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Financial development and economic growth in Tanzania: an ARDL and bound testing approach

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Abstract

Purpose – The purpose of this study is to empirically weigh the evidence for financial depth, liquidity and efficiency role to economic growth, and test for the existence of cointegration between financial development variables and economic growth in Tanzania.

Design/methodology/approach – The study used the autoregressive distributed lag model with bound testing procedures. The sample covered yearly time-series data from 1980 to 2017, i.e. 38 years.

Findings – The results suggest that financial system depth is positively related to economic growth in the short run and that financial system liquidity and efficiency is strongly negatively associated with economic growth both in the short and long run. Further, it is found that financial development is cointegrated with economic growth. Thus, financial reforms and liberalisation have not fully brought the desired positive effects on economic growth yet.

Originality/value – The study uses principal component analysis to capture specific dimensions within the financial system as an intuitive way to aggregate financial development effects. Unlike studies that included several countries with heterogeneous characteristics, which are sometimes difficulty to homogenise, in recognition of countries' unique experiences, this study uses data from Tanzania as a specific case. It documents pertinent pieces of evidence for a developing economy necessary for financial policy adjustments post the financial and economic liberalisation and reforms period. It nevertheless sheds light on financial policies for other comparable developing economies during and after both financial and economic liberalisation settings.

Keywords ARDL model, Economic growth, Financial development, Tanzania, Africa

Paper type Research paper

1. Introduction

Early in 1986, the Tanzanian economy embarked on economic transformation programmes. Specifically, economic liberalisation and later financial reforms were instituted. This current study covers the period from 1980 to 2017. It can be split into three main epochs (Robinson *et al.*, 2011). The first epoch spans from 1980 to 1985, which covered the end phase of *Ujamaa* socialism. Policies characterising it were state control of the economy and state-ownership of all major enterprises. The pricing and exchange rates were not based on market economy, devaluation and expansionary fiscal and monetary policies were the norm

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and unfavourable terms of trade and presence of external trade controls prevailed. The outcomes during this epoch were low export, loss-making state enterprises, massive subsidies financed by dictated bank loans, government budget deficits funded by printing money, high inflation and shortage of goods (Biermann and Wagao, 1986; Nord *et al.*, 2009).

The second epoch spans from 1986 to 1995. It was an epoch of liberalisation and partial reforms. The policies advocated liberalisation of exchange rates and trade regimes, liberalisation of marketing systems and domestic prices, start of financial system reforms and parastatal and civil services reforms. In 1986, Tanzania adopted the International Monetary Fund and World Bank economic recovery programmes. They geared towards moving the economy from a direct-controlled monetary policy to a market-driven monetary policy. Several developments ensued: the adoption of the monetary-targeting regime started in 1993, banking sector liberalisation started in 1991 and government securities (T-bills and bonds) were introduced in the 1990s (Twinoburyo and Odhiambo, 2018). The outcomes of these policies and actions saw the dominance of public monopolies, insolvency of large state-owned and state-run banks, weakness of budgetary management, fiscal deficits, elusive macroeconomic stability and low economic growth (Robinson *et al.*, 2011).

The last epoch spans from 1996 to 2017. It is longer and mainly a period of market-driven macroeconomic and structural reforms. The policies in this period included privatisation and reforms of parastatals, financial sector liberalisation, creation of the market-led regulation framework, trade reforms, regional integration and fiscal consolidation, among other issues. The outcomes of these policies were higher economic growth, declining inflation to single digits, strong export growth, increase in international reserves, creation of a more direct-controlled efficient and competitive banking system and increased credits to the productive economic sectors (Marobhe, 2019). Particularly between 2000 and 2014, the economy grew more rapidly than at any time in recent history; annual growth averaged 6.7%. This period has been characterised by strong labour productivity growth and the manufacturing sector grew at about 8%, which is higher than in former epochs (Diao *et al.*, 2018). Post-1990s reforms created more supportive economic settings for strong macro-economic performance, which reduced inflation rates and increased economic growth (Twinoburyo and Odhiambo, 2018).

Despite all these evidences and claims on the performance of the financial system and its expected effects on the economy in Tanzania, the current twin study's objectives are to empirically weigh evidences for financial development's depth, liquidity and efficiency's role to economic growth, and test for existence of cointegration between financial development variables and economic growth in Tanzania.

Sections in the article are organised as follows: Section 2 discusses the literature review and formulates hypotheses. Section 3 presents the modelling and methods used in the study. Section 4 covers the analysis, findings and discussion and Section 5 ends the paper with conclusions.

2. Literature review

2.1 Finance-growth nexus

In his work, Schumpeter (1911) theorised that a strong financial system allocates resources efficiently among innovative entities, thereby affecting economic growth. Thereafter, the relationship between financial development and economic growth has been widely researched (Levine and Zervos, 1998; Shahbaz *et al.*, 2018). There are two main debated positions as regards to the effects running from financial development to economic growth. These are positive effects (Nazir *et al.*, 2020) and negative effects (La Porta *et al.*, 2002).

Firstly, evidence for a positive causality supports the idea that financial development either leads or follows economic growth towards the same or positive direction (Nazir *et al.*, 2020; Shahbaz *et al.*, 2018). Hence, the dominance of a market-based system presupposes the presence of a liberalised economy and a financial system that is open, liberal and market based. That implies less restrictive and repressive policies which foster credits and deposits, and efficient and effective financial mobilisation, allocation and intermediation processes.

Arguably, the sign of effect depends on how banks are regulated and supervised (Demetriades and Rousseau, 2016) in a liberalised economy. Unlike repressive policies which keep interest rates low through interest rate ceilings, liberalisation policies work as channelling mechanisms for a positive causality running from financial development to economic growth. These policies include interest rate liberalisation, the abolition of directed credit allocation, the opening of banking sector entry, denationalisation of state banks and the strengthening of practical banking regulations (Fowowe, 2008).

Apanisile and Osinubi (2019) studied financial development channelling mechanisms effects. They indicate that the following financial transmission channels: monetary policy, credit and expectation are essential in stimulating outputs and stabilising prices for positive economic growth. Similarly, Taivan and Nene (2016) studied the Southern Africa Development Community and found that domestic credits promote investments. Thus, they found that financial development caused economic growth in Mauritius, Namibia and South Africa. In their study, Nazir *et al.* (2020) support a positive causality from financial development to economic growth. They show that financial innovations in forms of monetary management and credit flow to the private sector are important channels in the financial system for economic growth.

Secondly, evidence for a negative causality supports the idea that financial development either leads or follows economic growth towards the opposite or negative direction (Demetriades and Luintel, 1996; Xu, 2000; Deidda and Fattouh, 2002; Ardic and Damar, 2006; Cecchetti and Kharroubi, 2015). For instance, Ardic and Damar (2006) found a strong negative causality of financial depth to economic growth. They account for this effect based on channelling directions of the intermediation process. In this case, the financial system served to channel funds to government treasury and re-distribute it to rent rather than finance economic production. Deidda and Fattouh (2002) contend that financial development may have negative effects as long as it harms unfavourably the proclivity to save. Xu (2000) finds that the low- and middle-income economies displayed negative causality running from financial development to economic growth. Similarly, Dawson (2003) also found that the relationship is weakly negative or negligible supporting the model that financial development does not cause economic growth in transition economies.

Arguing for negative effect channels, Demetriades and Luintel (1996) basing on their empirical findings, propose that banking sector controls or policies, such as lending rate ceilings, channel negative influence on financial development thereby repressing financial system development and consequently negatively affect economic growth. Similarly, King and Levine (1993) advanced an endogenous model that ascribe the negative channelling effects to financial policies, which may include high taxes, interest rate controls, deposit rate ceilings and high reserve requirements, which may have negative effects on financial intermediation and consequently on economic growth.

According to the liberalisation theory, interest rate ceilings resulting from financial repression maintain low-interest rates, which in turn discourage savings thereby curtailing investments thus transmit negative effects to economic growth (Fowowe, 2008). Financial repression often is thought of as a fruit of state ownership and control on the banking system. In such settings, banks often engage in political lending and are prone to

government interventions (World Bank, 2001; La Porta *et al.*, 2002; Panizza, 2014). Evidently, La Porta *et al.* (2002) found that government ownership of banks is large in economies with low economic development, backward financial systems, inefficient and interventionist governments and poor property rights protection. They further show that high government ownership of banks is associated with slower financial development and lower economic growth.

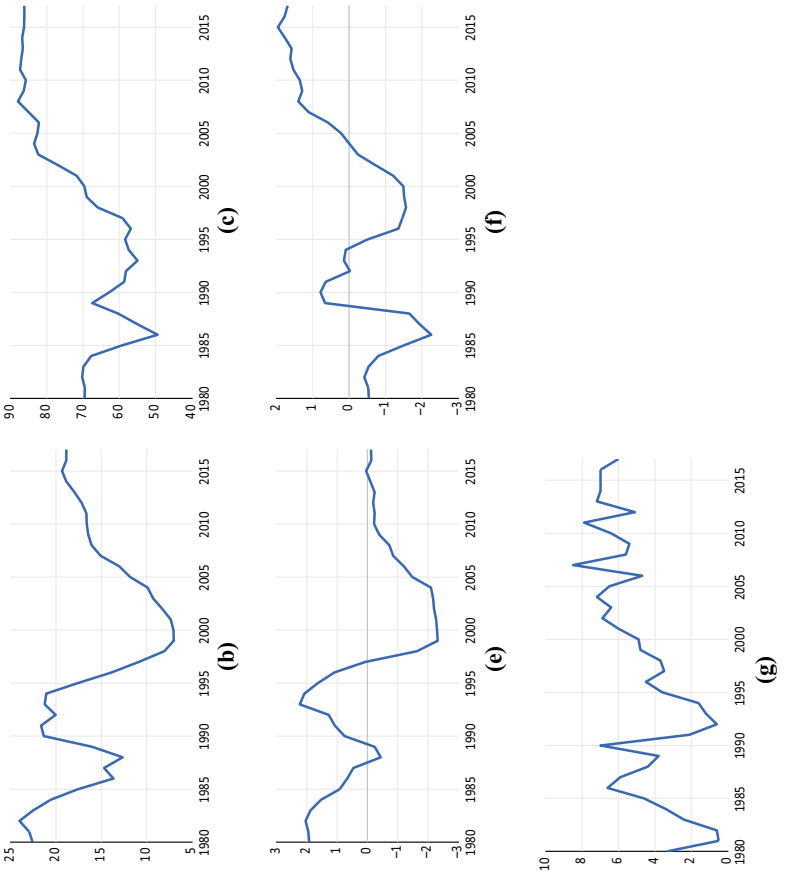
Other negative effect channels cited variously (Arcand *et al.*, 2011; Panizza, 2014) are the presence of curvilinear effects resulting into negative marginal effects, reduction in saving rates, credit constraints, credit crisis, disproportionate increase in household credits which is for consumption purposes rather than investment and excessive attraction of large labour force into the financial sector, because of increase in demand of skilled labour in financial sector. This labour force would otherwise be needed in the productive sectors of the economy. This happens especially in economies where there is a strong push for expansion of the financial sector's products and institutions.

2.2 Economic growth in Tanzania

After independence in 1961 and later in 1967, Tanzania decided to model its economy after socialistic Ujamaa economy, following the Chinese economic model. However, in 1970s, China introduced market-oriented policies (Zoega, 2013), very later to be followed by Tanzania in 1986. Zoega particularly found that fast economic growth in China could be ascribed to the introduction of policies that were market-oriented in the late 1970s. These policies led to increased competition and importation of foreign technologies. The role of the public sector in the economy was minimised, incentive schemes were introduced, laws and regulations fostered entrepreneurial activities and special economic zones were introduced and allowed to flourish. Further, Kuroda (2015) accounts for the role of the strong and reformed financial system in fostering economic growth in China.

Tanzania during a socialistic economy, before 1986's market-oriented economic reforms, experienced poor economic performance, shortage of goods and an inflationary economy (Nord *et al.*, 2009). Between 1986 and 1995, she experienced weak macroeconomic stability and low economic growth (Robinson *et al.*, 2011). And from 1996 after liberalisation and reforms, she saw higher economic growth, productivity growth, manufacturing growth, strong exports growth and declining inflation to single digits (Marobhe, 2019). Economic growth on average between 1980 and 2017 has been growing at 4.84% with a maximum of 8.5% in 2007 [Figure 1(g) and Table 2]. Comparatively, Masenya *et al.* (2018) evidenced an average growth of 6.7% between 2007 and 2016, and 7% between 2014 and 2016. They note that the 7% growth between 2014 and 2016 ranked Tanzania the third fastest growing economy in Africa after Ethiopia (8%) and Ivory Coast (7.5%).

They further document vital pieces of evidence for economic growth in Tanzania after economic reforms as follows: services, industry and construction mainly influenced growth between 1995 and 2016. Between 2007 and 2016, services alone contributed 50.8% to GDP growth, and industry and construction contributed 26.9%. The contribution of agriculture declined very low (14.6%) from 27.3% between 1997 and 2006, despite its major role to livelihood. These results imply economic structural change mainly towards services industry to which the financial services during 2006 and 2016 contributed only 7% to the economy. The rest contributed as follows: construction (14.3%); wholesale, retail and repair trade (11.7%); public administration (8.7%); manufacturing (8.7%); and information and communication (7.4%). Therefore, it is important to note that the economic reforms after a shift towards market-based economy may have contributed to strong economic growth and



Notes: (a) Domestic credit to private sector (% of GDP); (b) deposit money banks assets (% of GDP); (c) money bank assets to money bank and central bank assets (%); (d) liquid liabilities (% of GDP) (M3); (e) PC1; (f) PC2; (g) real GDP growth Rate (%)

Figure 1.
Financial development indicators/indices and economic growth

performance in Tanzania, especially in the last epoch as discussed in the introduction, but to what extent this growth can be ascribed to financial development is still debatable.

2.3 Financial development in Tanzania

In Figure 1 only seven series of interest [Figure 1(a)–(g)] are presented because of space limitation. The series covers from 1980 to 2017. The series indicates much of improvements happening after the year 2000. Tanzania started deliberations towards macroeconomic adjustment reforms in 1986, while the ultimate realisation of these reforms came later (Twinoburyo and Odhiambo, 2018).

The financial system in Tanzania by late 1980s was considered among the least developed in Africa. Monetary and capital markets did not exist. Financial instruments were mainly government securities to insurance companies, pension funds and postal savings bank. State banks dominated the financial system and interest rates and credit allocations were government controlled. The Bank of Tanzania (BOT) controlled monetary policies; it used to print money to finance deficits and maintain liquidity (Nord *et al.*, 2009; Balele *et al.*, 2018). In their survey of economies around the world, La Porta *et al.* (2002) found that around 1970 (when banks were nationalised in Tanzania), government ownership of banks was 100%, while around 1995 (during bank liberalisation in Tanzania), government ownership of banks was as high as 94.95%, indicating that even during liberalisation of state-owned banks, the ratio of government ownership of banks was very high and the private banks' share was very small (5.05%).

After a protracted period of extensive structural reforms and restructuring in the financial sector, eventually, the financial system moved to a market economy setting. There were two main types of financial sector reforms. Firstly, legal reforms started in 1991 and they aimed at creating a competitive environment, modernisation of the national payment systems, strengthening BOT regulatory and supervisory capacity and restructuring and privatisation of state banks and financial institutions. Secondly, financial reforms in 2003 aimed to empower the banking sector, develop financial markets, facilitation of long-term finance, creation of credit registry and advancing micro and rural finance (Balele *et al.*, 2018). Since 2000, the economy has attained one of the best performances in inflation within Sub-Saharan Africa, while expanding its financial intermediation capacity enormously. For instance, interest rates liberalisation had triggered domestic savings, and lending from commercial banks to the private sector increased (Nord *et al.*, 2009).

Following the Nyirabu Commission in 1991, comprehensive financial sector reforms ensued. They aimed at promoting efficient and effective savings mobilisation and allocation settings. They redirected the role of BOT in bank supervision and regulation compatible with market economy settings (Balele *et al.*, 2018). In 1991, the Banking and Financial Institutions (BFI) Act was enacted (Nord *et al.*, 2009). It legalised the private financial institutions and empowered BOT to license, regulate and supervise financial institutions. In 1995, another BOT Act was enacted among other banking laws which further consolidated the financial system in Tanzania (Balele *et al.*, 2018). Then the 2006 BOT Act and BFI Act enhanced BOT autonomy, accountability and strengthened the legal base for the financial sector. They enabled among other corrective actions, licensing and a shift towards risk-based supervision under the BOT (Balele *et al.*, 2018).

Considering all these financial reforms, by 1991, the banking sector was made up of six deposit-taking financial institutions. In 1992, private banks were allowed to operate, though operations started in 1994. In 1998, the financial sector expanded quickly into 24 commercial banks. Further expansion at the end of 2007 happened: ten non-bank financial institutions, many exchange bureaus, several pension funds, numerous insurance companies, single

stock exchange and several hundreds of savings and credit cooperatives were formed. By 2009, banks dominated 80% of the financial system assets (Nord *et al.*, 2009).

Further, Balele *et al.* (2018) document several achievements as follows: increase in banks and financial institutions (for instance 29 banks in 2000 to 59 banks in 2016); financial system modernisation resulted in a reduction in risk, operational costs, increased efficiency in fund transfer and cheque clearing. Increase in access and availability of long-term finances. Introduction of innovative delivery modes through digital finance and agent banking increased financial access. Opening of credit reference system led to low credit risk and low cost of borrowing. Importantly, they further evidence improvement overtime in financial depth and efficiency of the banking sector, for instance, efficiency increased from below 5% in 2000 to about 15% in 2016.

Despite all these empirical evidence, financial sector reforms and economic liberalisation done in Tanzania, does one need to be reminded by Naik and Padhi (2015) that there is little consensus on how financial development relates to economic growth. To the best of this review and according to the financial liberalisation and reforms in Tanzania, little is known in Tanzania about the effect of financial development on economic growth at the moment. This study contributes to empirical evidence on this nexus by testing the following hypotheses:

H1. Financial system depth, liquidity and efficiency are related to economic growth in Tanzania.

H2. Financial development is cointegrated to economic growth in Tanzania.

3. Methodology and modelling

3.1 Data and variables

Data for this study came from the World Bank Indicators databank and indexes of economic freedom from the Heritage Foundation's yearly publications. The analysis covers 38 years (1980–2017). Economic growth (GROWTH) is the dependent variable which is measured as real GDP growth percentage. Because of limitations of data, only four financial development indicators are used as follows: domestic credit to private sector as percentage of GDP (DCP); deposit money bank assets as percentage of GDP (DMB); deposit money bank to deposit money bank assets and central bank assets percentage (DMA); and liquid liabilities as percentage of GDP (LLG) or money three (M3). PC1 and PC2 are sub-indices developed from principal component analysis (PCA) to aggregate financial development measures into fewer indicators as much as possible. DMA and LLG were aggregated into PC1 measuring financial liquidity and efficiency; the higher the values, the higher the liquidity and efficiency. DCP and DMB were aggregated into PC2 measuring financial depth; the higher the values, the higher the depth.

Other variables thought to affect economic growth which are often included as control variables are economic freedom index (EFI), which captures financial as well as business freedom in the economy, it indicates confidence in the financial system and it is expected to affect economic growth positively. Education (measured by primary school enrolment gross percentage [ENP]) controls for human capital and is expected to affect growth positively. Degree of economic openness (measured by total trade, that is import plus export as a percentage of GDP [EOG]) – it is expected that openness should foster economic growth. Inflation rate (INF) – higher INF cause adverse effects on economic growth. Investment ratio (measured as a total investment as a percentage of GDP [IRG]) captures the rate at which the economic agencies are investing for growth and it is expected to affect economic growth

positively; population growth rate (POP) is expected to influence economic growth positively.

3.2 Model specification

For modelling and estimation purposes, the following equation is specified:

$$GROWTH_t = a_{i-j} + b_{i-j}.FINANCE_{j-t} + c_{i-j}.CONTROLS_{j-t} + \mu_{j-t} \quad (1)$$

Where a_{i-j} is a set of possible drifts (i) for each equation (j); b_{i-j} and c_{i-j} are respective sets of beta coefficients (i) for each equation (j), for both finance and control indicators; $FINANCE_{j-t}$ and $CONTROLS_{j-t}$ are each finance and controls variables for each equation (j) at a time (t); and μ_{j-t} is a set of white noise error terms for each equation (j) at a time (t).

The study applies the autoregressive distributed lag model (ARDL) proposed by Pesaran *et al.* (2001). The ARDL model bases on an ordinary least squares (OLS) modelling. It is appropriate to mixed order of integration [i.e. I (0) and/or I (1)] (Shrestha and Bhatta, 2018). Some advantages accrue to this method: it does not impose restrictive assumptions or same order of integration and it is suited to small samples and produces unbiased estimates of the long-run model and valid t-statistics irrespective of endogeneity in the series (Appiah, 2018). The study uses bounds testing procedures for cointegration within the ARDL framework. ARDL model in equation (2) is specified. However, the analysis conceptualises seven equations with GROWTH as the dependent variable. For parsimony's sake, a single ARDL equation is presented. The first part with λ_1, λ_2 and λ_3 coefficients represents the long-run relationships and the second part with γ_i and ψ_i coefficients represents the short-run dynamics of the models. Everywhere α_0 is a possible drift component and ε_i is a white noise process:

$$\Delta GROWTH_t = \alpha_0 + \lambda_1 GROWTH_{t-1} + \lambda_2 FINANCE_{t-1} + \lambda_3 CONTROLS_t + \sum_{i=1}^{p} \gamma_i \Delta GROWTH_{t-i} + \sum_{i=0}^{p} \psi_i \Delta FINANCE_{t-i} + \varepsilon_t \quad (2)$$

ARDL estimates $(p+1)^k$ number of regressions to attain optimal lag length for each series. In this case, "p" is the maximum possible number of lags that can be used and "k" is the estimable number of equations in the model (2). The optimal lag structure of first difference regression is selected using Akaike information criterion. The Pesaran *et al.*'s (2001) bound testing method is followed for long-run relationship tests and significance of coefficients is tested using t-tests. The null hypothesis of no cointegration H_0: $\lambda_1 = \lambda_2 = 0$ if rejected, and the alternative hypothesis of existences of cointegration is accepted, H_0: $\lambda_1 \neq \lambda_2 \neq 0$.

The steps used were first estimating the above ARDL model. The second step was to implement the ARDL bound test procedures to test for a long-run relationship using F-statistics (Shahbaz *et al.*, 2018). The null hypothesis that all intercepts are not equal to zero is tested. The resulting F-statistics are compared against critical values at 1, 5 and 10% for F-bounds tests. The pre-determined values by Pesaran *et al.* (2001) are in a pair of lower critical values bounds [I (0)] and upper critical values bounds [I (1)]. If the calculated F-values are below the lower bounds, the null hypothesis of no cointegration is maintained but if these calculated values are above the upper critical values, the null hypothesis of no cointegration is denied and the alternative hypothesis of the existence of cointegration is approved. But if the calculated value is between the critical values, then the result is considered indecisive.

The third step includes the formulation and estimation of an only short-run model if a long-run relationship based on the bound testing procedures does not exist.

$$\Delta GROWTH_t = \alpha_0 + \sum_{i=1}^{p} \gamma_i \Delta GROWTH_{t-i} + \sum_{i=0}^{p} \psi_i \Delta FINANCE_{t-i} + \lambda_3 CONTROLS_{t-i} + \varepsilon_i \quad (3)$$

In the third step, however, if there is evidence for a long-run relationship, additionally formulation and estimation of the long-run model are done. The long-run coefficients are estimated using OLS procedures in equation (4).

$$\Delta GROWTH_t = \alpha_0 + \lambda_1 GROWTH_{t-1} + \lambda_2 FINANCE_{t-1} + \lambda_3 CONTROLS_{t-i} + \varepsilon_i \quad (4)$$

Finally, if the long-run relationship is found, an ARDL error correction model to assess the error correction term (ECT) is estimated using the reduce form in equation (5).

$$\Delta GROWTH_t = \sum_{i=1}^{p} \gamma_i \Delta GROWTH_{t-i} + \sum_{i=0}^{p} \psi_i \Delta FINANCE_{t-i} + \lambda_3 CONTROLS_{i-i} + \eta ECT_{t-1} + \varepsilon_i \quad (5)$$

The analysis applied post-estimation tests as follows: cumulative sum (CUSUM) test and cumulative sum squared (CUSUMSQ) test for model stability; X_{COR} for Breusch–Godfrey serial correlation LM test (F-test); X_{HET} for heteroskedasticity test, Breusch–Pagan–Godfrey (F-test); X_{FUN} for functional form (Ramsey regression equation specification error test [RESET]) (F-test); and X_{NOR} is Jarque–Bera test for normality (chi-square test).

4. Analysis, findings and discussion

4.1 Principal component, descriptive and correlation analysis

To establish the robustness of the estimates, from the four alternative proxies of financial development, two main sub-indexes are developed using PCA. The results from the PCA are presented in Table 1. The first two principal components (PC1 and PC2), with values above one, are picked to represent the sub-indexes. These explain about 86% of the total variance in the original four variables data. This process has reduced the financial development indicators by half and yet retained about 86% of the information in data. PC1 and PC2 explain about 48.4 and 38% of the total variance in the data, respectively.

PC1 and PC2 could be thought of as representing DMA-LLG variables and DCP-DMB variables, respectively, based on eigenvectors loadings presented in Table 1. Similar references can be made based on correlation analysis in Table 2, where PC1 is highly correlated with DMA (0.88) and LLG (0.96) while PC2 is highly correlated with DCP (0.88) and DMB (0.75).

The correlation values for DCP, DMB and PC2 are positive and they indicate a very strong association with GROWTH. They imply a very strong positive association between financial depth and economic growth. While, correlations for DMA, LLG and PC1 indicate a very strong negative correlation with GROWTH; implying a very strong negative association between financial system liquidity and efficiency on one hand and economic

PCA
Eigenvalues: (sum = 4, average = 1)

PCs	Value	Difference	Proportion	Cumulative value	Cumulative proportion
1	1.936712	0.413768	0.4842	1.936712	0.4842
2	1.522944	1.099379	0.3807	3.459656	0.8649
3	0.423565	0.306787	0.1059	3.883222	0.9708
4	0.116778		0.0292	4.000000	1.0000

Eigenvectors (loadings)

Variable	PC 1	PC 2	PC 3	PC 4
DCP	−0.097082	0.716899	−0.683632	0.096320
DMA	0.628949	0.332196	0.162699	−0.683811
DMB	−0.345764	0.604553	0.703220	0.142986
LLG	0.689525	0.101079	0.107973	0.708999

Table 1.
Principal component analysis

growth on the other. Based on correlation and PCA analysis, it has been possible to both separate and aggregate financial development indicators based on the type of financial development characteristics. Thus, at this stage, it is possible to argue that financial development is not unidirectional, but instead exhibits different properties which may affect economic growth differently.

Table 3 presents the results of unit roots tests. The outcomes indicate that all variables are a mixture of stationary at first difference I (1) and stationary at level I (0) series using DF-GLS test statistics, while using Phillip–Perron test statistics, all the series are stationary at first difference. The mixture of stationarities in the tests gave early signs for a choice of the ARDL estimator which allows for the inclusion of both I (1) and I (0) series in the same equation. These findings have both economic and statistical significance. The economic implication of the non-stationary series is that shocks on the series will have permanent effects. This implies the absence of mean reversion. The statistical implication is that the non-stationary series may result in spurious regression estimations, except in instances where the series are cointegrated and regressors are strictly exogenous (Adu *et al.*, 2013). However, in most settings, it is difficult to meet strict exogeneity conditions. Given this setting, an estimator that accommodates both endogeneity and exogeneity conditions was sought, further confirming the choice of the ARDL modelling approach. This approach does not impose strict assumptions on exogeneity.

4.2 Short-run relationships and cointegration results

In this sub-section, the ARDL short-run and ECT for cointegration results are presented. There are seven regression equations analysed and presented in Table 4. Each financial development indicator is included alone in addition to other control regressors except for the last regression to avoid multicollinearity and spurious regression condition. The last regression included both PC1 and PC2 as these indices based on PCA are independent and therefore can be combined in the estimation. The results support the presence of co-integration evidenced by the ECTs. The ECTs indicate that financial development indicators and economic growth restore back to equilibrium as indicated by the negative and statistically significant sign. In the regressions, the ECT is between −0.56 and −0.85. Economically, that implies the speed of convergence is moderate to fast correcting towards

Table 2.
Descriptive and correlation analysis

Descriptives	DCP	DMA	DMB	ENP	EFI	EOG	GROWTH	INF	IRG	LLG	PC1	PC2	POP
Mean	7.25	16.00	72.11	82.66	34.97	31.85	4.84	17.44	25.52	21.63	0.00	0.00	2.93
Median	7.47	16.61	69.78	82.07	56.65	36.19	5.00	14.40	26.36	21.95	−0.13	−0.02	2.99
Maximum	14.61	24.02	87.91	107.05	60.10	65.69	8.50	37.90	35.52	28.64	2.23	1.96	3.41
Minimum	0.00	7.00	49.45	65.40	0.00	0.00	0.50	4.10	13.19	13.41	−2.32	−2.26	2.32
Std dev.	5.32	4.97	12.23	13.56	28.64	21.92	2.17	11.48	6.54	4.32	1.41	1.25	0.26
Skewness	−0.13	−0.36	−0.08	0.29	−0.43	−0.36	−0.50	0.30	−0.37	−0.30	−0.13	−0.01	−0.60
Kurtosis	1.46	2.07	1.56	1.69	1.19	1.86	2.32	1.55	2.09	2.29	2.00	1.75	3.32
Jarque–Bera	3.85	2.20	3.34	3.28	6.36	2.89	2.33	3.90	2.16	1.38	1.70	2.49	2.47
Probability	0.15	0.33	0.19	0.19	0.04	0.24	0.31	0.14	0.34	0.50	0.43	0.29	0.29
Observations	38	38	38	38	38	38	38	38	38	38	38	38	38
Correlations													
DCP	1	0.19	0.52***	0.15	0.36**	0.70***	0.36**	−0.40**	0.33**	−0.04	−0.14	0.88***	0.26
DMA		1	−0.08	0.13	−0.58***	0.01	−0.43**	0.55***	0.87***	0.84***	0.88***	0.41**	0.84***
DMB			1	0.73***	0.67***	0.25	0.58***	−0.76***	0.08	−0.32**	−0.48***	0.75***	−0.18
ENP				1	0.28*	0	0.29*	−0.38**	0.30*	−0.04	−0.15	0.48***	0.05
EFI					1	0.50***	0.61***	−0.88***	−0.40**	−0.50***	−0.70***	0.34**	−0.69***
EOG						1	0.18	−0.35**	0.19	0.08	−0.07	0.54***	0.01
GROWTH							1	−0.58***	−0.26	−0.53***	−0.63***	0.33**	−0.34**
INF								1	0.36**	0.64***	0.78***	−0.40**	0.54***
IRG									1	0.69***	0.69***	0.52***	0.72***
LLG										1	0.96***	0.12	0.64***
PC1											1	0	0.72***
PC2												1	0.34**
POP													1

Note: ***, ** and * are statistically significant at 1, 5 and 10%, respectively

Table 3. Unit root tests for stationarity

	DF-GLS test statistics					Phillips–Perron test statistic			
Series	Constant (C)	Level	First difference	Decision	Series	Constant (C)	Level	First difference	Decision
DCP	C	−0.960324	−2.793379***	I (1)	DCP	C	−1.625986	−5.062996 ***	I (1)
DMA	C	−1.453263	−3.04492***	I (1)	DMA	C	−1.90231	−3.406535**	I (1)
DMB	C	−0.558854	−4.061262***	I (1)	DMB	C	−0.666033	−3.694704***	I (1)
EFI	C	−0.77342	−6.098865***	I (1)	EFI	C	−1.208739	−6.045186***	I (1)
ENP	C	−2.19381**	−2.441787**	I (0)	ENP	None	−0.507555	−2.630561**	I (1)
EOG	C	−1.331095	−5.667156***	I (1)	EOG	C	−1.94321	−5.662796***	I (1)
GROWTH	C	−2.508942**	−5.324972***	I (0)	GROWTH	C	−2.451275	−8.400565***	I (1)
INF	C	−1.078698	−6.677957***	I (1)	INF	C	−1.215089	−7.388808***	I (1)
IRG	C	−1.729949*	−5.633769***	I (0)	IRG	C	−2.373382	−5.561587***	I (1)
LLG	C	−2.349705**	−3.308902***	I (0)	LLG	C	−2.10063	−3.271417**	I (1)
PC1	C	−1.984096**	−3.10471***	I (0)	PC1	C	−1.86037	−3.129243**	I (1)
PC2	C	−1.355155	−3.419795***	I (1)	PC2	C	−1.142057	−3.958815***	I (1)
POP	C	−1.549681	−1.903512*	I (1)	POP	None	−0.253217	−2.443787**	I (1)

Note: ***, ** and * are statistically significant at 1, 5 and 10%, respectively

Table 4.
Short-run and ECM analysis

Model	Growth_DCP		Growth_DMA		Growth_DMB		Growth_LLG		Growth_PC1		Growth_PC2		Growth_PC1 and PC2	
Model selection	ARDL (1, 2)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 2)		ARDL (1, 1, 0)	
Dependent	Growth		Growth		Growth		Growth		Growth		Growth		Growth	
Variable name	Coefficient		Coefficient		Coefficient		Coefficient		Coefficient		Coefficient		Coefficient	
Short run + ECT	Std error		Std error		Std error		Std error		Std error		Std error		Std error	
GROWTH (−1)	−0.57	0.15***	−0.85	0.18***	−0.56	0.16***	−0.78	0.18***	−0.85	0.17***	−0.60	0.16***	−0.85	0.18***
ECT	−0.57	0.11***	−0.85	0.17***	−0.56	0.15***	−0.78	0.17***	−0.85	0.17***	−0.60	0.15***	−0.85	0.17***
DCP (−1)	−0.36	0.19*												
D (DCP)	−0.03	0.10												
D [DCP (−1)]	0.46	0.12***												
DMA (−1)			−0.41	0.17**										
D (DMA)			−0.04	0.21										
DMB (−1)							0.08	0.07						
D (DMB)							−0.03	0.09						
LLG(−1)										−0.36	0.13**			
D (LLG)										−0.06	0.26			
PC1 (−1)								−1.36	0.49***				−1.43	0.51***
D (PC1)						0.15	0.97					0.21	0.48	
PC2												−0.30	0.98	
PC2 (−1)									−0.80	0.73				
D (PC2)									−0.42	0.64				
D [PC2 (−1)]										1.34	0.62**			
CONTROLS														
EFI	0.10	0.03***	0.15	0.04***	0.03	0.04	0.15	0.04***	0.14	0.04***	0.10	0.05*	0.16	0.05***
ENP	−0.04	0.03	−0.03	0.03	−0.02	0.03	−0.02	0.03	−0.04	0.03	−0.01	0.03	−0.04	0.03
EOG	0.01	0.03	−0.07	0.03**	0.01	0.03	−0.05	0.03*	−0.06	0.02**	−0.04	0.02*	−0.06	0.02*
INF	−0.01	0.05	0.16	0.06**	0.06	0.06	0.21	0.08**	0.21	0.07***	0.03	0.06	0.22	0.07***
IRG	0.08	0.08	0.14	0.10	−0.08	0.08	0.10	0.09	0.11	0.08	0.09	0.10	0.14	0.10
POP	6.13	2.81*	8.97	3.24**	−0.02	2.83	4.71	2.77*	5.10	2.59*	4.50	3.52	6.22	3.17*
R-squared	0.73		0.69		0.61		0.67		0.71		0.64		0.71	
Adjusted *R*-squared	0.62		0.59		0.48		0.56		0.61		0.50		0.60	
S.E. of regression	1.28		1.40		1.58		1.45		1.36		1.48		1.38	
F-statistic	6.82***		6.71***		4.70***		6.10***		7.29***		4.47***		6.45***	
Durbin–Watson stat	2.27		2.23		2.26		2.26		2.24		2.20		2.25	

Note: ***, ** and * are statistically significant at 1, 5 and 10%, respectively

the equilibrium relationship between the financial development levels and economic growth levels at rates between 56 and 85% each year from a previous year to reach steady states.

Further, pieces of evidence indicate that at first lags, DMA, LLG and PC1 have negative causality with GROWTH statistically significant at 5 and 1%. These results support a negative causality from financial liquidity and efficiency to economic growth in the short run. The magnitude of coefficients is small, implying inelastic changes of these variables to growth. Then, DCP, at first lag, indicates a positive causality to economic growth in the short run, statistically significant at 1%. The magnitude is small, supporting an inelastic effect on GROWTH. Thus, financial development depth as indicated by DCP positively causes economic growth in the short run. However, there is no statistical evidence of causality for DMB. These results are also robust and supported when PC1 and PC2 are used in their respective proceeding regressions.

EFI is positively correlated to growth and is consistently positively affecting growth as expected. That means the level of both financial and business freedom positively contributes to growth. ENP is negative and not statistically significant. Its correlation with growth is positive and statistically significant as expected. Thus, it is related to growth, but it does not cause growth. EOG is not correlated with growth. But it causes negative effects on growth when measures of liquidity and efficiency (DMA, LLG and PC1) are included in regressions. Thus, a lack of openness in the economy may facilitate low levels of liquidity and inefficiency in the financial system and economy at large. INF is strongly and negatively correlated with growth as expected. But it is positively affecting growth. This supports the idea that Tanzania was finally able to manage its inflation during the economic reforms periods. IRG is negatively correlated with growth but not statistically significant and does not affect growth. The correlation between POP and growth is strongly negative, but the effects of POP on growth are positive and statistically significant as expected. All the control variables, except POP, indicate very small magnitudes of effects on GROWTH, and the inelastic condition of these variables on GROWTH sheds light on the need to improve them through policies calibrations.

4.3 Long-run relationships and bound tests results

In this sub-section, the ARDL long-run and bound testing for cointegration results is presented. The ARDL case 3 model is unrestricted constant and no trend was selected for each analysis as shown in Table 5. Each financial development indicator or index was analysed alongside control regressors (not included in Table 5). Based on bound testing results, all the equations presented indicated the presence of cointegration as the F-statistics were all above the critical values (not shown here), some at 5% and others at 1%. Thus, all null hypotheses of no cointegration were rejected. Further, DMA, LLG and PC1 show robust and very strong negative long-run relationships with GROWTH, which are statistically significant at 1%. Thus, support for negative long-run causality from financial liquidity and efficiency to economic growth was confirmed. However, the size of effects was small, implying a minimal impact on GROWTH. While DCP, DMB and PC2 are not statistically significantly related to GROWTH, these measures indicate lack of long-run causality from financial depth to economic growth in the long run.

4.4 Discussion of findings

Both in the short and the long run, there is evidence for a negative causality from financial liquidity and efficiency to economic growth and the magnitudes of effects are small and inelastic. One main reason that accounts for this seemingly unusual effect is the setting of the financial system in Tanzania during this period under study. State-owned and state-run

Table 5.
Long-run and bound tests analysis

Model	Growth_DCP		Growth_DMA		Growth_DMB		Growth_LLG		Growth_PC1		Growth_PC2		Growth_PC1 and PC2	
Model selection	ARDL (1, 2)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 1)		ARDL (1, 2)		ARDL (1, 1, 0)	
Dependent	GROWTH		GROWTH		GROWTH		GROWTH		GROWTH		GROWTH		GROWTH	
Variable nme	Coefficient		Coefficient		Coefficient		Coefficient		Coefficient		Coefficient		Coefficient	
Long run	Sth error		Sth error		Sth error		Sth error		Sth error		Sth error		Sth error	
DCP	−0.62	0.28												
DMA			−0.49	0.13***										
DMB							0.15	0.16						
LLG									−0.46	0.11***				
PC1									−1.61	0.31***			−1.70	0.38***
PC2											−1.32	0.89	−0.35	0.70
F (/t) bound tests														
F-statistic	14.23***		11.60***		6.22**		9.70***		11.87***		8.28***		7.87***	
Diagnostics														
X_{COR}	1.69	(0.207)	2.64	(0.091)	7.23	(0.003)	4.60	(0.02)	2.91	(0.073)	3.71	(0.040)	3.73	(0.039)
X_{HET}	0.99	(0.475)	1.37	(0.248)	1.71	(0.134)	2.03	(0.075)	1.01	(0.453)	1.70	(0.137)	1.15	(0.364)
X_{FUN}	0.08	(0.778)	1.30	(0.264)	8.66	(0.006)	1.25	(0.274)	1.28	(0.212)	0.11	(0.744)	0.74	(0.397)
X_{NOR}	0.41	(0.815)	0.36	(0.833)	4.74	(0.093)	0.76	(0.683)	0.35	(0.841)	0.28	(0.870)	0.49	(0.782)

Notes: X_{COR} is Breusch–Godfrey Serial Correlation LM test: (F-test); X_{HET} is heteroskedasticity test: Breusch–Pagan–Godfrey (F-test); X_{FUN} is functional form (Ramsey RESET) (F-test); and X_{NOR} is normality test (chi-square test) Jarque–Bera test. CUSUM and CUSUMSQ tests graphs for model stability are not reported because of space limitation. ***, ** and * are statistically significant at 1, 5 and 10%, respectively

banks mostly dominated it. La Porta *et al.* (2002) for instance, showed that around 1995, the banking sector was 94.95% dominated by state-owned and controlled banks. The sector mainly served as a means of channelling resources into treasury and government rent re-distribution purposes with little private banks role and function to other economic agents. This result is similar to Al-Malkawi *et al.*'s (2012) findings, which supported negative relationships between financial development indicators for depth or size and financial intermediation ratio or efficiency through credit ratio and economic growth in United Arab Emirates. Their results suggest a bi-directional causality between the variables.

Secondly, during the protracted period (1986–2017), the economy worked financial reforms and liberalisation policies slowly from a socialistic economy setting to a market-based economy (Robinson *et al.*, 2011). Though the last epoch (1995–2017) saw the implementation of financial reforms, the effects could not be felt immediately, as even until the 2000s, the financial system was still underdeveloped compared to even other comparable countries in Africa. It is therefore plausible to argue that financial liquidity and efficiency did not service the intermediation function to the extent of affecting the economic growth positively. But instead, it merely serviced liquidity and efficiency roles towards the government rent re-distribution role. This finding is comparable to Mohamed's (2008) findings, who found a weak negative effect of financial development on economic growth in Sudan; he ascribes this effect to inefficient allocation of credits by banks.

The positive causality from financial depth to economic growth is found to be positive in the short run only, and its effects mainly coming from domestic credit to private sector. This reflects the views advanced previously by Marobhe (2019) and Twinoburyo and Odhiambo (2018) that the effect can be ascribed to financial sector reforms particularly in the1990s, where reform policies on many areas of financial system were implemented. For instance, the banking sector liberalisation scheme in 1991, facilitation of long-term finance, creation of credit registry and advancing micro and rural finance (Balele *et al.*, 2018), which attracted deposits and lending at the same time. Comparatively, Owusu and Odhiambo (2014) found that financial development through financial liberalisation policies had positive effects on economic growth in Nigeria both in the short and long run. They note the significance of financial liberalisation policies in fostering economic growth.

In the same vein, Nawaz *et al.* (2019) found evidence for a bi-directional and causal relationship between financial development and economic growth in Pakistan, and also Shahbaz and Rahman (2010) highlight evidence for the contribution of financial sector's development on economic growth in Pakistan. They suggest the need for governments to undertake financial reforms to improve efficiency of the financial sector which will in turn promote the rate of economic growth. Similarly, Lawal *et al.* (2016) present evidence for a two bi-directional cointegration for financial development and economic growth in Nigeria. They underscore the importance of strengthening policies that pursue strong financial development agenda for economic growth. Other comparable findings are, for instance, by Tinoco-Zermeno *et al.* (2014), who found that private sector bank credits have positive effects on real GDP, and they attributed this effect to financial liberalisation in Mexico. Seetanah (2008) documents evidence for the contribution of financial development to economic development in Mauritius. And, Ghildiyal *et al.* (2015) found evidence for effect of financial development on economic growth in India. They recommend that to facilitate economic growth, the regulators need to provide easy credits and facilitate financial deepening.

These particular present findings rhyme with the argument advanced by Fukuda and Dahalan (2012) who studied economies of India, Indonesia, Korea, Malaysia and Thailand, and found that the direction of finance-growth nexus is specific to an economy and is

bi-directional in nature. There are variations across counties even though the same ARDL approach for each country was used. Similarly, Majid (2007) studied the ASEAN-4 countries (namely, Indonesia, Malaysia, Thailand and the Philippines) and found country specific effects of financial development on economic growth. For instance, a unidirectional causality running from finance to growth was found in Malaysia, a bi-directional effect was found in Thailand, a unidirectional effect from growth to finance was found in the Philippines and he found no causality at all in Indonesia. He attributed these variations in effects on economic growth being affected by financial development as relying on each country's financial innovations. For instance, Iheanacho (2016) found that the effects of financial intermediary development on economic growth in Nigeria to be statistically insignificant, both in the short and the long run. He attributes this effect to the dominance of the oil sector in the economy as it is the case in oil-led economies in the world. Similarly, Odhiambo (2010) documents lack of evidence for a finance-led effect on economic growth, he rather found that economic growth caused financial development in South Africa.

Thus, the apparent differences in the directions of causality may be accounted for by the fact that liberalisation of the banking sector and reforms did not immediately attract the private banks into the sector. The previous big national banks ownership was mainly split into more banks and was diversified. That means international banks could partly acquire stakes in these banks but the control remained with the government. That may have increased financial depth, as reflected in more credits and deposits but did not improve financial liquidity and efficiency as control was still in the hands of the government.

Demetriades and Rousseau (2016) suggest weakness in banking supervision and weak regulations may be a contributing factor to the negative effects of liquidity and efficiency on economic growth. While at the same time, the growth of credit and ease of credit controls may have played positively in causing a positive financial depth effect on economic growth. Lack of evidence in the long-run for financial depth may also point to inefficient credit policies despite liberalisation and help to indicate periods of both poor (pre-) and good (post-) performance (liberalisation) in financial intermediation as noted by Apanisile and Osinubi (2019) in Nigeria and Adu *et al.* (2013) in Ghana.

5. Conclusions

The focus of this paper was to assess both short- and long-run effects and cointegration of financial development indicators on economic growth in Tanzania. The analysis was based on four measures of financial development, which was aggregated into two proxies. The evidence indicated that the type of indicator mattered in both aggregating indicators and in affecting economic growth. The aggregated indicators showed opposite directions among themselves and in affecting growth. This evidence partly explains as to why there are conflicting results from the existing literature.

The evidence confirms a negative relationship between financial liquidity and efficiency and economic growth. These results are not surprising to an economy that formerly was state-dominated and centralised to serve interests of the state exclusively and very later was liberalised. Lack of empirical evidence in the long run for financial depth effects on growth may account for low mobilisation and allocation of resources to investments. Thus, particular emphasis needs to be placed not only on quantity but also on qualities of banks supervision and regulation, financial liberalisation, financial sector reforms, level of interests and policies on management of deposit mobilisation and credit allocation mechanisms to be able to realise the mobilisation capacity and resources-channelling efficiency of the financial system to productive investments and industries.

Lastly, cointegration tests results are more of statistical properties of the series, given the negative sign and magnitude of the coefficients. However, they capture the speed of correction or contraction between financial development and economic growth. They show a high rate or magnitude of correction. That means adjusting the financial system to benefit economic growth if effectively done may be realised faster in Tanzania.

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