

Proposed method is distinguished by the universal nature of the application in the financial management system of commercial organizations:
- evaluation of the efficiency of financial and innovative business ideas put forward by internal and external entities of the organization;
- formation of the information evaluation ground which also contributes to the subsequent development of the Monte Carlo method;
- forecasting of risks in organizations;
- simplification and partial automation of forecasting and risk management process;
- promising financial and innovative technology which provides for information support of innovations;
- one of the decision making support systems to study dynamics of financial behavior of an organization in various situations;
- construction and analysis of scenarios for the competitors and partners' behaviors when implementing informational innovations evaluation applying "transparency" approach.

To sum up the above, it should be noted that innovations introduce an element of uncertainty into the activities of organizations in their financial management system, affecting their cost, the greater is the level of innovation the higher is the degree of uncertainty in costs. Uncertainty of financial and innovation activity assumes that neither actions nor outcome can be calculated, and actions are not defined if risks occur, but the outcome can be forecasted if certain actions are undertaken. That means that risk is subjective - the result of a taken business project can be unfavorable to some participants, whereas it may be favorable to others. Risk is the uncertainty caused by the probability of negative situations and outcomes emerge in the process of financial and innovative activities. Knight (2003) associates entrepreneurial income with innovations and risk, in his opinion, risk leading to profit is a unique uncertainty resulting from responsibility function in the last resort.

The developed method for assessing efficiency of financial and innovation activities of commercial organizations on the basis of stochastic modeling was tested in the financial management systems of SevKavNIPIgaz PJSC, Anda Technologies LLC, and C-Soft Rostov-on-Don SJSC.

Conclusions

So, a method for evaluation of efficiency of financial and innovation activities was developed, which suggests definition of a modified financial result from financial and innovation activities and index of financial and innovation development effectiveness based on the method of simulation modeling that allows to take into account the specific feature of innovations, i.e. uncertainty.

Each commercial organization engaged in financial and innovative activities if applying suggested scientific and methodological toolset will be able to independently develop, modernize and upgrade alternative financial and innovative methods for assessing innovation in the financial management system considering its own functional characteristics. The results of the assessment will contribute to the following justified set of actions:
- selection of management methods through identification of various options for financial and innovation performance based on simulation (simulation results are collected and analyzed for further risk assessment);

- formation of a theoretical and methodological grounds for further researches on development of financial and innovative methods for assessing innovation in the financial management of commercial organizations in conditions of uncertainty;
- conduct of an external economic assessment of the conditions to identify feasibility of an innovative business project: Manuylenko V. V., Mishchenko A. A. (2016);
- Monte Carlo measurement of the potential financial and innovation risk in the financial management system of commercial organizations, taking into account the assumption of the stochastic nature of the impact of endogenous and exogenous variables on the financial and innovative activity of organizations;
- complete reflection of all possible uncertainties arising during implementation of financial and innovation activities, for each of the possible scenarios with a probabilistic nature;
- development of new types of financial risks insurance in the insurance services market: Rusetskaya, Rusetskiy, Rybina, G. K., Rybina, Y.V., Sazhneva (2015);
- creation of scenarios for development of financial and innovation activities (simulation models) implemented in organizations;
- optimal combination of financial and innovative methods of evaluation, aimed at synergistic effect in the financial management system of commercial organizations;
- development of a risk-oriented policy in finances and innovations that determines development of financial and innovation activities in the financial management system of commercial organizations;
- development and implementation of: alternative financial and innovation strategies, including those of risk-oriented nature, development programs, financial and innovation policies for current moment and future;
- development of priority areas for development of financial and innovation activities of a commercial organization, improvement of its management;
- designation of areas for subsequent financial and innovative development of organizations.

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Appendix A. Practices for assessing efficiency of innovations in the researched organizations

Table A. 1. Assessment of the innovations influential degree onto development of the researched organizations as per Form 4 - Innovations

YY	Degree value: 1 – low; 2 – middle; 3 – high; 4 – out of place											
Anda Technology LLC												
	Diversification of goods, works, services	Preservation of traditional markets	Sales markets growth	In Russia	In CIS countries	In EU countries, Albania non EU*	In the USA and Canada	Other countries	Upgrade of the quality of goods, works,	Replacement of obsolete products	Employment growth	Increased flexibility in production
2012	3	4	3	3	4	4	4	4	3	4	3	2
2013	3	4	3	3	4	4	4	4	3	4	3	2
2014	3	4	3	3	4	4	4	4	3	4	3	2
											Marketing	
	Increase of operating capacity	Reduction of wages funds	Decrease of material costs	Increase of energy efficiency (reduction of consumption or leaks of energy resources)	Improvement of working environment and labor protection	Cutting down the time for connections with clients and suppliers	Motivational growth to innovative activities	Upgrade of informational relations within entity or with other companies	Elimination of environment pollution	Compliance with modern technical regulations, rules and standards	Promotion of goods, works, services to the new markets exploring new consumers	Promotion of goods, works, services to the new geographical markets
2012	2	4	4	4	4	4	2	2	3	3	3	
2013	2	4	4	4	4	4	2	2	3	3	3	
2014	2	4	4	4	4	4	2	2	3	3	3	
"C-Soft Rostov-on-Don" SJSC												
YY	Degree value: 1 – low; 2 – middle; 3 – high; 4 – out of place											
	Diversification of goods, works, services	Preservation of traditional markets	Sales markets growth	In Russia	In CIS countries	In EU countries and non-EU*	In the USA and Canada	Other countries	Upgrade of the quality of goods, works, services	Replacement of obsolete products	Employment growth	Increased flexibility in production
2009	1	2	2	2	4	4	4	2	3	4	4	4
2010	1	2	2	2	4	4	4	2	3	4	4	4
2011	1	2	2	2	4	4	4	2	3	4	4	4
2012	1	2	2	2	4	4	4	2	3	4	4	4
2013	1	2	2	2	4	4	4	2	3	4	4	4
2014	1	2	2	2	4	4	4	2	3	4	4	4
											Marketing	

	Increase of operating capacity	Reduction of wages funds	Decrease of material costs	Increase of energy efficiency (reduction of consumption or leaks of energy resources)	Improvement of working environment and labor protection	Cutting down the time for connections with clients and suppliers	Motivational growth to innovative activities	Upgrade of informational relations within entity or with other companies	Elimination of environment pollution	Compliance with modern technical regulations, rules and standards	Promotion of goods, works, services to the new markets exploring new consumers	Promotion of goods, works, services to the new geographical markets
2009	2	2	4	3	1	1	1	2	4	3	2	2
2010	2	2	4	3	1	1	1	2	4	3	2	2
2011	2	2	4	3	1	1	1	2	4	3	2	2
2012	2	2	4	3	1	1	1	2	4	3	2	2
2013	2	2	4	3	1	1	1	2	4	3	2	2
2014	2	2	4	3	1	1	1	2	4	3	2	2

Note: non - EU countries, Albania, Bosnia and Herzegovina, Iceland, Kosovo, Liechtenstein, Macedonia, Norway, Serbia, Turkey, Black Sea, Switzerland

Source: compiled by the authors V. V. Manuylenko, A. A. Mishchenko as per the data of Form 4 – Innovation "Entity's Innovational Performance Data"

Table A. 2: Indicators characterizing financial and innovation performance of the researched organizations in the financial management system

Indicators	YY						Variations (+,–)
	2009	2010	2011	2012	2013	2014	
"Anda Technology" LLC							
Revenues increase resulted from innovative goods, works and services %	–	+579,7	+ 71,6	+ 47,8	+ 38,9	+ 24,5	– 555,2
2. Proportion of revenues resulted from innovative goods, works and services within the science and technical revenue, %	60,7	77,0	96,8	98,5	97,2	96,0	+ 35,3
3. Innovational level of goods, works and services, %	60,7	77,0	96,8	98,5	97,2	96,0	+ 35,3
4. Share of cost price of sales of innovative goods, works, services in the general cost price of sales, %	89,9	96,5	89,4	97,8	96,2	98,5	+8,6
5. Intensity of innovative costs, %	463,4	80,1	72,4	98,1	85,9	80,5	– 382,9
6. Efficiency of financial and innovation development, %	+ 97,0	– 18,1	+ 128,6	– 182,3	+106, 0	+ 85,1	– 11,9
7. Gross profitability (unprofitability) of sales, %	– 80,6	+ 20,5	+ 23,3	– 0,3	+ 12,0	+ 22,3	+ 102,9
8. Gross profitability (unprofitability) of sales of innovative goods, works and services, %	– 86,9	– 3,8	+ 33,6	+ 0,5	+ 13,2	+ 19,3	+ 106,2
9. Organization value growth, %	–	– 2,6	+102, 9	– 53,1	+ 65,0	– 14,2	– 11,6
"C-Soft Rostov-on-Don" SJSC							
1. Revenues decrease resulted from innovative goods, works and services, %		– 1,1	0	–	–	–	–
2. Share of revenue from innovative	24,5	23,9	0	8,5	0	0	– 24,5

Indicators	YY						Variations
goods, works, services in revenues from the main type of economic activity,%							
3. Innovational level of goods, works and services, %	19,7	19,3	–	7,8	0	0	– 19,7
4. Share of cost price of sales of innovative goods, works, services in the general cost price of sales, %	2,0	2,1	0,3	0,03	0	0	– 2,0
5. Intensity of innovative costs, %	1,7	1,8	0,2	0,02	0	0	– 1,7
6. Efficiency of financial and innovation development, %	+ 106,2	+ 159,4	– 1,8	+ 34,5	0	0	– 106,2
7. Gross profitability (unprofitability) of sales, %	+ 20,4	+12,3	+ 14,0	+ 29,1	+ 36,7	+ 39,1	+ 18,7
8. Gross profitability (unprofitability) of sales of innovative goods, works and services, %	+1063,0	+ 946,9	– 100	+35801,8	0	0	1063,0
9. Organization value growth, %	–	+ 5,6	– 22,2	+ 78,4	+ 56,6	+ 124,5	+ 118,9

Source: compiled by the authors V. V. Manuylenko, A. A. Mishchenko as per the data of Form 4 – Innovation "Entity's Innovational Performance Data"

Appendix B

Actions to obtain empirical function of a random variable distribution:

1. A random variable is generated within the established interval by the random number generator - the IFID indicator, which according to "SevKavNIPIgaz" PJSC > = 33.2%; "Anda Technologies"LLC > = 128,6%; "C-Soft Rostov-on-Don" SJSC > = 159.4%;
2. According to the distribution function F (x), probability for a random variable reach a value less than or equal to x with a confidence level of 95% is calculated by the forecast FRFIA;
3. Inverse distribution function Fx-1 (the quantile of the distribution) (with the given argument p the value of x is calculated, with the random variable being less than or equal to x with probability p) is used to calculate forecast FRFIA. The quantile of the order = 95%;
4. Repetition of the procedure is 10,000 times;
5. Variation series of the forecast value of the IFID is prepared for the period of 6 years.

Figure B. 1. Process of determining modified financial result of financial and innovation activities; financial and innovation development efficiency indicator for “Anda Technology” LLC

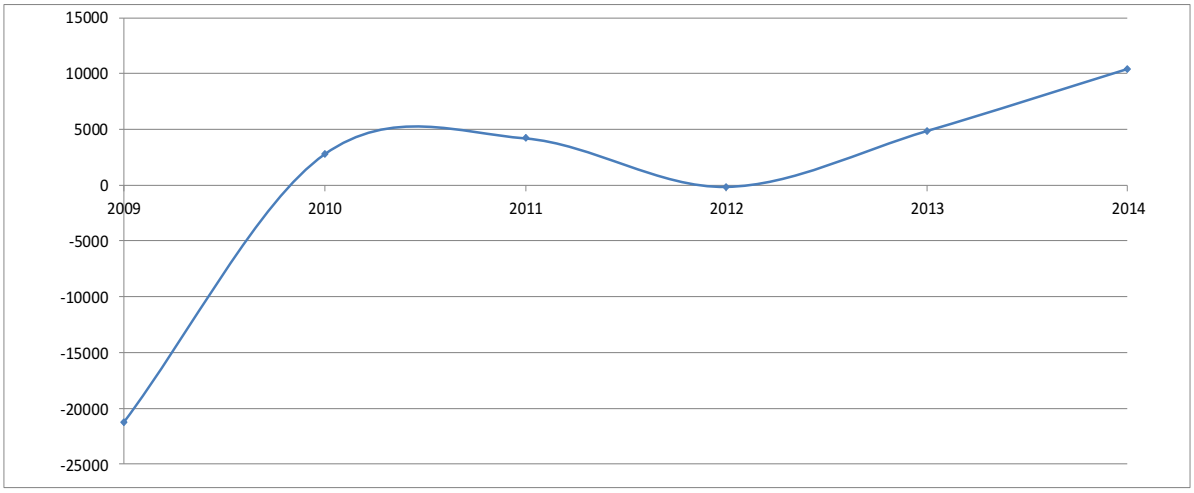
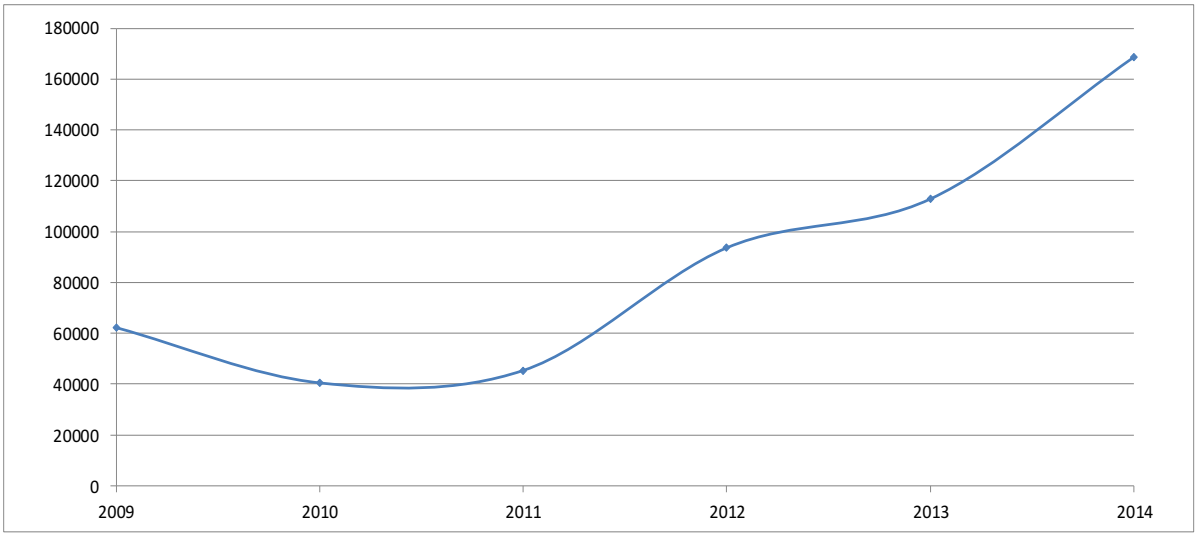


Figure B. 2. Process of determining modified financial result of financial and innovation activities; financial and innovation development efficiency indicator for "C-Soft Rostov-on-Don" SJSC



Annex C. Modified indicators characterizing financial and innovational activities of commercial organizations

Table C. 1. Individual modified indicators characterizing financial and innovational activities of the researched organizations

Indicators	YY					
	2009	2010	2011	2012	2013	2014
"Anda Technology" LLC						
1. Modified financial result of financial and innovative performance (thousand rubles)	–21229	+ 2779	+4207	– 139	+4859	+10424
2. Production costs for innovative goods, works and services (thousand rubles)	10570	9782	12086	23758	29294	34597
3. Number of workers involved in financial and innovational activities (persons)	2	2	2	4	4	6
4. Gross margin (gross loss) of the sales of innovative goods, works, services versus risks, % (line 1 / line 2)	– 200,8	+ 28,4	+ 34,8	–0,6	+16,6	+30,1
4.1. Gross margin (gross loss) of the sales of innovative goods, works, services in fact, %	– 86,9	– 3,8	+ 33,6	+0,5	+13,2	+19,3
5. Gross margin (gross loss) of financial and innovative activities to a single worker involved with adjustment to risk (thousand rubles), line1 / line 3)	-10614,5	+1389,5	+2103,5	–34,8	+1214,8	+1737,3
5.1. Gross margin (gross loss) of financial and innovational activities to a single worker involved, (fact in thousand rubles)	–4593	– 187,5	+ 2030	+28,3	+967,5	+1110,3
"C-Soft Rostov-on-Don" SJSC						
1. Modified financial result of financial and innovative performance (thousand rubles)	+62118	+40379	+45310	+93591	+112800	+168640
2. Production costs for innovative goods, works and services (thousand rubles)	3767,3	4139,8	500	55	0	0

Indicators	YY					
	2009	2010	2011	2012	2013	2014
3. Number of workers involved in financial and innovational activities (persons)	165	142	149	196	222	222
4. Gross margin (gross loss) of the sales of innovative goods, works, services versus risks, % (line 1 / line 2)	+1648,9	+ 975,4	+ 9062,0	+170165,5	0	0
4.1. Gross margin (gross loss) of the sales of innovative goods, works, services in fact, %	+1063,0	+ 946,9	– 100	+ 35801,8	0	0
5. Gross margin (gross loss) of financial and innovative activities to a single worker involved with adjustment to risk (thousand rubles), line1 / line 3)	+ 376,5	+ 284,4	+ 304,1	+ 477,5	+ 508,1	+ 759,6
5.1. Gross margin (gross loss) of financial and innovational activities to a single worker involved, (fact in thousand rubles)	242,7	276,1	– 3,4	100,5	0	0

Source: compiled by the authors V. V. Manuylenko, A. A. Mishchenko

The Effect of Minimum Wages, Inflation Rate, Human Resources Quality, Economic Growth Toward Productivity of Labor Force and Its Implication to Education Unemployment Rate in South Sulawesi-Indonesia

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Abstract

A study carried out in order to know the effect of directly or indirectly between the minimum wage, inflation, human resources and economic growth of the productivity of labor and educated unemployment rate is implemented in the province of South Sulawesi in September-November 2014. Data collection method used is library research is research through several books, literature or scientific explanations to obtain underlying theories in analyzing the data obtained from the study site. Search data is done by using the documentation by way of recording data reports that have been published and literature. For estimation models used in this study is a model of simultaneous equations using path analysis (Path Analysis) to see the effects of direct and indirect effects of the minimum wage, inflation, human resources and economic growth on work productivity and the unemployment rate of educated using WarpPLS. Analysis result concluded that the minimum wage, inflation rate and quality of human resources (HR) effect on the rate of educated unemployment in the province of South Sulawesi, either directly or indirectly through labor productivity. While economic growth variables did not provide significant direct effect on the unemployment rate of educated, but the indirect effect through productivity.

Keywords: path; unemployment rate; work productivity; human resources; inflation; minimum wages; economic growth

JEL Classification: B4; J3; J6; J8; R1

Introduction

Unemployment is one of the problems facing all countries in the world as a result of the gap between the numbers of working age population entering the labor force with the availability of jobs. Unemployment educated workforce is highly educated upper middle (SMA, Diploma and Degree) and does not work (Tobing 2004). The unemployment rate of educated (Educated Unemployment rate) is the ratio of the number of job seekers to the top high school education (as a well-educated group) to the size of the labor force in that group (BPS 2009). Every year colleges produce graduates whose numbers continue to rise. Moreover, some economists predict unemployment in developing countries are generally dominated by youth unemployment and educated unemployment (Todaro 2004).

The unemployment rate relatively young group with an unemployment rate higher than the population caused by several factors: First, the structural factors. These factors consist of lack of skills of young groups in the appeal of a more mature, inaccuracies or geographical constraints and the scarcity of information that hamper the labor market, and the age factor when leaving school, usually leave school at an earlier age to experience higher levels of unemployment. Second, the factors of non-structural consists of the increase in worker wages that encourage employers to terminate the employment relationship or do not accept the new employees, increased participation of women, including those who are married to the labor force, perceptions of youth against the available jobs among others, about the level of wages low, as well as perceptions of career and work environment. The rising trend in unemployment of educated labor is due to that the higher the education the higher the aspiration to get a position or employment is more appropriate (Sutomo *et al.* 1999).

In 2012, South Sulawesi province has a labor force of 3.6 million. Amounting to 94.13% of the working

population and the remaining 5.87% is unemployed. The unemployment rate in South Sulawesi province has decreased from year to year. Most people who are unemployed are not the poor, even from families who are very capable. Poor people tend to sustain life with work of any kind, although only by working odd jobs because basically they needed food. Based on the statement, in terms of education, most of which turned out to be 53.08% of the unemployed in South Sulawesi province has a high school education / vocational upwards. While nearly half of which is 47.91% of the people who work have an elementary education down in the province of South Sulawesi.

Education has always been a strategic place in developing human resources as a form of development agenda and the future establishment of a country. A good education will produce a professional workforce that can meet the needs of a country's workforce. Unemployment is often associated with level of education. The higher a person's education, the greater the chances of getting a decent job. This means that if the quality of human resources the higher the employment also increased, thereby reducing the rate of educated unemployment. This is consistent with what previous research, which says that by improving the quality of human resources it will reduce the level of unemployment of educated, because the quality of the resources owned by university graduates with the skills, knowledge and technology that they have the employment opportunities for the educated unemployed is huge absorbed in major industries (Cahyani 2014).

The level of wages of all workers is always different. A key to the difference in wage levels lies in the very different qualities among the workforce. The cause of the most influential are graduates of education, training and experience of someone who is different in each person's ability and contribution to the revenue it receives. The higher the quality of a person, the greater the contribution to the company, so the wages are also getting bigger. Besides differences in areas or regions became the cause of differences in wage levels. Region that has a high-income area that would create income effects for the workforce because of a growing company in the area.

Another factor that can contribute to the unemployment rate is inflation. Inflation has two sides of the same coin. According to Philips curve, there is a negative relationship between the unemployment rate and the inflation rate. This means that the higher the unemployment rate results in the lower rate of increase in wages, in the sense that the rate of inflation pressure. On the other hand, the high inflation rate but can worsen the purchasing power of people can also increase the cost of production. The increase in production costs will have an impact on the reduction of labor which resulted in an increase in the number of unemployed.

Aside from inflation and human resources, economic growth also affects the level of educated unemployment. Economic growth reflects the state of the economy in a region. The economic situation will affect the growth and condition of the company that operates the relevant area. The higher the economy in a region, the higher the growth opportunities for the company and the creation of employment opportunities for the people of the concerned area. Economic growth also shows the extent to which economic activity can generate additional income or welfare of society at a certain period. Besides economic growth through increased GDP is expected to absorb the labor force in the region, due to the increase in the GDP is likely to increase production capacity.

In connection with this problem, the objectives determine the effect, directly or indirectly between the minimum wage, inflation, human resources and economic growth on labor productivity and the rate of educated unemployment in the province of South Sulawesi, either directly or indirectly through labor productivity. Originality of this study show as: This study was never examined the mediating effect influence labor productivity of the minimum wage, inflation, human resources and economic growth of the education level of unemployment, we examine the results of Cahyani (2012) about the unemployment of educated, Zulhanafi (2013) on productivity and unemployment, Sari (2011) on economic growth, educated unemployment. No similar studies that tested the model designated in the same location (in Sulawesi). It became the location of originality in this study and there are no previous studies that examined the effect of mediation in labor productivity in the influence of the quality of human resources to the education level of unemployment, especially in Sulawesi.

1. Materials and methods

Research sites. This study was conducted in South Sulawesi province from September-November 2014 by taking the data several districts / cities in South Sulawesi which has an open unemployment rate of

open unemployment rate above the provincial and national levels. Data is taken from six districts / cities include: 1) Luwu; 2) The city of Makassar; 3) Palopo; 4) East Luwu District; 5) Pangkep; 6) Bantaeng.

Research design. This research is an explanatory research that aims to explain the influence of the quality of human resources (HR) on the level of educated unemployment in the province of South Sulawesi, either directly or indirectly through labor productivity.

Method of collecting data. Data collection methods used were library research (library research) is research through several books, literature or scientific explanations to obtain underlying theories in analyzing the data obtained from the study site. Search data is done by using the documentation by way of recording data reports that have been published and literature.

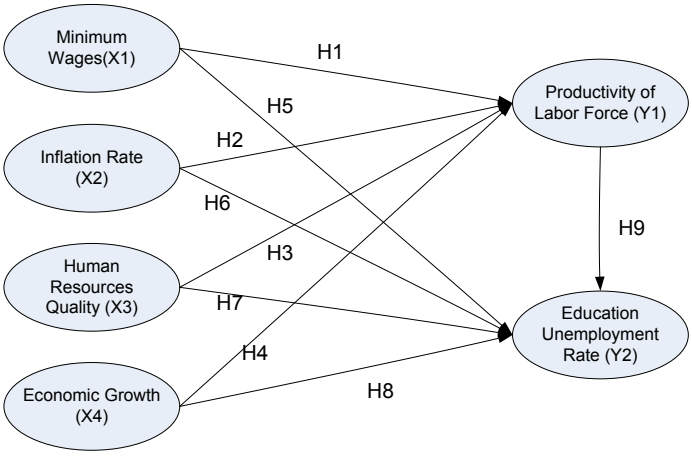
Analysis method. The analytical method used in this research is the method of data panel (merging data time series and cross Election) using simultaneous equations model by Path Analysis by WarpPLS 4, for each variables in this study is manifest variables (observable variables). The simultaneous equation model can be seen in the following equation:

$$Y_1 = f(X_1, X_2, X_3, X_4) \quad (1)$$

$$Y_2 = f(X_1, X_2, X_3, X_4, Y_1) \quad (2)$$

where: X_1 = Minimum Wages; X_2 = Inflation Rate; X_3 = Human Resources Quality; X_4 = Economic Growth; Y_1 = Productivity of Labor Force (Rupiah/people); Y_2 = Educated of Unemployment Rate (%).

Figure 1. Conceptual Framework



Hypothesis testing as follow:

1. Minimum Wages is significantly effect to Productivity of Labor Force
2. Inflation Rate is significantly effect to Productivity of Labor Force
3. Human Resource Quality is significantly effect to Productivity of Labor Force
4. Economic Growth is significantly effect to Productivity of Labor Force
5. Minimum Wages is significantly effect to Education Unemployment Rate
6. Inflation Rate is significantly effect to Education Unemployment Rate
7. Human Resource Quality is significantly effect to Education Unemployment Rate
8. Economic Growth is significantly effect to Education Unemployment Rate
9. Productivity of Labor Force is significantly effect to labour Education Unemployment Rate

2. Results and discussion

Goodness of Fit

The model in this study is said to be fit if supported by empirical data. As it is known that the Goodness of Fit the structural model in the form of SEM-relevance predictive value (Q^2) which is calculated based on the value of R^2 each endogenous variable. Rated R for each dependent variable can be seen in Table 1:

Table 1. R-Square of dependent variable

Variable	R-Square
Productivity of Labor Force	0.656
Educated of Unemployment Rate	0.594
Predictive-relevance (Q^2)	0.860

Based on Table 1 it can be seen that the value of Predictive-relevance (Q^2) of 0.860 or 86.0%. This means that the model can be explained by variables associated by 86.0% while the remaining 14.0% is explained by other variables outside the model.

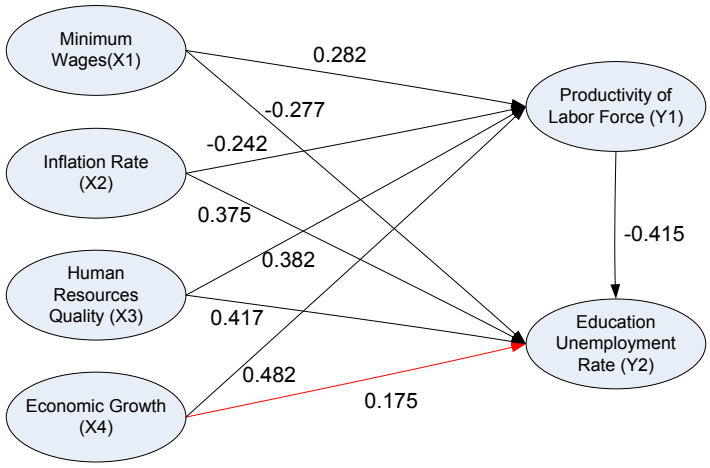
Structural Model

Table 2. Path Model: Direct Effect

No	Relationship	Coeffiicient	P-value	Conclusion
1	X1 to Y1	0.282	0.015	Significant
2	X2 to Y1	-0.242	0.019	Significant
3	X3 to Y1	0.382	0.010	Significant
4	X4 to Y1	0.482	0.000	Significant
5	X1 to Y2	-0.277	0.017	Significant
6	X2 to Y2	0.375	0.013	Significant
7	X3 to Y2	0.417	0.003	Significant
8	X4 to Y2	0.175	0.413	Not Significant
9	Y1 to Y2	-0.415	0.000	Significant

Source: Primary Data Processed, 2016

Figure 2. Structural Model SEM: Direct Effect



Based on Table 3 and Figure 2 can be presented structural model test results as follows:

1. The effect of the minimum wage (X1) to the Work Productivity (Y1), structural coefficient obtained for 0.282, and a P-value of 0.015. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between the minimum wage (X1) of the Work Productivity (Y1).

2. The Effect of inflation (X2) to the Work Productivity (Y1), structural coefficient obtained at -0.242, and a P-value of 0.019. Because the P-value of <0.05, and the coefficients are negative, indicating that there is significant influence but inversely between the rate of inflation (X2) on the Work Productivity (Y1).
3. The Effect of human resources (X3) to the Work Productivity (Y1), structural coefficient of 0.382, and a P-value of 0.010. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between human resources (X3) of the Work Productivity (Y1).
4. The Effect of Economic Growth (X4) to the Work Productivity (Y1), structural coefficient of 0.482, and a P-value of 0.000. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between economic growth (X4) of the Work Productivity (Y1).
5. The effect of the minimum wage (X1) to educated unemployment rate (Y2), structural coefficient obtained at -0.277, and a P-value of 0.017. Because the P-value of <0.05, and the coefficients are negative, indicating that there is significant influence but inversely between the minimum wage (X1) to educated unemployment rate (Y2).
6. The Effect of inflation (X2) to educated unemployment rate (Y2), structural coefficient of 0.375, and a P-value of 0.013. Because the P-value <0.05 indicates that there is a significant and positive influence between the rate of inflation (X2) to educated unemployment rate (Y2).
7. The Effect of human resources (X3) to educated unemployment rate (Y2), structural coefficient of 0.417, and a P-value of 0.003. Because the P-value of <0.05, and the coefficient is positive, indicating that there is significant and positive between human resources (X3) against educated unemployment rate (Y2).
8. The Effect of Economic Growth (X4) to educated unemployment rate (Y2), structural coefficient of 0.175, and P-value 0.413. Because the P-value> 0.05, indicating that there is no significant relationship between economic growth (X4) against educated unemployment rate (Y2).
9. The Effect of Work Productivity (Y1) to the unemployment rate of educated (Y2), structural coefficient obtained at -0.415, and a P-value of 0.000. Because the P-value of <0.05, and the coefficients are negative, indicating that there is significant influence but inversely between Work Productivity (Y1) to the unemployment rate of educated (Y2).

In addition to the direct effect of the test, the SEM is also known indirect effect (indirect effect). The indirect effect is the result of multiplying two (2) direct effect. The indirect effect is declared significant if both the direct influence that shape is significant. Here is presented the results of the indirect effect:

Table 3. Structural Model SEM Results: Indirect Effect

Indirect Effect	Coefficient Direct Effect		Coefficient of Indirect Effect	Information
X1 → Y1 → Y2	X1 →Y1 = 0.282 *	Y1 → Y2 = -0.415*	-0.117	Significant
X2 → Y1 → Y2	X2 →Y1 = -0.242 *	Y1 → Y2 = -0.415*	0.100	Significant
X3 → Y1 → Y2	X3 →Y1 = 0.382 *	Y1 → Y2 = -0.415*	-0.159	Significant
X4 → Y1 → Y2	X4 →Y1 = 0.482 *	Y1 → Y2 = -0.415*	-0.200	Significant

Based on Table 3 and Figure 2, there are four indirect effect. More results are described as follows:

1. The indirect effect of the minimum wage (X1) to educated unemployment rate (Y2) through labor productivity (Y1), coefficient indirect effect of -0.117. The direct effect (minimum wage (X1) to Productivity of labor (Y1) is a significant and direct influence of productivity of labor (Y1) to the unemployment rate of educated (Y2) is also significant, it can be concluded that there is an indirect effect significant between minimum wage (X1) to educated unemployment rate (Y2) through labor productivity (Y1). the coefficient is negative means that the higher the minimum wage (X1), will affect more the low rate of unemployment of educated (Y2) through productivity work (Y1) is high.
2. The indirect effect between the rates of inflation (X2) to educated unemployment rate (Y2) through labor productivity (Y1), the indirect influence coefficient of 0.100. The direct effect (inflation rate (X2) to Productivity of labor (Y1) is a significant and direct influence of productivity of labor (Y1) to the unemployment rate of

educated (Y2) is also significant, it can be concluded that there is an indirect effect significant between the rate of inflation (X2) to the unemployment rate of educated (Y2) through productivity work (Y1). the coefficient is positive, meaning that the higher the rate of inflation (X2), will affect the increasingly steeper Similarly unemployment rate of educated (Y2) through Productivity of labor (Y1) is high.

3. The indirect effect between human resources (X3) against educated unemployment rate (Y2) through labor productivity (Y1), coefficient indirect effect of -0.159. The direct effect (Human resources (X3) to Productivity of labor (Y1) is a significant and direct influence of productivity of labor (Y1) to the unemployment rate of educated (Y2) is significant, it can be concluded there is an indirect effect significant between human resources (X3) against educated unemployment rate (Y2) through labor productivity (Y1). the coefficient is negative means that the higher the human resources (X3), will affect more the low rate of unemployment of educated (Y2) through productivity work (Y1) is high.
4. The indirect effect between economic growths (X4) against educated unemployment rate (Y2) through labor productivity (Y1), coefficient indirect effect of -0.200. The direct effect (economic growth (X4) to Productivity of labor (Y1) is a significant and direct influence of productivity of labor (Y1) to the unemployment rate of educated (Y2) is significant, it can be concluded there is an indirect effect significant between economic growth (X4) against the unemployment rate of educated (Y2) through labor productivity (Y1). the coefficient is negative means that the higher the economic growth (X4), will affect more the low level of unemployment of educated (Y2) through productivity work (Y1) is high.

3. Discussion

The analysis showed that the minimum wage, the quality of human resources (HR) and economic growth and a significant positive effect on labor productivity in South Sulawesi province. This means that the higher the wages, human resources and economic growth are obtained, the labor productivity will be higher as well. The different results found in the effect of inflation on the growth rate of the economy where the inflation rate have a significant effect but the negative so that the higher the rate of inflation will further lower the level of work productivity. These results support multiple theories and previous empirical studies, as proposed by Simanjuntak (2001), which says that the higher the formal education obtained, then labor productivity will increase as well. Education does not only gain knowledge but also improve job skills that will improve labor productivity. Some classical economists and the neo-classics like Adam Smith, Von Therenen, and Alfred Marshall agreed that human capital consists of the skills and creativity gained through education and useful for all members of society.

Similar results were found in the significant influence of the minimum wage, the rate of inflation, and human resources on the level of educated unemployment. This study shows that the inflation rate and the quality of human resources (HR) positive and significant impact on the unemployment rate of educated in the province of South Sulawesi. This means that the increase in inflation and quality of human resources (HR) will increase the level of educated unemployment. In theory, these results can be received with a view of the labor demand side. If the quality of human resources (HR) increased means the ratio between the number of people who have graduated from high school education up to the total population aged 20 years and over greater. The magnitude of this ratio is not followed by employment provided cause employment declines that have an impact on the unemployment rate increased, too educated. A significant result was found negative but also on variable minimum wage on the unemployment rate of educated which indicates that the higher the wage, the unemployment rate would be lower. However, different results are found in the effect of economic growth that does not provide a significant direct effect on the unemployment rate but the indirect effect is through productivity.

These results support some empirical studies previously pointed out by Sari (2011) and Notoatmodjo (2003), which says that education levels affect the educated unemployment means that any changes in the level of education result in changes of educated unemployment, *i.e* when education levels rise has also led educated unemployment has increased. Labor productivity and a significant negative effect on the unemployment rate of educated in the province of South Sulawesi. If the labor productivity has increased the ability of labor to produce output will increase, so will have an impact on the increase in labor demand. Increased labor demand will impact on the level of educated unemployment. Conversely, if the labor productivity decreased the ability of the

workforce will have an impact on the decline in labor demand that the unemployment rate will rise educated.

The results are consistent with the theory of Bellante and Jackson (2000), which states that if productivity has increased the use of labor will also increase. Vice versa, if the productivity has decreased the use of labor will also decrease. This drop will increase the unemployment rate. The results of the study Zulhanafi *et al.* (2013), also concluded that the significant effect of education on labor productivity and labor productivity effect on the unemployment rate.

Limitations from this study is only include labors who have education level in Sulawesi and type of data is cross sectional. So the result of this study do not allow to generalize on the labor and time different studies.

Conclusions and Recommendations

Based on the problems, objectives and discussion presented earlier, then from this study can be concluded that the minimum wage, inflation rate and quality of human resources (HR) effect on the rate of educated unemployment in the province of South Sulawesi, either directly or indirectly through labor productivity, While economic growth variables did not provide significant direct effect on the unemployment rate of educated, but the indirect effect through productivity.

Based on the conclusions, it is recommended: to reduce the level of educated unemployment, the government should further enhance employment opportunities for educated unemployed and improve the quality or the quality of education that is based on skill and technology in the face of the job market. For further research on the problem of educated unemployment is advisable to conduct further studies to include other independent variables.

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