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The Nexus Between Domestic Investment and Economic Growth in Middle East and North Africa Countries. Do Patents Matter?

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Abstract:

In this paper, we try to search the effect of patents on the relationship between domestic investment and economic growth. Data for Middle East and North Africa (MENA) countries over the period 1998 – 2022 are applied for panel data analysis. Empirical analysis validates that domestic investment impact positively on economic growth. However, patents don't have any incidence on economic growth. Also, the outcome of domestic investment on economic growth attests to be not influenced by patent.

Keywords: domestic investment; economic growth; patents; MENA countries; panel data analysis.

JEL Classification: O31; O32; O38; O47; O50.

Introduction

Domestic investments play a crucial role in the economic growth of a country. They help stimulate demand create jobs increase productivity and foster innovation. In fact, domestic investments have a multiplier effect on the economy as they increase the demand for goods and services. When companies invest in new facilities, equipment and technologies, this creates employment opportunities and stimulates consumption, which encourages other companies to invest in turn. In addition, domestic investments allow companies to improve their efficiency and productivity through the adoption of new technologies, the modernization of equipment and the improvement of infrastructure. This leads to more efficient use of resources, increased output per worker and increased competitiveness in international markets. Otherwise, domestic investments contribute to improving public

infrastructure such as roads, bridges, ports and telecommunications networks.

Quality infrastructure promotes trade facilitates travel and stimulates foreign investment, which has a positive impact on economic growth. In fact, several recent empirical works have shown that domestic investments have favorable effects on the improvement of economic growth. Among these studies, we can cite Adams (2009), Tang et al. (2008), Choe (2003), Ghazali (2010), Mohamed et al. (2013), Ilegbinosa et al. (2015), Ullah et al. (2014), Miao et al. (2021), Emmanuel and Kehinde (2018), Lautier and Moreaub (2012), Bayar (2014), Ndikumana and Verick (2008), Güngör and Ringim (2017), Al-Sadig (2013), Tran and Hoang (2019), Abu and Karim (2016), Tawiri (2010), Younsi et al. (2021), Chakraborty and Mukherjee (2012), Bakari (2022a), Bakari et al (2020a), Bakari and Mabrouki (2017), Bakari and Tiba (2022), Bakari (2017a), Bakari (2021a), Bakari et al. (2021b), Bakari et al. (2022a), Bakari and Tiba (2019) and Bakari (2021b).

Patents protect technological inventions and encourage them to be developed and commercialized. They offer inventors a period of exclusivity to exploit their inventions, which encourages them to invest in the research and development of new technologies. This fosters innovation and stimulates creativity within the economy. Additionally, patents provide legal protection to inventors by allowing them to exclude others from using the manufacture or sale of their invention for a specified period. This gives inventors a competitive edge and encourages them to invest in their idea. Investors are also more inclined to finance projects that are protected by patents as this gives them legal certainty and the possibility of making long-term profits. Otherwise, patents also protect the intellectual property rights of inventors by preventing other economic actors from commercializing or using their inventions without their consent. This promotes fair competition by avoiding product plagiarism or counterfeiting. Companies are encouraged to develop unique innovations and constantly improve their products to remain competitive in the market.

Similarly, innovation and the economic valuation of patents stimulate economic growth by promoting job creation. When a company develops an innovative technology, it can create new markets and new jobs to support the production, marketing and management of this technology. Patents also facilitate technology transfer between companies which can foster increased collaboration and the development of commercial partnerships which has a positive impact on the economy. Moreover, countries that place importance on invention patents become more attractive for foreign investment. International companies, especially technology-focused ones, are attracted by strong intellectual property regulatory regimes that ensure the protection of their innovations. This encourages foreign direct investment and facilitates the transfer of knowledge and technology between countries which promotes global economic growth. In fact, several recent empirical works have shown that patents have favourable effects on improving economic growth. Among these studies, we can cite Thompson and Rushing (1999), Iwaisako and Futagami (2013), Blind et al. (2022), Ferreira et al. (2020), Alexiou et al. (2016), Mabrouki (2017), Mabrouki (2022), Bulus and Bakirtas (2021), Bilbao-Osorio and Rodríguez-Pose (2004), Hasan and Tucci (2010), Mabrouki (2018a), Mabrouki (2018b), Lin et al (2021), Mabrouki (2019), Saito (2017), Dereli (2019), Ben Youssef (2020), Pece et al (2015), Bakari (2022b) and Bakari (2019a).

In the other direction, the interaction between domestic investments and patents can play an important role in the economic growth of a country. First, domestic investments in research and development (R&D) can foster the creation of new inventions and technological discoveries. These inventions can be patented to protect intellectual property rights and encourage companies to invest more in innovation. In addition, invention patents grant temporary exclusivity to inventors to exploit their innovation. This can encourage competition between companies as they seek to develop new technologies to compete in the market. Healthy competition can drive productivity, efficiency and innovation which contributes to economic growth. Similarly, invention patents can also play a role in attracting foreign investment.

Foreign companies may be attracted by the advantages of intellectual property and the possibilities of marketing their inventions. Foreign direct investment can bring in additional capital, technology and knowledge which can stimulate economic growth. Also, when invention patents expire the technical knowledge, they contain may become publicly available. This allows for dissemination of knowledge and wider use of inventions. Businesses and individuals can then leverage this knowledge to develop new product or service ideas that contribute to economic growth. On the other hand, invention patents provide legal protection against unauthorized use or appropriation by other market players. This can reassure investors and encourage them to invest more in long-term research and innovation projects. This increased protection can improve the stability and security of investments thereby promoting economic growth.

In Middle East and North Africa (MENA) countries the situation of domestic investments and patents can vary from one country to another. However, there are some common trends that can be observed in the region. In many MENA countries domestic investment has traditionally been limited due to factors such as low investor confidence restrictive regulations corruption and political uncertainty. However, in recent years many countries have undertaken reforms to stimulate domestic investment. Measures have been taken to improve the business climate facilitate administrative procedures reduce regulatory obstacles and encourage entrepreneurship. Some economies in the region such as the United Arab Emirates and Saudi Arabia have seen significant growth in domestic investment, particularly in sectors such as technology, renewable energy and real estate.

The situation of invention patents also varies from country to country in the MENA region. In some countries the systems for the protection of intellectual property rights and the registration of patents are well developed and offer solid protection to inventors. These countries have well-established patent offices and a culture of innovation supported by supportive government policies. The United Arab Emirates, Israel and Turkey are examples of countries in the region that have established strong patent systems. However, in other countries in the region, patent systems are less developed, which can limit the protection of intellectual property rights and discourage innovation. Some countries also have challenges in enforcing intellectual property rights which can deter potential inventors from filing patents. Overall, there is a growing awareness in the MENA region of the importance of domestic investment and innovation to drive economic growth. Governments and economic actors increasingly recognize the importance of creating an environment conducive to investment, the protection of intellectual property rights and the promotion of innovation in order to foster economic growth and the diversification of the economies of the region.

Examining the impact of domestic investments and patents on economic growth in MENA (Middle East and North Africa) countries is of great importance due to several key factors. First of all, domestic investments are considered as an essential driver of economic growth in the MENA region. Domestic investment generates jobs stimulates domestic demand promotes innovation and improves the skills of the labour force. In MENA countries where unemployment is often high, domestic investment can create employment opportunities, reduce import dependency, and promote economic diversification. Moreover, invention patents are a key indicator of technological innovation and can play a significant role in economic growth.

Patents protect intellectual property rights and encourage companies to invest in research and development. Technological innovation can improve productivity boost competitiveness and allow companies to differentiate themselves in the global market. In the context of MENA countries where innovation is often seen as a challenge, the promotion and protection of patents can encourage the creation of technological enterprises, the transfer of technology and the adoption of advanced technologies. In addition, examining the impact of domestic investment and patents in MENA countries is important to attract foreign investment. Foreign investors generally seek stable economic environments that are predictable and conducive to innovation. An increase in domestic investments and invention patents can signal a favourable business climate, an ability to absorb new technologies and an openness to collaboration with foreign partners.

In this work, we search if the interlinkage terms for domestic investment and patents contribute to economic growth. This paper checks the idea that the impact of domestic investment on economic growth is influenced by patents. parallelly, we check the idea that the impact of patents on economic growth is influenced by domestic investment. We execute cross-country panel data analysis using World Development Indicator (WDI) data. In Section 2, we format a growth equation and empirical methodology. Section 3 covers empirical results. Section 5 conclude our work.

1. Empirical Methodology

As we mentioned that the objective of this work is to examine the role of invention patents in the impact of domestic investments on economic growth in the case of MENA countries. In another way, we will examine the impact of the interaction between domestic investments and patents on economic growth in the case of MENA countries. In fact, our database covers 18 countries and a period from 1998 to 2022. Table 1 presents the variables and their abbreviations that will be used in our estimation.

Table 1. The description of the variables

No	Abbreviation	Variables	Description of indicators*
1	FD	Financial development	Broad money (% of GDP)
2	X	Exports	Exports of goods and services (% of GDP)
3	FDI	Foreign direct investment	Foreign direct investment, net inflows (% of GDP)
4	DY	Economic growth	GDP growth (annual %)
5	GGF	Governance	General government final consumption expenditure (% of GDP)
6	DDI	Domestic investments	Gross fixed capital formation (annual % growth)
7	M	Imports	Imports of goods and services (% of GDP)
8	DIN	Inflation	Inflation, consumer prices (annual %)
9	DPAR	Patent	Patent applications, residents (annual % growth)
10	DP	Population	Population growth (annual %)

Note: World Bank Indicators
Source: Built by authors

We set up a GDP-growth equation as in Romer (1990), Barro (2003), Rahman and Mamun (2016), Ozturk and Al-Mulali (2015), Fosu (1990), Al-Mulali et al. (2014), Huang et al. (2008), Tumwebaze and Ijjo (2015):

$$DY_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 X_{it} + \beta_3 FDI_{it} + \beta_4 GGF_{it} + \beta_5 M_{it} + \beta_6 DIN_{it} + \beta_7 DP_{it} + \beta_8 DDI_{t-1} + \beta_9 DPAR_{t-1} + \beta_{10} DDI_{t-1} * DPAR_{t-1} + w_i + u_t + v_{it}$$

where: w_i is a country effect, u_t is a year effect, v_{it} is independent and identically distributed error; $DDI_{t-1} * DPAR_{t-1}$ is the interaction between domestic investment and patents

Before introducing the empirical balances and the evaluation of the performances, certain preliminary tests of the data are usually appreciated as very essential. For this reason, the table of descriptive statistics is one of the preliminary tests of the implementation of data that provides certain preliminary terms or information concerning the appropriate nature of the compressed variables. Table 2 denotes the descriptive statistics of all the variables included in our empirical evaluation.

Table 2. Statistics descriptive

	DY	DDI	DPAR	DIN	X	M	GGF	DP	FDI	FD
Mean	3.35027	4.50136	0.15186	5.38806	39.52423	37.19915	15.58104	1.80862	1.93362	73.17415
Median	3.54270	4.86626	0.09575	3.15237	33.38782	32.09799	15.51967	1.59709	1.58198	68.91101
Maximum	11.24206	47.1634	2.00000	36.6030	104.8048	87.06775	29.32164	9.97197	11.4559	247.2416
Minimum	-12.0367	-65.4224	-0.53191	-3.8461	10.34546	15.59339	7.285561	0.77908	-2.1485	35.47193
Std. Dev.	3.15739	12.1657	0.37535	6.70425	22.30466	15.84643	4.430259	1.04967	1.88865	29.69192
Skewness	-1.32643	-1.11766	1.79209	2.05625	1.597378	1.098980	0.686704	4.07343	1.67561	3.022834
Kurtosis	7.67057	11.6860	9.09193	7.95944	4.928855	3.579273	3.145505	29.6322	8.46075	18.12926
Jarque-Bera	158.6858	442.440	274.769	228.298	76.59818	28.41625	10.49083	4266.05	225.778	1459.945
Probability	0.00000	0.00000	0.00000	0.00000	0.000000	0.000001	0.005272	0.00000	0.00000	0.000000
Sum	442.2359	594.179	20.0461	711.224	5217.199	4910.287	2056.697	238.739	255.239	9658.987
Sum Sq. Dev.	1305.96	19388.85	18.45	5888.06	65172.23	32895.32	2571.16	144.33	467.27	115490.9
OBS	132	132	132	132	132	132	132	132	132	132

Source: Authors' calculations using Eviews 12 software

According to Table 2, all the variables have a probability of refusal of approximately less than 5%. This means that all the variables are in a state of being estimated in the case of panel data. In addition, the standard deviation of the variables takes into account the fluctuation and volatility of the statistics during the period of investigation. All given variables are positively skewed. The overall skewness and Kurtosis coefficients indicate that the variables follow the normal distribution. For all the variables, the maximum and the minimum show us the existence of several evolutions and variations between them.

2. Empirical Results

In this section, we present our empirical results. In fact, we will examine the nature of correlation between the variables included in our model first which will be presented in Table 3. Next, we will apply estimates based on the following empirical models such as Panel OLS, Panel OLS (Fixed Effect), Panel OLS (Random Effect), Panel GMM, Panel GMM (Fixed Effect), Panel GMM (Random Effect), Panel GLM, Panel 2SLS, Panel 2SLS (Fixed Effect), Panel 2SLS (Random Effect) and Panel RLS which will be presented in Table 4.

Table 3. Correlation analysis

	DY	DDI	DPAR	DIN	X	M	GGF	DP	FDI	FD
DY	1.000000									
DDI	0.550286	1.000000								
DPAR	0.011228	0.070401	1.000000							
DIN	0.067705	0.024383	0.009882	1.000000						
X	0.063149	0.062085	0.133866	-0.358066	1.000000					
M	-0.020605	-0.044406	0.089791	-0.382416	0.805736	1.000000				
GGF	-0.186057	-0.021733	-0.066357	-0.413313	0.033998	0.065669	1.000000			
DP	-0.012763	0.048328	-0.071482	-0.063257	-0.10466	-0.08844	0.129119	1.000000		
FDI	0.160308	0.179694	0.042312	-0.096841	0.390603	0.549393	-0.06254	0.061101	1.000000	
FD	-0.149758	-0.138975	-0.125880	-0.254551	-0.05712	0.293298	-0.06893	0.289514	0.286971	1

Source: Authors' calculations using Eviews 12 software

Table 3 shows us that there is a positive correlation between domestic investment and economic growth, a positive correlation between patents and economic growth, and a positive correlation between domestic investment and patents. invention. Table 4 (see Appendix) shows the results of the estimation of the panel data models. In fact, all models denote virtually the same results.

We have noticed that domestic investments 'DDI' have a positive effect on economic growth 'DY'. On the other hand, patents 'DPAR' have no effect on economic growth 'DY'. Similarly, the interaction between domestic investment and patents 'DDI*DPAR' has no effect on economic growth 'DY'. In fact, there are several works like John (2016), Kentor (1998), Yuliana et al. (2019), Ramirez and Nazmi (2003), Ali (2015), Purba et al. (2019), Kanu et al. (2014), Stupnikova and Sukhadolets (2019), Ajose and Oyedokun (2018), Hussin and Saidin (2012), Kesar et al. (2023), Zahir and Rehman (2019), Abbas et al. (2020), Qayyum and Zaman (2019), Aslan and Altinoz (2021), Oluwatobi and Ogunrinola (2011), Iheanacho (2017), Soytas and Sari (2009), Apergis and Payne (2010), Adhikary (2011), Yasmeen et al. (2021), Bakari et al. (2020b), Bakari et al. (2021b), Bakari and El Weriemmi (2022), Bakari et al. (2019), Bakari (2020), Bakari (2016), Bakari (2017b), Bakari (2019b), Bakari et al. (2018a), Fakraoui and Bakari (2019), Bakari (2017c), Bakari et al. (2018b) who found that domestic investments have adverse effects on economic growth. In addition, there is another category of works which have also confirmed that invention patents also have adverse effects on economic growth. Among these works, we can cite Bilbao-Osorio and Rodríguez-Pose (2004), Niwa (2018), Cook (2014), Feser et al. (2008), Fagerberj (1987), Bakari (2022c), Bakari et al. (2022b).

Conclusions

Examining the impact of domestic investments and patents on economic growth in MENA countries is of great importance because of their potential to create jobs stimulate innovation diversify the economy and attract foreign investment. These factors are critical to fostering sustainable economic development and prosperity in the MENA region. We hypothesized that the domestic investment strengthens the positive or the negative effect of patents on economic growth in MENA countries during the period 1998 - 2022. Empirical results indicate that domestic investment has a positive effect on economic growth, but Patents do not have any effect on economic growth. Also, the interaction terms of patent and domestic investment proved to be positive and not significant, which mean that the effect of patent on economic growth does not affect by the domestic investment and the effect of the domestic investment on economic growth does not affect by patent.

Several factors may contribute to the lack of effect of cooperation between domestic investment and patents on economic growth in countries in the Middle East and North Africa (MENA) region. The first factor is that countries in the MENA region can often suffer from institutional weaknesses, particularly in terms of governance and the protection of intellectual property rights. This can make it difficult for companies to exploit their patents and fully benefit from their R&D investments. The second factor is that MENA countries may lack adequate infrastructure to

conduct effective research and development activities. Lack of funding for laboratories equipped with technical skills and collaboration between universities and companies can hinder progress in technological innovation. Third, cooperation between the public and private sectors is essential to foster technological innovation and economic growth. However, in many countries in the MENA region there may be a lack of trust and communication between these two sectors which limits opportunities for collaboration and hinders the development and commercialization of patented inventions. The fourth factor is that countries in the MENA region may face a shortage of qualified human resources in the field of research and development. A lack of specialized technical and scientific skills can hamper the ability of companies to fully exploit invention patents and turn R&D investments into tangible innovations. The last factor is that countries in the MENA region can be relatively isolated from global research and innovation networks, which limits opportunities for international collaborations and access to the latest technological advances. This can hamper the ability of companies to remain competitive in the global marketplace and fully exploit their patents.

MENA (Middle East and North Africa) countries can improve the role of domestic investments and patents for stimulating economic growth by implementing several recommendations. First, governments can put in place policies that incentivize domestic investors to invest in strategic projects and industries. This can be achieved through tax incentives, reductions in bureaucratic hurdles and looser regulations to encourage domestic investment. Second, MENA countries should improve access to finance for entrepreneurs and SMEs to facilitate innovation and job creation. This can be achieved by establishing specific financing mechanisms such as venture capital funds and banks specialized in financing innovative companies. Third, governments must invest more in research and development to promote innovation and invention. This can be achieved by increasing public spending on R&D by establishing public-private partnerships to foster collaboration between universities, businesses and research centers and by providing tax incentives to encourage businesses to invest in R&D. Fourth, MENA countries should put in place more efficient systems for registering and protecting patents. This will help foster innovation by protecting the intellectual property rights of inventors and encouraging investment in research and development. Fifth, it is important to promote collaboration between universities and industry in order to facilitate the transfer of knowledge and the commercialization of innovations. Governments can encourage the creation of partnerships between universities and businesses, support the creation of applied research centers focused on the needs of industry and offer tax incentives for companies that collaborate with universities in the development of innovative technologies.

Implementing these recommendations, MENA countries can improve their ability to innovate, create added value and stimulate their economic growth. This will reduce dependence on natural resources to create more jobs and improve the competitiveness of their economies on the international scene. It should be remembered that challenges and opportunities may vary from country to country in the MENA region. Some countries have succeeded in promoting innovation and economic growth through targeted policies and investments in R&D, institutional reforms and better integration into international research networks. However, in general, the factors mentioned above may contribute to the weak correlation between cooperation between domestic investments and patents and economic growth in the countries of the MENA region.

Credit Authorship Contribution Statement

All three authors of this article contributed equally to the entire research and writing process. Each of us actively participated in the study design, data collection and analysis, drafting the manuscript, and critically revising the content. We worked closely together at every stage of the project, sharing ideas and making joint decisions. In addition, all authors have read and approved the final version of the submitted article. There is therefore no significant distinction between our contributions, and we consider that we are all equally responsible for the entire content of the article.

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Conflict of Interest Statement

Authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Table 4. Panel Estimation Models

Variable	Panel OLS	Panel OLS (Fixed Effect)	Panel OLS (Random Effect)	Panel GMM	Panel GMM (Fixed Effect)	Panel GMM (Random Effect)	Panel GLM	Panel 2SLS	Panel 2SLS (Fixed Effect)	Panel 2SLS (Random Effect)	Panel RLS
DDI	0.134099**	0.090971**	0.122288**	0.236036***	0.070268***	0.081813***	0.134099**	0.236036**	0.070268**	0.081813**	0.079524***
DPAR	-0.436923	-0.984742	-0.613980	-3.544589	0.303410	0.069619	-0.436923	-3.544589	0.303410	0.069619	-0.754523
DIN	-0.032285**	-0.085997**	-0.050412**	-0.079413**	-0.127029*	-0.126463*	-0.032285**	-0.079413**	-0.127029**	-0.126463**	-0.072565**
X	-0.006383	-0.012727	-0.009301	-0.051383	-0.044999	-0.046124	-0.006383	-0.051383	-0.044999	-0.046124	-0.017397
M	0.005326	-0.003086	0.003395	0.078239	0.047735	0.050131	0.005326	0.078239	0.047735	0.050131	0.021087
GGF	-0.153707**	-0.175964**	-0.162547***	-0.190046**	-0.195639**	-0.198599**	-0.153707**	-0.190046**	-0.195639**	-0.198599**	-0.185729**
DP	0.061725	-0.088230	0.012867	-0.035696	-0.223070	-0.217349	0.061725	-0.035696	-0.223070	-0.217349	-0.004099
FDI	0.164412	0.259861	0.199180	-0.131571	0.114080	0.097250	0.164412	-0.131571	0.114080	0.097250	0.156592
FD	-0.017385	-0.018466	-0.018430	-0.019415	-0.010184	-0.011093	-0.017385	-0.019415	-0.010184	-0.011093	-0.015620
DDI*DPAR	-0.010658	0.050269	0.006984	0.373228	0.496127	0.489898	-0.010658	0.373228	0.496127	0.489898	0.064170

Note: * **; ** and * denote significances at 1%, 5% and 10% levels respectively; OLS - Ordinary Least Squares; GMM - Generalized Method of Moments; GLM - Generalized Linear Model; 2SLS - Two-Stage Least Squares, RLS - Recursive Least Squares.
Source: Authors' calculations using Eviews 12 software