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Research on the Impact of Financial Resources on Industrial Growth in Sub-Saharan Africa

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Abstract:

This study contributes to the literature on financial efficiency and industrial growth. We use the Autoregressive Distributive Lag (ARDL) method to find the impact of institutional financial quality on the industry sector's growth in 14 Sub-Saharan African countries from 1990 to 2020. Our results show that only gross fixed capital formation has long-run variables and a significant (at 1% level) causal effect on the magnitude of industrial value added. As for the short run, only credit has an effective (at a 1% level) causal impact on the magnitude of industrial value added. The error correction (EC) term shows a joint significance with the causality of all variables in the long term.

Keywords: economic growth; absorptive capacity; human capital; market liberalization.

JEL Classification: O19; O47; O55; F63. F36; G21; O15.

Introduction

For over a decade, many sub-Saharan African countries, including Ethiopia, Ghana, Tanzania, Zambia, and Mozambique, have enjoyed high sustained growth. This growth has been broadly based across different sectors of the economy, with industrial output doubling within a decade in several cases. South Africa's population of 60 million remains one of the most productive on the continent. The country has the second-largest economy in Africa, after Nigeria, and is also unarguably the most industrialized nation in sub-Saharan Africa.

However, despite being rich in natural resources such as crude oil, copper, coal, and manganese, Sub-Saharan Africa remains backward, among others, because of a poor financial sector. This study, therefore, looks at the finance–industrial growth nexus for 14 Sub-Saharan countries from 1990 to 2020; literature is reviewed in Section 1; methodology is detailed in Section 2; results are discussed in Section 3; and the last Section concludes with some policy recommendations.

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1. Review of Related Literature

The debate on the financial sector-growth nexus can be traced to Schumpeter (1911) and Robinson (1952). After that, a build-up eventually produced four (supply leading, demand following, feedback and neutrality) hypotheses, which are variations of empirical studies' findings. The supply-leading or finance-led growth hypothesis suggests that financial development causes economic growth. Aluko and Ibrahim (2020) have suggested that this thesis demonstrates a change in basic assumptions from the orthodox positive effect of financial development on economic growth.

The positive impact of financial development on economic growth is subject to a threshold level of factors. It applies only to a certain extent – as financial development positively impacts economic growth until it exceeds an optimal level where the impact becomes negative. Demand-following or growth-led finance hypothesis holds that economic growth causes financial development (Robinsons, 1952; Lucas, 1988, both cited in Cheng and Hou, 2022); Nyasha and Odhiambo, 2015 (as cited in Lee et al., 2021). The feedback hypothesis, also known as Patrick's (1966) hypothesis, suggests a bidirectional causality exists between finance and economic growth (Ghirmay, 2004; Akinlo and Egbetunde, 2010, cited in Lee et al., 2021). There is also a neutrality hypothesis which suggests that finance and economic growth do not cause each other (Nyasha and Odhiambo, 2015, as cited in Lee *et al*., 2021).

Anyanwu (1997) argued that agricultural productivity promotes the economic development of an emerging nation in several ways by increasing the food supply for domestic consumption, providing the raw material for industrial use, expanding the domestic markets for the manufacturing sector, increasing domestic savings and foreign exchange earnings from agricultural exportation.

Önder and Özyıldırım (2013) used ordinary least squares (OLS) multiple regression to investigate the impact of privately and publicly owned bank credit on productivity and economic growth in Turkey from 1992 to 2010. The findings showed that bank facilities positively impacted agriculture, infrastructure, and the election era.

Chi et al. (2021) examined the relationship between financial deepening and manufacturing sector productivity of Cameroon from 1970 to 2018, applying the Engle–Granger two-step co-integration and autoregressive distributed lag technique. The manufacturing value added measured manufacturing sector productivity, while credit to the private sector, broad money supply and trade openness proxied financial deepening. The findings indicated a long-run relationship between financial deepening and manufacturing sector productivity. The error correction term unveiled that financial deepening and manufacturing sector productivity congregate to long-run equilibrium.

Table 1 shows that industry in Sub-Saharan Africa contributed 27.1% and 26.5% of GDP in 2010 and 2020; the overall average for the 14 countries covered in this study was 27.3% (World Bank, 2022). This is a typical position held by low-income countries, respectively 28.3% and 25.9% for 2010 and 2020. The role of the industry sector is to maximize opportunity by widening the mix of commodities made available to global markets, providing essential inputs to other industries, creating skilled jobs and spillover effects (Ekor and Adeniyi, 2012). Its performance, particularly in Sub-Saharan Africa, is affected by several factors, including inadequate access to credit (Chi et al., 2021). Credit is noted as essential for industry (Chi et al., 2021; Ogundipe et al., 2021), although this is subject to debate like the efficiency of the financial system (Nazam et al., 2020) and needs to be proven in the practical level (Zhang et al., 2013). The results showed that credit to the private sector and broad money supply positively impacted manufacturing sector productivity, whereas trade openness negatively impacted short-run manufacturing sector productivity.

Table 1. Percentage share of industry to gross domestic product

	Agriculture		Industry		Manufacturing		Services	
	2010	2020	2010	2020	2010	2020	2010	2020
Sub-Saharan Africa	15.9	18.5	27.1	26.5	9.8	11.2	50.9	48.9
Low income	23.6	26.8	28.3	25.9	4.8	10.7	42.9	39.1
Lower middle income	15.3	16.1	33	27.8	16.4	14.9	46.8	48.1
Upper middle income	6.9	7	36.7	34.1	21.7	22.1	50.5	55.9
High income	1.3	1.3	23.9	22.4	14.1	13.4	69.0	71.8

Source: World Development Indicators: Structure of value added http://wdi.worldbank.org/table/4.2 [accessed 30th December 2022]

2. Research Methodology

We use the Autoregressive Distributive Lag (ARDL) method to find the impact of institutional financial quality on the industry sector's growth in 14 Sub-Saharan African countries from 1990 to 2020. The ARDL technique is beneficial because it eliminates residual correlation among variables by assuming that all variables are endogenous. It can be used when variables are stationary at I(0) or integrated order I(1), and it captures the short-term and long-term effects of independent variables on rice production. Additionally, it can generate short-term and long-term elasticities for small sample sizes by utilizing the OLS approach for cointegration between variables.

Our variables include value-added industry rates, credit extension to the private sector, broad money supply and gross fixed capital formation, and inflation rate and trade openness. Apart from inflation and trade openness, the rates are calculated; however, all the variables are obtained from the World Bank World Economic Indicators.

ARDL affords flexibility in the order of integration of the variables. ARDL is suitable for the independent variable in the model, which is I(0), I(1), or mutually cointegrated (Frimpong and Oteng, 2006). However, it is unsuitable when variables are stationary beyond I (1). Specifically, Nkoro and Uko's (2016) model distinguished between dependent and explanatory variables in any long-run relationship, identified the co-integrating vectors with multiple co-integrating vectors and derived the Error Correction Model (ECM) by integrating short-run adjustments with long-run equilibrium without losing extended-run information.

Additionally, by excluding non-stationary variables from the analysis through unit root tests, the technique paves away problems associated with violations of assumptions of constant mean and variances that would, among other things, lead to misleading estimates. The method distinguishes between long-run and short models using the Pesaran-Shin bounds co-integration technique (Pesaran and Shin, 1999; Pesaran et al., 2001, as cited in Nkoro and Uko, 2016).

The long-run specification is expressed in the following form:

$$\text{ivac}_t = \beta_0 + \beta_1 \text{credit} + \beta_2 \text{m2} + \beta_3 \text{inf} + \beta_4 \text{gfcf} + \beta_5 \text{trop} + \varepsilon_{it} \quad (1)$$

where: ivac_t is the growth rate of industry value added; credit is the growth rate of bank credit to the private sector in US$; m2 is the growth rate of broad money supply; inf is the rate of inflation; gfcf is the growth rate of gross fixed capital formation; and trop is trade openness. β_1 through β_5 are parameters to be estimated, β_0 is the intercept and ε error term.

As for ARDL, its generalized form is:

$$Y_t = \gamma_{0j} + \sum^{p}_{i=1} \delta Y_{t-1} + \sum^{q}_{i=0} \beta'_j X_{t-1} + \varepsilon_{it} \quad (2)$$

where: Y_t is a dependent variable, $(X'_t)'$ is a k x 1 vector that is allowed to be purely *I* (0) or *I* (1) or co-integrated, δ is the coefficient of the lagged dependent variable called scalar, β_j are k x 1 vector; p, q are optimal lag orders; ε_t is the stochastic error term.

3. Analysis and Research Results

Summary Statistics

Government borrowing for budgetary purposes mainly contributed to domestic credit expansion. Domestic credit to the private sector, provided by the financial sector, includes all credit to various sectors on a gross basis, apart from credit to the central government, which is net, and is expressed in constant US dollars as a measure of financial efficiency and development. It shows the ability of banks to transform their mobilized deposits into productive credits and is expected to enhance growth in the industry.

This would allow countries at the lower end of growth in the industry to have easier access to credit to fund investments more efficiently, thus increasing growth (Adeleye et al., 2020). The control variables include broad money supply (M2), inflation, gross fixed capital formation and trade openness. From Table 2, the highest industry value added (584 US$m) was recorded in South Africa in 2020; Malawi had the lowest level of 11.474 US$m in 2002. Overall, industry value added is relatively low compared to other developing countries (World Bank, 2022). We also use the ratio of standard deviation to the mean, called coefficient of variation (CV), to check the size of the standard deviation and, therefore, the relative level of variability. As a rule of thumb, a CV>1 shows a higher variability, and a CV<1 indicates a lower variability. From CV, the variability is relatively high for all the variables, saving trade openness.

Table 2. Descriptive statistics

1	2	3	4	5	6	7	8	9
Variable	Obs	Mean	Std. dv	Min	Max	CV	Unit roots	Lag length
Ivac	434	3.26	13.58	-87.40	89.89	4.16	0	0
Credit	420	619.33	12099.45	-99.29	247931.30	19.54	0	0
m2	420	245.02	4449.86	-188.82	91126.32	18.16	0	0
Inf	434	116.90	1190.41	-3.21	23773.13	10.18	0	1
Gfcf	420	15.24	92.69	-90.53	1805.10	6.08	0	0
Trop	434	59.75	31.33	0.78	174.66	0.52	1	1

Source: Authors' computation, 2023

Correlation Analysis

Table 3 presents the correlation between variables. Two observations are made here. First, there is the absence of multicollinearity among the variables as all coefficients (save credit/ivac, gfcf/ivac and gfcf/crredit) indicate a moderate correlation with one another below the benchmark of 0.8. (Dada and Abanikanda, 2022); therefore, most regressors do not have a perfect or exact linear representation of one another. Second, the potential relationships between industry value added (ivac) and other variables are mixed; three are positive, and two are negative; this also applies to bank credit, where the potential relationships between it and the other variables are mixed.

Table 3. Correlation matrix[2]

	ivac	Credit	m2	Inf	gfcf	trop
ivac	1.000					
credit	-0.014	1.000				
m2	-0.013	0.999	1.000			
inf	-0.048	0.016	0.016	1.000		
gfcf	0.063	0.945	0.950	0.078	1.000	
trop	0.009	-0.050	-0.043	0.020	-0.015	1.000

Source: Authors' computation, 2023

Unit Root Test

In the causality between two or more variables, the series must be stationary; that is, the series must have no seasonality, a constant mean, and a constant autocorrelation structure; and should tend to return to the long-term trend following a shock. We cannot use non-stationary time series, those with a non-constant mean, a non-constant variance, and a non-constant autocorrelation over time (Yuan et al., 2007). If we fit regressions that use non-stationary series, our results will be spurious, and their outcomes cannot be used for forecasting or prediction (Granger and Newbold, 1974); cited in (Akinwale and Grobler, 2019). Therefore, it is vital to check whether the series is stationary (Mongale et al., 2018). Several tests, including the Levin-Lin-Chu, Harris Tzavalis, Fisher type and Im-Pesaran-Shin, are used for testing stationarity, also called unit root tests.

Each test has specific assumptions; for instance, the Lim-Pesaran-Shin test assumes that slopes are heterogenous while the Levin-Lin-Chu takes homogenous slopes. If the series is non-stationary, differencing is made to make them stationary. The order of differencing at which the series becomes stationary is said to be integrated of order d, i.e. I(d); for the first order, it is said to be integrated of order I(1); for the second order, it is said to be integrated with the order I(2), following Fang and Wolski (2016). The results of the stationarity test we made using Lim-Pesaran-Shin are presented in Table 2, under Unit root - Column 8 above, where all the variables, save trade openness, are stationary.

Optimal Lags

After obtaining a functional form and knowing what we are using, we get optimal lags for our variables. Given that the economic processes are dynamic where a dependent variable takes time to respond to the effect of regressors (Hacker and Hatemi, 2008), there is a need to capture all past information that could entail the estimation framework; failure to do this would result to misspecification. Using lags becomes essential, and choosing the optimal lag length is vital. Selecting the optimal number of lags avoids losing degrees of freedom, multicollinearity, serial correlation, and misspecification errors.

There are already econometric packages like Stata that we are using that are useful in estimating optimal lags, using techniques like the final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC), to name a few. Given the complication of estimating optimal lags on panel data, we manually estimated each optimal lag length for the variable for all 14 countries and then came up with the most common lag among the countries. The results are presented in Table 2 - Column 9 above.

Cointegration test

After completing the static test, we do a cointegration test to establish whether a long-run relationship exists between or among variables (Ilesanmi and Tewari, 2017). Cointegration is optional for panel data because it is ascertained from the statistical significance of long-run coefficients and the error term.

It indicates that time series move together eventually and that the error term resulting from the linear combination of time series quantifies the deviation of the time series from their typical long-run relationship, which can be used to predict their future values (Granger, 1986); cited in (Akinwale and Grobler, 2019). The results based on Pedroni's test show that of the seven statistics, four are, in absolute terms, more significant than 2, implying that the variables are co-integrated. Therefore, the null hypothesis of no co-integration is rejected for all panel and group statistics, suggesting that our panel exhibits co-integration among the variables.

Table 4. Cointegration test results

Test	Panel	Group
v	0.4037	.
rho	-0.521	0.5364
t	-5.043	-5.716
adf	-4.614	-5.357

Source: Authors' computation, 2023

Research Results

Our next task is to select which of the two (Pooled Mean Group - PMG and Dynamic Fixed Effects - DFE) models are suitable for our data. We used the Hausman test (whose results of Chi2 = 0.73; Prob > chi2 = 0.9815) led us to choose PMG as our most efficient estimator. Our estimated model in Table 5 below shows that only gross fixed capital formation has a long run and significant (at 1% level) causal effect on the magnitude of industrial value added. As for the short run, only credit has a significant (at a 1% level) causal impact on the magnitude of industrial value added. As for the error correction (EC) term, all variables have a significant joint causality in the long term. The adjustment speed of 0.9195 has the expected sign, implying that there is joint co-integration among the variables in the panel of data from 14 countries in Sub-Saharan Africa. Any deviations from the long-run equilibrium are corrected at 91.95% (adjustment speed) per year. As for individual countries, the short-run coefficient specifically for credit was significant for only five countries (Botswana, South Africa, Sudan, Togo, and Uganda). Similar results were found for other variables; for instance, trade openness though not jointly significant in all countries, was significant in Cameroon, Congo DR, Kenya, Malawi, South Africa, and Tanzania.

Table 5: Regression results

	Variables	Values
__ec	credit	-0.00077 (0.0016)
	m2	0.000108 (0.0044)
	inf	-0.00162 (0.009)
	gfcf	0.133*** (0.0230)
	trop	0.228 (0.0273)
SR	__ec	-0.9195*** (0.072)
	credit D1.	0.044*** (0.016)
	m2 D1.	0.116 (0.034)
	infD1.	0.143 (0.105)
	gfcf D1.	-0.0161 (0.031)
	trop D1.	-0.038 (0.125)
	_cons	0.814 (0.644)

Note: ***, **, implies significant at 1% and 5% level; figures in parentheses are standard errors
Source: Authors' computation, 2023

Conclusion

This paper investigates the impact of financial resources on industrial growth in Sub-Saharan Africa from 1990 to 2020. The yearly secondary data comes from Global Development Indicators. The results indicate that the variables have a long-term connection. We use the Autoregressive Distributed Lag (ARDL) technique to determine the long-term coefficients. Our results show that only gross fixed capital formation has a long run and significant (at 1% level) causal effect on the magnitude of industrial value added. As for the short run, only credit has a significant (at a 1% level) causal impact on the magnitude of industrial value added. As for the error correction (EC) term, all variables have a significant joint causality in the long term. The adjustment speed of 0.9195 has the expected sign, implying that there is joint co-integration among the variables in the panel of data from 14 countries in Sub-Saharan Africa.

The results show that financial resources significantly and positively affect industrial growth in Sub-Saharan African countries in the short run. This implies that governments should encourage effective ways to increase financial resources to private enterprises in the industrial sector through efficient bank intermediation that will boost manufacturing and industry. In addition, governments should create more avenues for industrial development and improve the operation of existing ones to ensure that credit directed to the sector is effectively and efficiently utilized.

Hence, commercial banks should give more credit to the private sector to mutually benefit the industry and expand funding into the capital market, considerably boosting industrial activities and productivity.

Credit Authorship Contribution Statement:

I want to state and recognize the roles and contributions to the scholarly output by Mr. Vincent Gibogwe on the following: data curation, formal analysis, software, supervision, review & editing, in addition to my roles in conceptualization, investigation, methodology, project administration, validation, visualization, and writing – original draft. Both Vincent and I contributed equally to the funding acquisition and resources.

Conflict of Interest Statement

The 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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