Financial intermediation and economic growth in the East African Community: A financial index approach

Benjamin Kanze Muhoza[†]

Abstract

Despite the abundant literature on financial development and economic growth nexus, the debate is far from settled. In this paper we create a financial development index using principal component analysis (PCA) and use it to examine the effect of financial intermediation on economic growth within the East African Community (EAC) using panel data over the period 1985-2017. The DOLS and FMOLS models are estimated since they control for heterogeneity, serial correlation, small sample bias and endogeneity in the presence of long run relationship. The results indicate that financial intermediation has a positive and significant effect on economic performance of the EAC countries in the long run. Among the controls, capital formation and FDI also have positive effects on growth while the growth of the population reduces the per capita income.

Key words: Financial Intermediation; Economic Growth, East African Community, DOLS.

[†] School of Economics, University of Nairobi, Email: benmuhozak@gmail.com

1. Introduction

The seminal work on the role of finance on growth shows that financial intermediation through the banking channel plays an important role in economic growth (Schumpeter 1911). Additionally, financial development may influence growth and reduce poverty through the Mckinnon (1973) "conduit effect" savings mobilization boots investment. In spite of the importance that policymakers attach on the role of finance on economic growth, to date there is no consensus in the literature on the reverse causality.

There are four dominant hypotheses. The supply-leading hypothesis suggests that financial intermediaries help mobilize savings for investments, attracting foreign investments and allow better capital allocation between competing entrepreneurs which in turn stimulates growth (Badun, 2009). Moreover, financial intermediaries enhance efficient resource allocation by lowering information asymmetries and transactions costs which further lead to technological progress and long-run growth (Bencivenga and Smith 1991; King, Levine 1993; Levine 2005). The demand-following hypothesis pioneered by Robinson (1952) states that the financial sector follows economic growth. The third hypothesis assumes that there is a bi-directional or mutual causality between finance and growth while the last hypothesis advanced by Lucas (1988) suggests that there is no relationship between finance and economic growth.

The financial sector of the EAC countries[1] i.e Kenya, Uganda, Rwanda, Burundi and Tanzania are bank dominated with Kenya having the large number of commercial banks. While Kenya is known as having a strong financial sector by the standards of developing countries, Tanzania, Rwanda and Uganda are experiencing remarkable growth in their financial sector and Burundi is coming up though its growth is low compared to its counterparts. This can be observed using the share of the domestic credit to the private sector as a share of GDP in figure 1:

Figure 1 shows that financial depth, has been increasing from 2010 where it was 16.59% of the GDP, it increased up to 20.07% in 2016 for the period after the global financial crisis. Allen et al. (2010) noted that the financial development in SSA is still lower not only in comparison with developed countries but also with respect to other developing countries.

One of the strategic goals of the EAC is to attain the Financial Sector Development and Regionalization Project (FSDRP) with the objective of achieving a single market for financial services in the community (EAC, 2017). Most studies on the EAC, however, focus at country level (Odhiambo, 2008; Onuonga, 2014, Chuku and Ndanshau, 2016; Gisanabagabo and Ngalawa, 2017). On the other hand, results of the studies that examined finance-growth nexus are very mixed. While some find no effect or even negative effect on the financial sector on growth (Ang and McKibbin, 2005; Odhiambo, 2008) others find a positive effect (Matei, 2014; Caporale et al., 2009). Results may also be country specific (Kar, Nazlıoğlu and Ağır ,2011). Thus, the effect of finance on growth remains a chicken-egg in the literature.

---

[1]Even though South Soudan is now a member of EAC now, it has not been included due to data limitations

Figure 1: Domestic credit to the private sector as a share of GDP in the EAC
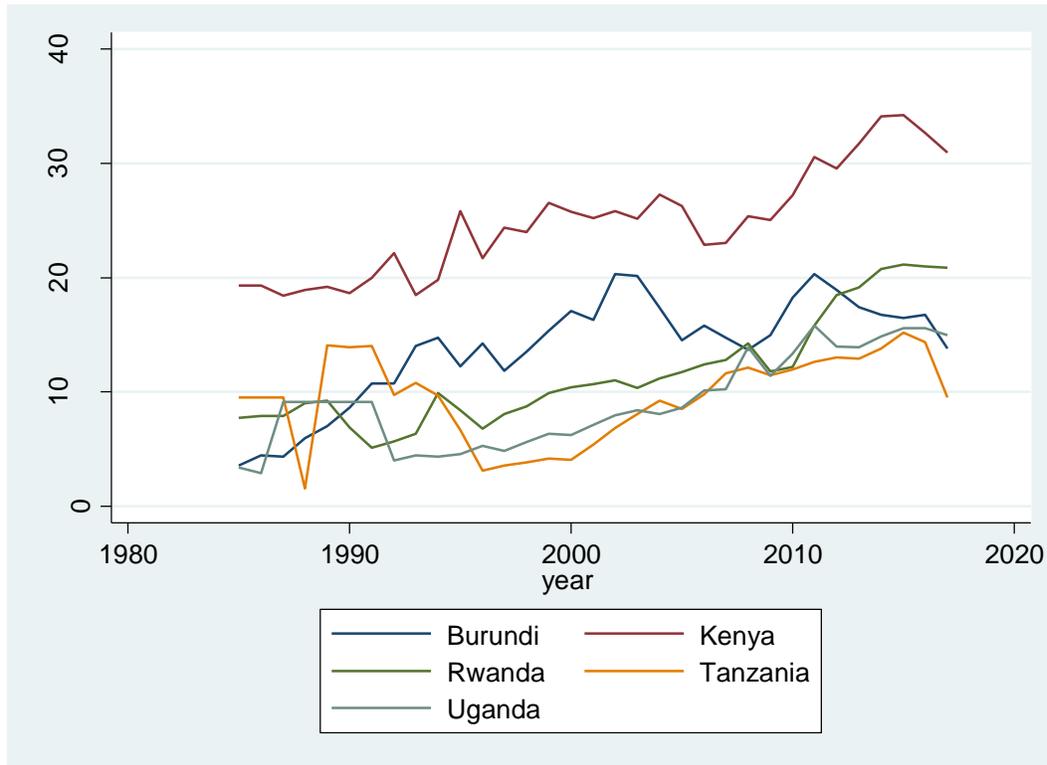
Source: Author's computation from the World Development Indicators (WDI).

A potential reason that could be explaining non-convergence of results is explained by Adu, Marbuah and Mensah (2013) who indicated that the effect of finance on growth results differ due to high sensitivity of proxies used to capture the financial sector. Thus, we use the Principal Component Analysis (PCA) to construct a financial intermediation index. This index helps us to examine the finance-growth interlinkage by combining several proxies of financial sector development to obtain a composite index. This approach has not been applied before on the EAC countries. The PCA enables to avoid the problem of multicollinearity by constructing one index since financial intermediary indicators tend to display same information about the financial market (Ang and McKibbin, 2005). Using data from 1985 to 2017, we estimate the Dynamic Ordinary Least Squares (DOLS) and the Fully Modified Ordinary Least Squares (FMOLS) which are models that suitably fit panel data with long time dimension and more importantly correct for heterogeneity and serial correlation together with endogeneity (Stock and Watson, 1993; Pedroni, 2001).

The remainder of the paper is organized as follows: section 2 reviews the literature. The methodology, estimation procedure and data issues are presented in section 3 while results are presented and discussed in section 4. Concluding remarks are given in section 5.

2. Literature review

Both theoretical and empirical literature are rich and wide on the link between financial intermediation[2] and economic growth. It is believed that financial intermediation generally influences economic performance by mobilizing savings from lenders and transforming them into productive investments for borrowers by reducing not only transaction costs but also asymmetric information. The most influential studies supporting the view that financial intermediation causes economic growth are to be found in the works of Benchivenga and Smith (1991), Levine (1997), King and Levine (1993) Levine and Zervos (1998), Rajan and Zingales (1996), Beck and Levine (2004) among others.

Other studies have been conducted and supported the same view. Seven and Yetikner (2016) examined the link between banks, stock markets and growth by grouping countries by their income levels and using the system-GMM estimation. They found that; the development of the banking sector is positively correlated with economic growth in low and middle-income countries while the effect is surprisingly negative for high income countries. Secondly, they found that stock markets are positively correlated with growth in middle and high-income countries. The positive effect of banks on growth is equally supported by Onder and Ozyildirim (2010). They examine the effectiveness of banks on economic growth in Turkey and find that credits provided by private banks (as a measure of financial depth) impact positively the per capita GDP in Turkey both in developed and undeveloped Turkish provinces and played a key role in reducing poverty.

Apergis et al. (2007) used panel data for 15 OECD countries and 50 other Non-OECD countries. They use liquid liabilities, bank credit and private credit to measure the financial sector development. Using panel cointegration estimation, they found that the effect of financial intermediation on growth is highly significant in Non-OECD countries that are less developed as compared to OECD countries. This might suggest that the lesser a given country is developed the higher the effect of financial intermediation on growth.

Due to inconclusive insights from finance-nexus causality, Matei (2014) examined whether a bi-directional causality existed for 16 European Union (EU) countries and 10 Non-EU emerging countries using quarterly data over 2002-2012 period. The author used the vector error correction models (VECM) and found that the effect of financial intermediation on economic growth was greater than the effect of economic growth on financial intermediation. On the same veil, a study by Caporale et al. (2009) also found that the granger causality test between financial development and growth was unidirectional with finance causing growth using data from new European Union (EU) members.

Though channels through which financial intermediation affects growth are well discussed in the literature, one should be very careful in assuming that financial development causes economic growth. Ang and McKibbin (2005) using data from Malaysia for the period of 1960-2001 and a PCA to construct a financial development index found that unlike most of the existing empirical findings it is indeed the financial sector that deepens due to growth implying that where enterprise leads, finance follows. Hence supporting Robinson's view.

---

[2] It is important to note that in this study, financial intermediation and financial development are used interchangeably since they both show how financial sector affects economic growth.

In Africa, studies have been conducted on the same matter. Allen and Ndikumana (2000) examined financial intermediation and economic growth in Southern Africa region. They found that financial development through liquid liabilities was strongly correlated with the GDP per capita growth while bank credit and credit to the private sector were not good determinants of growth as measures of financial development. Agbetsiafa (2004) using data of 8 Sub-Saharan countries found that there is cointegration between financial development and growth thus implying long run relationship between the two. However, applying the causality test, the results indicated that for two countries (ie Ivory Coast and Kenya) finance was not causing growth. Another study conducted in Africa is in the West African region where Agbélénko and Kibet (2015) found that well-functioning financial sector would improve economic growth. They use a dynamic GMM estimation and measure the size of the financial sector by the credit to the private sector while controlling for trade openness, inflation, education and FDI. However, their results are subject to the Nickell bias since the setting of the Arrelano Bond (1991) requires very large cross sections units and small time period which is not the case in their study.

Results from country level analysis are very heterogenous. For example, in the case of Kenya, Kagochi (2013) using an autoregressive distributed lag (ARDL) bounds finds that only liquid liabilities as a measure of financial development leads to growth in Kenya while other measures like private and domestic credits do not affect economic growth. On the other hand, Odhiambo (2008) uses the Johansen-Juselius cointegration method and error correction model (ECM) and finds that the causality between financial development and growth in Kenya is a unidirectional causality that comes from growth to finance. Furthermore, Onuonga (2014) uses the ARDL bounds together with Vector Error Correction Model (VECM) approach and measures the financial sector development by the domestic credit to the private sector and broad money. The author finds that there is a bi-directional causality between financial depth and economic growth.

These three selected papers from Kenya show how studies on finance-growth nexus can be very contradictory. One can note that the three studies support three different theories. This would lead to the conclusion that results may be very dependent on the methodological and econometric approaches adopted to analyze the finance-growth nexus. This point of view can be emphasized given another study conducted on 10 SSA countries by Akinlo and Egbetunde (2010) that used the Vector Error Correction Model (VECM) which revealed that in those countries, finance-growth nexus causality differed. In Kenya for example they found a bi-directional causality, in Gabon financial depth granger caused growth while in Zambia it was the contrary.

Generally, most of existing literature assert a unidirectional causality between financial development and growth in favor of the former. However, however, some studies have found unidirectional causality in favor of growth. This is because, these studies are subject to the types of data they use, the choice of proxies to measure financial depth as emphasized by Adu, Marbuah and Mensah (2013) and the econometric approach. Also, different measurements of financial intermediation may have affected different findings in the context of SSA.

3. Data and methodology
3.1 Theoretical framework

Financial intermediaries mediate providers and users of financial capital. They play a key role in an economy by linking parties with excess capital with those in need of funds. Traditionally, financial intermediation aims at reducing transaction costs and information asymmetry (Allen and Santomero, 1998). By doing so, financial intermediaries mobilize savings for investments, manage risks, influence allocation of resources promote innovation. Hence, the working of financial intermediaries may alter with the long run growth in an endogenous growth model (Levine, Loayza and Beck, 2000).

The relation between finance and growth can be traced from an endogenous growth model derived from the AK model framework developed by Pagano (1993) where the aggregate output (Y_t) is a linear function of the aggregate capital stock (K_t):

$$Y_t = AK_t \quad\text{.. (1)}$$

Where each firm faces a technology (A) with constant returns to scale but with an increasing function for productivity of the aggregate capital stock K_t. K_t being a composite of both physical and human capital.

For ease of computation, we assume a stationary population and that only one good is produced in an economy and that good can be invested or consumed. If invested, it can depreciate per period at a rate δ. Hence, gross investment equals:

$$I_{t=}K_{t+1} - (1 - \delta)K_t \text{... (2)}$$

In a closed economy, gross savings should be equal to gross investments. However, in the model developed by Pagano (1993), there is a loss of a proportion 1-ϕ on the flow of savings that is due to financial intermediation so that at the equilibrium we have:

$$\phi S_t = I_t \quad\text{... (3)}$$

Using equation (2) the steady state growth rate can be written as follows:

$$g = A\frac{I}{Y} - \delta\text{.. (4)}$$
$$g = A\phi s - \delta\text{... (5)}$$

Where, g is the economic growth and s is the saving rate obtained from S over Y.

Therefore, financial intermediation can affect economic growth in three possible ways. It can increase ϕ the amount of savings channeled to investments, it can increase A the marginal productivity of capital and finally can increase the private saving through s. By assuming zero depreciation rate ($\delta = 0$) we obtain the Pagano endogenous growth model given by:

$$g = A\phi s \quad\text{.. (6)}$$

3.2 Model specification

We assume that economic growth is a function of financial intermediation:

$$Growth = f(Financial\ intermediation) \dotfill (7)$$

However, there are other factors that also affect growth. Hence the empirical model that is estimated can be stated as follows:

$$lny_{it} = \beta_0 + \beta_1 FI\_Index_{it} + \beta_2 lnFDI_{it} + \beta_3 Trade_{it} + \beta_4 lnCapform_{it} + \beta_5 Inflation_{it} + \beta_6 Popgrowth_{it} + u_{it} \dotfill (8)$$

Where, y_{it} is logarithm of the GDP per capita in the USD dollars constant for the year 2010, $lnFI\_Index_{it}$ is the financial intermediation index, $lnFDI_{it}$ is the logarithm of the Foreign Direct Investments inflows in USD dollars, $Trade_{it}$ is trade openness which is the sum of the exports and imports of goods and services divided by the GDP, $lnCapform_{it}$ is the logarithm of the gross capital formation in USD dollars, $Inflation_{it}$ is the inflation rate and finally $Popgrowth_{it}$ is the rate of the growth of the population. The subscripts i and t denote the individual country and the time period respectively. Gross capital formation is used to proxy physical capital, population growth is used to capture labor, inflation is used as a proxy for macroeconomic stability while trade openness captures external shocks.

Inflation adversely affects output growth by the reducing the ability of the private sector to perform efficiently. Smyth (1994) found that inflation has a negative and significant effect on productivity growth while Sarel (1996) found that the effect of inflation on growth was non-linear. Thus, at a certain threshold it may be slightly positive or insignificant but after that threshold level the effect becomes significantly negative. Hence, we expect that inflation would have an insignificant or negative effect on growth in the long run for the EAC. The effect of liberalizing trade, captured by trade openness, is expected to have a positive effect on growth. empirically, however, it has different outcomes. Dowrick and Golley (2004) indicate that less developed countries get little benefit by engaging in free trade at the global level due to low level of productivity and Yanikkaya (2003) finds that trade barriers are positively correlated with growth in developing countries.

Alfaro et al. (2000) investigate how FDI is beneficial to economic growth and the role played the local financial markets. They indicate that not only FDI has a positive effect on growth especially with the transfer on technology (Borensztein, De Gregorio, Lee, 1998), but also local financial markets play an important role in attracting FDI. Therefore, we expect FDI to have a positive effect on growth as capital formation or developing countries since through investment in physical capital improves per capita growth (Oketch, 2006).

3.2 Econometric approach

We test for unit roots using the Im, Pesaran and Shin (IPS) test and the Levin, Lin and Chu (LLC) test (Levin, Lin and Chu, 2002 and Im, Pesaran and Shin, 2003). The existence of cointegration is tested using the Kao and the Johansen Fisher panel cointegration tests. While the Kao test is a residual based test for cointegration based on the Engle-granger approach, the Johansen Fisher test

reports the Johansen's cointegration trace test and maximum eigenvalue test for different individual cross-section units and the MacKinnon-Haug-Michelis p-values (MacKinnon, Haug, and Michelis, 1999 and Kao, 1999). The null hypothesis in both tests is no cointegration. In case, it is rejected, the alternative hypothesis of the presence of cointegrating relationships in the model holds.

The Kao test is estimated in two steps. In the first step, the pooled model is estimated and then the residuals are obtained. Run the following auxiliary regression based on the residuals from Step 1 and construct appropriate test statistics

$$e_{it} = \rho_i e_{i,t-1} + \sum_{j=1}^{p_i} \Psi_{ij} \Delta e_{i,t-j} + v_{it} \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \ (9)$$

The tests statistics derived by Kao are asymptotically distributed as N(0,1).

While using macro panels, that is, panel with long time period dimension, it is possible that variables in the model exhibit long run relationships. If this is the case, then the OLS estimates are biased because of serial correlation, heterogeneity and potential non-exogeneity of regressors. In this case, the OLS estimates may not be efficient for small sample bias (Pedroni, 2001). Alternative models to the OLS estimation technique have been proposed by Phillips and Hansen (1990) for the FMOLS and Stock and Watson (1993) for the DOLS. Both DOLS and FMOLS are usually preferred to the OLS estimator because they yield consistent and asymptotically efficient estimates by considering the small sample bias and endogeneity bias by taking the leads and lags of the first-differenced regressors (Kao and Chiang, 1999). However, the parametric DOLS is preferred to the non-parametric FMOLS because the FMOLS imposes additional requirements that all variables should be integrated of the order 1, that is, I(1) and that the regressors themselves should not be cointegrated. These estimators have been used in studies that examined the effect of financial development on growth (Falahaty and Hook, 2013; Sehrawat et al., 2014; Abubakar et al., 2015 and Stojkoski et al., 2017).

According to Kao and Chiang (1999), the DOLS estimator for heterogenous panels is formalized as follows:

$$y^*_{it} = \alpha_i + x^{*\prime}_{it}\beta + \sum_{j=-q_i}^{q_i} c_{ij} \Delta x^*_{it+j} + v^*_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \ (10)$$

Where, y^*_{it} is the dependent variable, α_i are the intercepts, β is a $k \times 1$ vector of slope parameters, is the set of regressors which is cointegrated with y^*_{it}. u_{it} is the error term that is assumed to be stationary such that:

$$u_{it} = \sum_{j=-q_i}^{q_i} c_{ij} \varepsilon_{it+j} + v^*_{it} \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots \ (11)$$

v^*_{it} is stationary v^*_{it} and ε_{it} are uncorrelated not only contemporaneously but also in all lags and leads.

3.4 Measurement of variables

Measuring financial development has been a huge subject of discussion in the literature with two approaches being adopted; the banking sector-based approach and the stock market-based approach. Early studies mainly focus on the banking sector. For example, King and Levine (1993) measure financial development by liquid liabilities on a sample of 80 countries. However, this measure does not tell whether the liabilities are those of the central bank, commercial banks or other financial intermediaries. Afterwards, Levine et al. (2000) uses credit to the private sector which is an improvement in measurement indeed but, consequently, omits credit to the public sector. Roughly, each measure used by most studies has its advantages and shortcomings. Levine and Zervos (1998), Beck and Levine (2002) and most of recent studies include measures of stock markets in their models.

Arestis et al. (2000) finds that both stock markets and banks affect growth, but the effects of banks were more powerful. Though it is not a sufficient reason not to consider stock markets in measuring the financial depth due to recent advancement in the literature advocating for the inclusion of the stock markets when measuring the financial sector depth; lack of data on stock markets in EAC for most of the years under examination limits its use in this study. The only stock market development proxy available is the shares of the listed companies in the GDP but only for Kenya. Hence in the measurement of the financial development, stock market development is not used for the EAC countries. There has been debate on good measures of the banking sector development. Even the most used in the literature such as broad money (M2), domestic credit provided by the financial sector and the domestic credit to the private sector by banks; have been criticized. Therefore, there is no consensus on the best measure of the banking sector development. Moreover, taking just one variable into account to measure effect of financial development on growth does not give reliable estimates since a single proxy does not capture the effect of the whole financial sector (Ang and McKibbin, 2005).

Recent improvements in the field of financial development suggest the use of the Principle Component Analysis (PCA) which requires to form a financial development index using as many measures as possible (Ang and McKibbin, 2005; Seven and Yetkiner, 2016). This approach is adopted in this study. PCA captures the effect of each financial sector development proxy in one variable which shows the effect of the whole financial sector in its variability. The intuition is that each proxy brings an extra information not contained in the other and hence a better measure. In this study we use broad money (M2), domestic credit provided by the financial sector and the domestic credit to the private sector to construct the financial development index. Moreover, the financial development index obtained using the PCA approach presents some econometric advantages. First, the use of the index overcomes the problem of multicollinearity and over-parametrization that would otherwise have arisen if the three adopted measures of financial development were to be used separately in the same regression model (Stock and Watson,2002).

3.5 Data

The data used in this study is obtained from the World Bank's World Development Indicators (WDI) database. We obtain the data for all the 5 countries of the EAC for the period 1985 to 2017. This data constitutes a panel of 5 countries which are Burundi, Kenya, Rwanda, Tanzania and Uganda. This study also controls for other factors that are largely used in growth models such as

FDI, trade openness, inflation, capital formation and population growth. Though there is no consensus on the variables to use to measure the financial development sector, the most commonly used in the literature are domestic credit provided by the financial sector, domestic credit to the private sector and broad money (M2). We do not, however, incorporate the stock markets variables. This is because stock markets in developing countries are not developed compared to those of developed countries and this is seen even by the lack of data on stock market development.

4. Empirical findings and discussions

Table 1 indicates that the measures of financial development are highly and significantly correlated which means that they may contain similar information hence, the rationale of using an index.

Table 1: Correlation matrix of measures of financial development.

	Domestic Credit	Broad Money	Private Sector
Domestic Credit	1.0000		
Broad Money	0.8186***	1.0000	
Private Sector	0.7847***	0.8572***	1.0000

*** $p < 0.01$

Table 2 shows how the financial intermediation index is computed. The first component explains 88.02% of the changes of the standardized variance. Therefore, it is the best measure of the financial development since other components clearly have relatively very low variations in percentage. Component 2 explains 7.39% while Component 3 explains 4.59% of the variation.

Table 2: Principal component analysis for financial development (FD) index

	PCA1	PCA2	PCA3
Eigen values	2.7224	0.221551	0.137819
% of variation	0.8802	0.0739	0.0459
Cumulative %	0.8802	0.9541	1.0000
Variable	Vector1	Vector2	Vector3
Privatesector	0.5778	-0.5623	0.5915
Domesticcredit	0.5685	0.7973	0.2026
BroadMoney	0.5856	-0.2192	-0.7804

In order to make the estimates more reliable, we include control variables in the regression. we only use four controls that have been widely used in growth models. We include the inflation rate measured as the change in the consumer price index. According to Fischer (1993), in the presence of inflation, investments tend to reduce, productivity growth reduces and therefore growth equally reduces. Trade openness, population growth and gross capital formation are included.

Table 3 presents the summary statistics. We establish that the average GDP per capita for the time of the study is 534.3147 USD dollars for the EAC countries while the average growth rate of the population is 2.82%. The EAC countries experienced a two digits inflation rate of around 15% on average. The average amount of FDI inflows was 273 million of USD dollars while the capital formation was 2.65 billion of USD dollars on average for the same period.

Table 3: Summary statistics

Variables	Obs.	Mean	Std. Dev	Min	Max
GDP Per capita	162	534.3147	251.7514	204.7320	1169.340
FI Index	162	0.010608	1.638171	-2.3676	4.3715
FDI	162	273000000	1.638171	-5900000	2100000000
Capital formation	162	2650000000	3530000000	24000000	15000000000
Inflation	162	14.9616	28.0487	-2.4059	200.0260
Population	162	2.8220	1.5184	-6.1848	7.9178
Trade	162	0.4236	0.1164	0.1968	0.7285

The results of the tests for unit roots are presented in table 4. We use two to ensure that the order of integration that they indicate is valid for homogenous and heterogenous panels. The results indicate that the log of GDP per capita, FI index, log of FDI, trade openness and the log of capital formation are integrated of order 1, that is, they are stationary after the first difference.

Table 4: Unit root tests

Variable	IPS		LLC	
	Level	First difference	Level	First difference
Log GDP per capita	3.2227	-4.9047 ***	0.2782	-4.1303 ***
FI Index	0.8425	-8.4404 ***	0.1294	-7.0974***
Log FDI	-1.1076	-11.3172***	-1.7357**	-10.2921***
Population	-9.6188 ***		-4.3595***	
Trade	-0.2305	-7.8694***	-0.2126	-6.6170 ***
Inflation	-3.3206***		-3.1849***	
Log capital formation	2.3680	-4.9466***	0.6171	-4.3126 ***

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation

The null hypothesis of no cointegration is rejected and we conclude that the variables in the model are cointegrated and hence acknowledged the presence of a long run relationship. The cointegration tests are presented in Tables 5 and 6.

Table 5: Kao Residual Cointegration test

	t-Statistic	Prob.
ADF	1.516986	0.0646
Residual variance	0.002748	
HAC variance	0.002472	

Hence, there is a long run relationship between economic growth and the variables used as regressors in the model. More specifically, there is evidence of the existence of a long run relationship between financial intermediation and the per capita income for EAC countries for the period of 1985-2017. The p value for the Kao test is significant at 10% level which allows us the

rejection of the null hypothesis of no cointegration. On the other hand, the Johansen Fisher panel cointegration test also has p values that are significant at 5% level and which indicate the presence of more than one cointegrating relationships.

Table 6: Johansen Fisher panel cointegration test

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	283.0	0.0000	253.3	0.0000
At most 1	178.6	0.0000	89.66	0.0000
At most 2	105.0	0.0000	45.90	0.0000
At most 3	66.61	0.0000	33.82	0.0002
At most 4	40.33	0.0000	27.91	0.0019
At most 5	22.59	0.0124	17.74	0.0594
At most 6	20.20	0.0274	20.20	0.0274

The estimation results of the DOLS and the FMOLS models are presented in table 7. Even though both the DOLS and the FMOLS results are presented, the interpretation and discussion are only based on the DOLS estimation results[3]. The results indicate that financial intermediation has a positive and significant effect on economic growth. The coefficient of the FI index is positive and highly significant at 1 % level. An increase of 1% in the index of financial intermediation is expected to increase the per capita income by 0.0818%. This is a largely shared finding in empirical literature as it has been indicated that better working intermediaries have positive effects on growth (Zhang et al., 2012; Loayza and Romain Rancière, 2004). Most studies that cover developing countries also found similar results (Ahmed and Wahid, 2011; Falahaty and Hook, 2013 and Agbélénko and Kibet, 2015). Seven and Yetkiner (2016) found that the positive effect of financial depth on the economic growth of developing countries was less pronounced for the stock markets. Therefore, EAC countries should improve on policies that would strengthen the financial sector and financial intermediaries. Among such measures includes improving the legislation that govern the financial markets.

The explanation for the positive correlation between financial intermediation and growth is to be found in the specific relation of the variables that form the index of financial intermediation and growth. For instance, increasing the share of the domestic credit that goes to the private sector, would have significant positive effect on income per capita in the EAC. This may be explained by the fact that the private sector tends to use more efficiently funds borrowed from financial intermediaries. On the other hand, since banks allow better capital allocation, banks in the EAC play an important role in increasing efficient use of capital in the EAC and hence economic growth.

Table 7: Estimation results

VARIABLES	(1) DOLS	(2) FMOLS

---

[3] FMOLS estimates may be biased if there is a cointegrating relationship among the regressors. It also imposes all the variables to be I (1) which is not the case in our study.

FI Index	0.0818***	0.0799***
	(0.0267)	(0.0108)
Logfdi	0.0410**	0.0275***
	(0.0198)	(0.00624)
logCapform	0.153***	0.172***
	(0.0445)	(0.0152)
Trade	0.00168	0.000963**
	(0.00115)	(0.000381)
Inflation	-0.00131	-0.00136***
	(0.00126)	(0.000470)
Population	-0.0694**	-0.0197**
	(0.0349)	(0.00880)
Constant	2.376***	2.110***
	(0.637)	(0.240)
Observations	162	162
R-squared	0.812	0.367

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

However, FI index is not the only variable that has an impact on economic growth in the long run. The study also finds that FDI is positively correlated with growth in the long run. The coefficient of FDI is positive and significant at 5% level. 1% increase in the volume of FDI increases the economic growth by 0.041%. The positive effect of FDI on the growth of EAC countries is justified by the fact that there is need for funds in developing countries to boost investment and income growth (Nennenkamp, 2002). Conversely, better financial markets can also attract FDI (Alfaro et al., 2000; Alfaro et al., 2004 & Azman-Saini et al., 2010). The log of the capital formation coefficient has the highest magnitude which is 0.153%. It indicates that an increase of 1% in the volume of physical capital invested increases the per capita income of EAC countries in the long run by 0.153%. Even though it has a positive effect on economic growth, trade openness has been found insignificant while inflation has a negative but insignificant effect on growth in the long run. The growth of the population reduces the per capita income significantly. The results indicate that 1% increase in the growth of the population, reduces the per capita income by 0.0694%. The coefficient is significant at 5% level.

4. Conclusion

The study examines the effect of financial intermediation on economic growth of EAC countries composed by Burundi, Kenya, Rwanda, Tanzania and Uganda using panel ARDL model for the period of 1985 to 2017. We construct an index of financial intermediation which captures proxies for the development of the banking sector using the principle component analysis. The domestic credit to the private sector, broad money and domestic credit provided by the financial sector were used to form the index through the Principal Component Analysis (PCA). The Kao and Johansen cointegration tests were performed and indicated the presence of long run relationships. Given that the OLS estimation technique yields biased and inconsistent estimates in the presence of long run relationship for heterogenous panels, the FMOLS and the DOLS were estimated and we found that financial intermediation has a positive and significant effect on economic growth of the EAC

177

countries. Policies that aim to improve financial markets working in general and financial intermediation should be implemented so as to boost economic growth of EAC countries in the long run. Gross capital formation and FDI equally have positive and significant effects on economic performance of the EAC countries. While trade openness and inflation are not found to be significant, the growth of the population significantly reduces economic growth.

REFERENCES

Abubakar, A., Kassim, S. H., & Yusoff, M. B. (2015). Financial development, human capital accumulation and economic growth: empirical evidence from the economic community of West African States (ECOWAS). *Procedia-Social and Behavioral Sciences*, *172*, 96-103.

Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development finance*, *3*(4), 192-203.

Agbélénko, F. A., & Kibet, K. S. (2015). Financial development and economic growth in West African Economic and Monetary Union (WAEMU). *African Journal of Business Management*, *9*(17), 624-632.

Agbetsiafa, D. (2004). The finance growth nexus: evidence from Sub-Saharan Africa. *Savings and Development*, 28(3),271-288.

Ahmed, A. D., & Wahid, A. N. (2011). Financial structure and economic growth link in African countries: a panel cointegration analysis. *Journal of Economic Studies*, *38*(3), 331-357.

Akinlo, A. E., & Egbetunde, T. (2010). Financial development and economic growth: The experience of 10 sub-Saharan African countries revisited. *The Review of Finance and Banking*, *2*(1),017-028.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of international economics*, *64*(1), 89-112.

Allen, D. S., & Ndikumana, L. (2000). Financial intermediation and economic growth in Southern Africa. *Journal of African Economies*, *9*(2), 132-160.

Allen, F., & Santomero, A. M. (1997). The theory of financial intermediation. *Journal of Banking & Finance*, *21*(11-12), 1461-1485.

Allen, F., Carletti, E., Cull, R., Qian, J., &Senbet, L. W. (2010). The African financial development gap. EUI Working Paper ECO 2010/24.

Ang, J. B., & McKibbin, W. J. (2007). Financial liberalization, financial sector development and growth: evidence from Malaysia. *Journal of development economics*, *84*(1), 215-233.

Apergis, N., Filippidis, I., & Economidou, C. (2007). Financial deepening and economic growth linkages: a panel data analysis. *Review of World Economics*, *143*(1), 179-198.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, *58*(2), 277-297.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, *58*(2), 277-297.

Azman-Saini, W. N. W., Law, S. H., & Ahmad, A. H. (2010). FDI and economic growth: New evidence on the role of financial markets. *Economics letters*, *107*(2), 211-213.

Bađun, M. (2009). Intermediation by Banks and Economic Growth: A Review of Empirical Evidence. *Financial Theory and Practice*, *33*(2), 121-152.

Baltagi, B. H., Griffin, J. M., & Xiong, W. (2000). To pool or not to pool: Homogeneous versus heterogeneous estimators applied to cigarette demand. *Review of Economics and Statistics*, *82*(1), 117-126.

Beck, T., & Levine, R. (2004). Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance*, *28*(3), 423-442.

Beck, T., Levine, R., & Loayza, N. (2000). Finance and the Sources of Growth. *Journal of financial economics*, *58*(1), 261-300.

Bencivenga, V. R., & Smith, B. D. (1991). Financial intermediation and endogenous growth. *The Review of Economic Studies*, *58*(2), 195-209.

Blackburne, E. F., & Frank, M. W. (2007). Estimation of nonstationary heterogeneous panels. *Stata Journal*, *7*(2), 197-208.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, *87*(1), 115-143.

Bogdan, D. I. M. A., & OPRIȘ, P. E. (2014). Financial Intermediation and Economic Growth. *Timisoara Journal of Economics and Business*, *6*(20), 127-136.

Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? 1. *Journal of international Economics*, *45*(1), 115-135.

Caporale, G. M., Rault, C., Sova, R., & Sova, A. (2009). Financial development and economic growth: Evidence from ten new EU members. DIW Discussion papers, (No.940)

Chuku E.D., & Ndanshau M.O.A. (2016). The Non-bank Financial Intermediaries and Economic Growth om Tanzania: An empirical Analysis. *University of Dar Es Salaam Journals*.

Dowrick, S., & Golley, J. (2004). Trade openness and growth: Who benefits? *Oxford review of economic policy*, *20*(1), 38-56.

EAC (2017). Retrieved from https://www.eac.int/financial/banking

Edison, H. J., Levine, R., Ricci, L., &Sløk, T. (2002). International financial integration and economic growth. *Journal of international money and finance*, *21*(6), 749-776.

Falahaty, M., & Hook, L. S. (2013). The effect of financial development on economic growth in the MENA region. *Journal of Economic Cooperation & Development*, *34*(3), 35-60.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of monetary economics*, *32*(3), 485-512.

Gisanabagabo, S., & Ngalawa, H. (2017). Financial intermediation and economic growth: Evidence from Rwanda. *Journal of Economic and financial Sciences*, 10(2), 253-273

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics*, *115*(1), 53-74.

Kagochi, J. M. (2013). Financial development and economic growth in Kenya: Evidence from an expanded neoclassical growth approach. *Asian-African Journal of Economics and Econometrics*, *13*(2), 117-131.

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of econometrics*, *90*(1), 1-44.

Kao, C., & Chiang, M. H. (1999). On the estimation and inference of a cointegrated regression in panel data. Center for Policy Research working Paper (No. 02).

Kar, M., Nazlıoğlu, Ş., & Ağır, H. (2011). Financial development and economic growth nexus in the MENA countries: Bootstrap panel granger causality analysis. *Economic modelling*, *28*(1-2), 685-693.

King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *The quarterly journal of economics*, *108*(3), 717-737.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of econometrics*, *108*(1), 1-24.

Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of economic literature*, *35*(2), 688-726.

Levine, R., & Zervos, S. (1998). Stock markets, banks, and economic growth. *American economic review*, 88(3), 537-558.

Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of monetary Economics*, *46*(1), 31-77.

Loayza, N., &Ranciere, R. (2004). Financial development, financial fragility, and growth. Journal of Money, Credit and Banking, 38(4), 1051-1076.

Lucas Jr, R. E. (1988). On the mechanics of economic development. *Journal of monetary economics*, *22*(1), 3-42.

MacKinnon, J. G., Haug, A. A., &Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of applied Econometrics*, *14*(5), 563-577.

Matei, I. (2014). Finance as a driver of growth? Evidence from EU countries. *Revue d'économie politique*, *124*(4), 571-586.

McKinnon, R.I. (1973), "Money and Capital in Economic Development", Washington D.C: The Brookings Institution.

Nennenkamp, P. (2002). FDI and Economic Growth in developing Countries. *J. World Investment*, *3*, 595.

Odhiambo, N. M. (2008). Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, *25*(4), 704-713.

Oketch, M. O. (2006). Determinants of human capital formation and economic growth of African countries. *Economics of Education Review*, *25*(5), 554-564.

Önder, Z., &Özyıldırım, S. (2013). Role of bank credit on local growth: Do politics and crisis matter? *Journal of Financial Stability*, *9*(1), 13-25.

Onuonga, S. M. (2014). Financial development and economic growth in Kenya: An empirical analysis 1980–2011. *International Journal of Economics and Finance*, *6*(7), 226-239.

Pagano, M. (1993). Financial markets and growth: an overview. *European economic review*, *37*(2-3), 613-622.

Pedroni, P. (2001). Purchasing power parity tests in cointegrated panels. *Review of Economics and Statistics*, *83*(4), 727-731.

Phillips, P. C., & Hansen, B. E. (1990). Statistical inference in instrumental variables regression with I (1) processes. *The Review of Economic Studies*, *57*(1), 99-125.

Rajan, R. G., & Zingales, L. (1996). Financial dependence and growth. National bureau of economic research, (No. w5758).

Robinson, J. (1952). The Generalization of the General Theory, in: The Rate of Interest and Other Essays. MacMillan, London. pp 67-142.

Sarel, M. (1996). Nonlinear effects of inflation on economic growth. IMF *Staff Papers*, *43*(1), 199-215.

Schumpeter, J. A (1911), "The theory of economic development" Cambridge MA: Harvard University Press, USA.

Sehrawat, M., &Giri, A. K. (2016). The impact of financial development on economic growth: Evidence from SAARC countries. *International Journal of Emerging Markets*, *11*(4), 569-583.

Seven, Ü., &Yetkiner, H. (2016). Financial intermediation and economic growth: Does income matter? *Economic Systems*, *40*(1), 39-58.

Smyth, D. J. (1994). Inflation and growth. *Journal of Macroeconomics*, *16*(2), 261-270.

Stock, J. H., & Watson, M. W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica: Journal of the Econometric Society*, 61(4), 783-820.

Stock, J. H., & Watson, M. W. (2002). Forecasting using principal components from a large number of predictors. *Journal of the American statistical association*, *97*(460), 1167-1179.

Stock, J. H., & Watson, M. W. (2002). Macroeconomic forecasting using diffusion indexes. *Journal of Business & Economic Statistics*, *20*(2), 147-162.

Stojkoski, V., Popova, K., &Tevdovski, D. (2017). Financial Development and Growth: Panel Cointegration Evidence from South-Eastern and Central Europe.MPRA Paper No. 80802

Yanikkaya, H. (2003). Trade openness and economic growth: a cross-country empirical investigation. *Journal of Development economics*, *72*(1), 57-89.

Zhang, J., Wang, L., & Wang, S. (2012). Financial development and economic growth: Recent evidence from China. *Journal of Comparative Economics*, *40*(3), 393-412.