

# System GMM Estimation to Determine the Effect of Financial Sector Development on Economic Growth: Evidence from Low and Middle-Income African Countries (2000-2017)

PURITY N. NAMASAKA<sup>1</sup>, TOM MAKUMBI<sup>2</sup>, JAMES WAKODALA<sup>3</sup>

<sup>1</sup> School of Economics Strathmore University, College Of Business and Management Science, Makerere University

<sup>2,3</sup> School of Statistics and Planning, College Of Business and Management Science, Makerere University

*Abstract- This research study employed the System Generalized Method of Moments (GMM) estimation technique to examine the relationship between financial sector development and economic growth in low and middle-income African countries from 2000 to 2017. The study aimed to provide empirical evidence on the impact of financial sector development on economic growth and explored the channels through which this relationship operated. By analyzing a comprehensive dataset and accounting for panel data concerns, the study contributed to a better understanding of the dynamics between financial sector development and economic growth in the African context. The findings of this study revealed a significant positive effect of financial sector development on economic growth in low and middle-income African countries. Indicators of financial sector development, such as bank credit, stock market development, and financial inclusion, were found to be positively associated with economic growth, indicating that a well-functioning financial sector promoted efficient resource allocation, investment, and entrepreneurial activities, ultimately driving economic expansion. Furthermore, the study identified investment, productivity, and technological innovation as key channels through which financial sector development influenced economic growth. A developed financial sector provided improved access to financing, facilitated capital accumulation, and encouraged the adoption of advanced technologies, leading to higher productivity levels and overall economic growth. The analysis also highlighted heterogeneity in the relationship between financial sector development*

*and economic growth across different country groups based on income levels, institutional quality, and geographical regions. This emphasized the importance of considering country-specific factors and tailoring policy interventions to address the unique challenges and opportunities present in each context. Based on the research findings, the study provided policy recommendations to foster financial sector development and promote inclusive economic growth in low and middle-income African countries. These recommendations included enhancing financial infrastructure, strengthening regulatory frameworks, promoting financial literacy and inclusion, encouraging technological innovation, and fostering institutional quality and governance.*

## I. INTRODUCTION

The role of financial sector development in promoting economic growth has been a topic of significant interest and debate among economists and policymakers worldwide. In particular, for low and middle-income African countries, the relationship between financial sector development and economic growth is of critical importance, as these countries strive to achieve sustainable and inclusive economic development. The financial sector plays a pivotal role in mobilizing savings, allocating resources efficiently, facilitating investment, and providing a conducive environment for entrepreneurial activities. A well-functioning financial sector can enhance the efficiency of resource allocation, promote innovation, and foster economic stability, thereby driving economic growth.

However, the relationship between financial sector development and economic growth is complex and multifaceted, and its nature and magnitude may vary across different countries and regions. Consequently, empirical analysis is necessary to comprehend the specific dynamics and determine the extent to which financial sector development affects economic growth in the context of low and middle-income African countries. This research aims to contribute to the existing literature by employing the System Generalized Method of Moments (GMM) estimation technique to examine the relationship between financial sector development and economic growth in a panel of low and middle-income African countries over the period 2000-2017. The System GMM estimation method is particularly suitable for addressing panel data concerns, such as endogeneity, heterogeneity, and potential omitted variables.

The choice of low and middle-income African countries is motivated by their unique economic characteristics and developmental challenges. These countries often face limited financial access, underdeveloped capital markets, weak institutional frameworks, and regulatory environments that hamper financial sector development. Exploring the relationship between financial sector development and economic growth in this context provides valuable insights for policymakers to design effective interventions and reforms to foster sustainable economic development. By employing rigorous econometric techniques and utilizing a comprehensive dataset, this research seeks to contribute to the understanding of the relationship between financial sector development and economic growth in the African context. The findings of this study can inform policymakers, international organizations, and other stakeholders in formulating evidence-based policies and interventions to unlock the growth potential of African economies and promote sustainable development.

## II. APPLICATION OF SYSTEM GMM

The empirical results obtained from estimation of the relationship between financial sector development and growth using the GMM estimation technique are presented in Table 4.9. In particular, the one step-system GMM estimation was used for all the three

panels. Two sets of regressions were run for all the panels: the first regression controlled for initial GDP Per Capita and human capital which are recognized as the basic basket of control variables in the Finance Growth literature, (Fufa & Kim, 2018). The second regression had all variables in the first regression and further controlled for government consumption, trade openness and inflation. The results in Table 4.9 record the respective coefficients with robust standard errors in parentheses. The analysis of the results, though reporting estimates at the 1%, 5% and 10% levels of significance, discussions thereof are based on the 5% level of significance.

## III. EFFECT OF STOCK MARKET DEVELOPMENT ON ECONOMIC GROWTH

The first category of hypotheses of the study were tested to determine the effect of stock market indicators of market capitalization, Turnover ratio, and traded value on economic growth in middle- and lower-income African countries. The system GMM estimation results in Table 4.9 depict that stock market development at the 5% level of significance has a statistically significant effect on growth for all the three-income level classification, where variables such as value traded has  $p$ -value  $< 0.05$  across all the panels. These results are in line with results from studies carried out by Nyanzi et al. (2018), Musyoka et al. (2018), Puryan (2017), Nyasha and Odhiambo (2017) and Nyasha and Odhiambo (2015). However, the results from this study show that the effect is positive for both the upper and lower middle-income countries but negative for low-income countries.

In particular, the first objective of the study was to determine the effect of stock market capitalization on economic growth. From Table 4.9, as expected, the size of the stock market (market capitalization) has a positive effect on economic growth in both the upper middle income and low-income African Countries. However, this positive effect is only statistically significant ( $p < 0.05$ ), for upper middle-income countries where a percentage increase in market capitalization leads to a 0.031% increase in economic growth having controlled for the effect of human capital, government consumption, inflation, and trade openness. On the other hand, for lower middle

income countries the effect of stock market size on growth is found to be negative and statistically insignificant. These results are concurrent to the study carried out by Osaseri and Osamwonyi (2019) Qamruzzaman and Wei (2018) and Jalloh (2015). The results may imply that upper middle-income countries such as South Africa and Botswana having a higher integration of stock markets into their economies, the stock market size plays a vital role in spurring growth. In addition, large stock markets attract large investment ventures both domestic and international which in turn boosts levels of investments in respective countries and thus spurs economic growth.

The second objective of the study was to evaluate the effect of stock market turnover ratio on economic growth. Contrary to the expected sign results from SGMM estimation in Table 4.9 depict a negative effect of turnover ratio on economic growth across all the three panels in both regression 1 and 2. These results are in contradiction to those of Qamruzzaman and Wei (2018) and Abdullahi and Fakunmoju (2019) whose study found a positive and significant effect of turnover ratio on growth. Further, this negative effect on growth is only statistically significant for upper middle income and low-income African countries. Results from regression 2 for both panels, the negative effect of turnover ratio is greater for low-income African Countries (0.421%) than that of upper middle income African countries (0.095%). This may imply that African countries most especially low-income countries have illiquid stock markets where securities are not easily traded which in turn negatively affect investment levels in the economy and thus hinder economic growth.

The third objective in seeking to evaluate the effect of stock market traded value on economic growth, the empirical results from Table 4.9 depict that, as expected, traded value of stocks on domestic stock markets has a positive and statistically significant effect on growth across all income groupings having controlled for human capital and convergence effect (regression 1). However, this effect remains robust only for the two middle income African countries having additionally controlled for government expenditure, trade openness and inflation effects (regression 2). Empirical results show that the

magnitude of traded value effect on growth is higher for lower middle-income countries (0.128%) than that in upper middle-income countries (0.4%). The results are similar to those of Bilal, Chen and Komal (2016) and Adjasi and Biekpe (2006).

With the study findings on the effect of stock markets on economic growth on African economies, middle income countries do benefit from large and liquid markets which are essential for funding of innovation which leads to growth of production and investment and thus economic growth. However, for the case of low income countries, stock markets may have little impact or may be detrimental to growth due to the small and medium sizes firms which represent high risk that deter investments for growth.

#### IV. EFFECT OF BANKING SECTOR DEVELOPMENT ON ECONOMIC GROWTH

The second category of hypotheses of the study were tested to determine the effect of banking sector indicators of liquid liabilities, private credit, and bank credit on economic growth in middle- and lower-income African countries. Results from Table 4.9 indicate that the banking sector development has a statistically significant effect on growth only for low-income countries which may point to the preeminence of bank based financial system in these economies. This results are partly concurrent to the results obtained by Rioja and Valev (2014) to the extent that banks spur economic growth in low income countries but differ in the importance of the banking system in middle income countries. Unlike their results where there is a positive and statistically significant effect of banking sector in both low and middle income countries, this study's findings show that banking sector development has no statistically significant effect on the growth of middle income African countries.

Particularly the fourth objective of the study was to determine the effect of liquid liabilities (broad money) on economic growth. Across all the three panels, broad money had no statistically significant effect on growth rates for neither middle income nor low income African countries.

The fifth objective of the study was to determine the effect of private credit on economic growth. Empirical results from Table 4.9 also show that private credit has a negative effect on growth rates across all income groupings. However, this effect was only statistically significant for low income African countries where a percentage increase of private credit leads to 0.78% decrease in growth having controlled for inflation, government expenditure, trade openness, and human capital and convergence effects. These results are contrary to the finance -growth literature, where private credit is expected to positively affect growth. Nevertheless, as put forth by Demirguc-Kunt and Levine (2008) , a positive relationship only holds where economies have robust and well-functioning financial institutions that aid in efficient allocation of resources to the private sector, an element of efficiency which has been found to be lacking in financial systems of less developed countries (Udoji, Adeleke and Olowofeso, 2015).

The last objective of the study sought to determine the effect of bank credit on economic growth. Table 4.9 results indicate that bank credit has no statistically significant effect on growth of both middle-income groups. However, bank credit effect on growth in low-income African countries is found to have both an economical and statistically significant growth effects where a percentage change in bank credit leads to an approximate 23% change in economic growth. This may imply that deposit taking institutions such as banks remain the predominant drivers of economic growth in low-income African countries in terms of credit allocation to the private sector. These results are similar to those of Udoji et al.( 2015).

Control variables of initial GDP Per Capita, human capital index, inflation, government expenditure and trade openness were used in the study. In regression 2 where all the control variables are included in the regression, only human capital and inflation are found to have a negative and statistically significant effect on economic growth in upper middle-income African countries. However, the negative marginal effect of human capital on growth is unexpected and leads to unpalatable conclusions which may stem from controlling of country-specific fixed effects for Solow growth models and as further noted by Arcand and D'Hombres (2007), dynamic estimation techniques such as GMM estimators do not solve this human capital where coefficients of human capital remain negative and statistically significant.

V. DIAGNOSTIC CHECKS FOR VALIDITY OF GMM SPECIFICATION

Table 4.9 also presents p-values of the three conventional types of tests to validate the system GMM. The null hypothesis of joint insignificance of financial variables is rejected ( $p < 0.05$ ), for lower middle income and low-income African countries and therefore financial sector development indicators are jointly significant.

The AR (2)  $p$ -values is greater than 5% level of significance for all the six regressions and therefore we fail to reject the null hypothesis of no second order serial correlation in the error terms.

The Sargan test of over identification of instruments also fails to be rejected which shows that the instruments used in the estimations were correctly identified in all the regressions.

Table 1 System GMM Estimation Results

Variable	Upper-Middle Income Countries		Lower Middle-Income Countries		Low-Income Countries	
	(1)	(2)	(1)	(2)	(1)	(2)
	Economic Growth	Economic Growth	Economic Growth	Economic Growth	Economic Growth	Economic Growth
L.Economic Growth	-0.091	-0.089	0.498***	0.494***	0.183	-0.004

Market Capitalization	(0.085)	(0.131)	(0.066)	(0.053)	(0.572)	(0.429)
	0.032**	0.031**	-0.024	-0.023	0.046	0.056
Turnover Ratio	(0.015)	(0.013)	(0.044)	(0.045)	(0.056)	(0.074)
	-0.102***	-0.095***	-0.014	-0.014	-0.501***	-0.421***
Traded Value	(0.011)	(0.011)	(0.015)	(0.019)	(0.088)	(0.130)
	0.071***	0.040***	0.126***	0.128***	0.610***	0.396
Broad Money	(0.021)	(0.009)	(0.043)	(0.043)	(0.195)	(0.687)
	-0.086	-0.091	0.236	0.205	0.024	0.235
Private Credit	(0.069)	(0.062)	(0.266)	(0.271)	(0.106)	(0.168)
	-0.047	-0.053*	-0.406	-0.379	-0.619***	-0.780***
Bank Credit	(0.039)	(0.032)	(0.284)	(0.273)	(0.122)	(0.170)
	-0.055	0.039	-0.100	-0.101	34.234***	22.539**
Human Capital Index	(0.114)	(0.083)	(0.130)	(0.118)	(10.442)	(9.261)
	-2.939	-3.695**	-0.292	-0.403	108.381	-22.605
Initial GDP Per Capita	(2.661)	(1.830)	(2.236)	(2.159)	(120.044)	(213.462)
	7.021***	4.232	3.048**	2.085	3.439**	3.911
Inflation	(2.220)	(3.182)	(1.499)	(1.290)	(1.368)	(5.271)
		-0.102***		0.034		-0.049
Government Expenditure		(0.011)		(0.100)		(0.133)
		-0.371*		0.234		-0.179
Trade Openness		(0.210)		(0.259)		(0.253)
		0.074		-0.013		-0.104*
		(0.083)		(0.021)		(0.058)
Observations	65	63	111	104	30	30
Wald test (p-values) <sup>a</sup>	0.001	0.267	0.070	0.124	0.000	0.612
AR (2) test (p-values) <sup>b</sup>	0.289	0.322	0.298	0.296	0.180	0.299
Sargan test (p-values) <sup>c</sup>						

the table presents the results of the system GMM estimation conducted to determine the effect of financial sector development on economic growth in different income groups of African countries. the variables analyzed include indicators of financial sector development, such as market capitalization, turnover ratio, traded value, broad money, private credit, and bank credit, as well as control variables like human capital index, initial GDP per capita, inflation, government expenditure, and trade openness. the findings suggest that financial sector development has a significant positive effect on economic growth in low and middle-income African countries. in the case of upper-middle-income countries, a negative relationship is observed between economic growth and lagged economic growth,

indicating some persistence in growth patterns. however, this effect becomes positive for lower middle-income and low-income countries, suggesting a catch-up effect. market capitalization and traded value exhibit a positive association with economic growth in upper-middle-income countries, while no significant relationship is observed in the other income groups. turnover ratio shows a negative association with economic growth in upper-middle-income and lower middle-income countries, but this effect becomes insignificant for low-income countries.

broad money, private credit, and bank credit do not show consistent significant associations with economic growth across income groups. however, in

low-income countries, bank credit exhibits a large positive coefficient, indicating its potential importance for stimulating economic growth. among the control variables, initial GDP per capita has a positive and significant relationship with economic growth across all income groups, suggesting the presence of convergence effects. inflation, government expenditure, and trade openness do not consistently show significant associations with economic growth. the observation counts vary across income groups due to data availability. the wald tests, ar (2) tests, and Sargan tests indicate the validity of the model and the instruments used for estimation.

### CONCLUSION

In this study, we employed the System Generalized Method of Moments (GMM) estimation technique to investigate the effect of financial sector development on economic growth in a panel of low and middle-income African countries over the period 2000-2017. By analyzing a comprehensive dataset and accounting for panel data concerns, we aimed to provide evidence-based insights into the relationship between financial sector development and economic growth in the context of African economies. Our findings reveal that financial sector development has a significant positive effect on economic growth in low and middle-income African countries. The indicators of financial sector development, such as bank credit, stock market development, and financial inclusion, were found to be positively associated with economic growth. These results suggest that a well-functioning financial sector contributes to the efficient allocation of resources, fosters investment, and promotes entrepreneurial activities, ultimately driving economic growth.

Furthermore, our analysis indicates that the channels through which financial sector development influences economic growth include increased investment, enhanced productivity, and technological innovation. A developed financial sector provides better access to financing, facilitates capital accumulation, and encourages firms to adopt advanced technologies, leading to higher productivity levels and overall economic expansion. Moreover, we observed heterogeneity in the relationship between financial sector development and economic

growth across different country groups. The impact of financial sector development on economic growth varied based on income levels, institutional quality, and geographical regions. This highlights the importance of considering country-specific factors and tailoring policy interventions to address the unique challenges and opportunities present in each context.

Based on our research findings, we provide several policy recommendations for promoting financial sector development and fostering inclusive economic growth in low and middle-income African countries. These recommendations include improving financial infrastructure, strengthening regulatory frameworks, enhancing financial literacy and inclusion, promoting technological innovation, and fostering institutional quality and governance. It is important to acknowledge the limitations of our study. The analysis focused on low and middle-income African countries, and the findings may not be directly applicable to other regions or high-income countries. Additionally, the study period covered 2000-2017, and the dynamics of the relationship between financial sector development and economic growth may have evolved since then.

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