UNISA ECONOMIC RESEARCH WORKING PAPER SERIES

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN UGANDA: A MULTIVARIATE CAUSAL LINKAGE

Nicholas M. Odhiambo
Sheilla Nyasha

Working Paper 26/2019
August 2019

Nicholas M. Odhiambo
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Email: odhianm@unisa.ac.za / nmbaya99@yahoo.com

Sheilla Nyasha
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Email: sheillanyasha@gmail.com

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN UGANDA: A MULTIVARIATE CAUSAL LINKAGE

Nicholas M. Odhiambo and Sheilla Nyasha[1]

Abstract

In this study, we have explored the dynamic causal relationship between financial development and economic growth in Uganda during the period from 1980 to 2015. Although the finance-growth nexus debate had been raging for decades, Uganda, just as many other low-income sub-Saharan African countries, has not yet received adequate coverage on the subject. To eliminate the variable-omission-bias associated with some previous studies, two intermittent variables namely, savings and inflation, have been included alongside financial development and economic growth in a multivariate Granger-causality setting. In addition, five proxies of financial sector development have been used in the current study, namely money supply, deposit money bank assets as a percentage of bank assets, liquid liabilities to GDP, private credit by deposit money banks to GD, and bank deposits to GDP. Using the ARDL approach, the findings of the study reveal that the direction of causality between financial development and economic growth in Uganda is not clear-cut. It varies from one model to the other, depending on the proxy used for financial development. When financial development is proxied by liquid liabilities to GDP and bank deposits to GDP, a unidirectional causality from financial development to economic growth is found to prevail. When deposit money bank assets to bank assets ratio is considered a proxy of financial development, a bi-directional causality between financial development and economic growth is found to predominate. Finally, when money supply and private credit by deposit money banks to GDP proxies are used, no causality is found to exist between financial development and economic growth in either direction. Based on these results, it is recommended that when drafting policies aimed at boosting economic growth, policymakers should target growth-led financial development proxies as policy implementation outcome may vary depending on the targeted financial development proxy.

Keywords: Financial Development; Economic Growth; Uganda; Granger-Causality

[1] Corresponding author: Sheilla Nyasha, Department of Economics, University of South Africa (UNISA). Email address: sheillanyasha@gmail.com .

1. Introduction

The relationship between financial development and economic growth has attracted numerous studies in recent decades. Four different views exist on the empirical front regarding the causal relationship between financial development and economic growth. The first view argues that financial development is important and that it leads to economic growth (i.e. the supply-leading response). This view has been widely supported by McKinnon (1973) and Shaw (1973), among others. The second view conversely argues that it is economic growth that drives the development of the financial sector – the demand-following response.

Unlike the first view and the second view, the third view maintains that both financial development and economic growth Granger-cause each other – bidirectional causality between financial development and economic growth. Contrary to these three views, there is a fourth view, which argues that financial development and economic growth are not causally related at all. In other words, these studies assert that financial development and economic growth are neutral with respect to each other; and hence, they have no significant effect on the other (see also Lucas, 1988; Graff, 1999).

Although a number of studies have been conducted on the causal relationship between financial development and economic growth in a number of developing countries, the majority of these studies have concentrated mainly on the Asian and Latin American countries. Even though some studies have recently been conducted on African countries, the majority of these studies have focused mainly on middle-income countries; and as a result, a large number of low-income countries do not currently have any reliable scientific empirical research regarding the relationship between financial development and economic growth, which could inform their macroeconomic policies. Such countries have had to rely on studies done in other countries, which might not be able to satisfactorily address their country-specific socio-economic dynamics.

In addition, some of the previous studies have over-relied on the cross-sectional data, which may not satisfactorily address the country-specific issues. As has been highlighted in the previous studies, the traditional cross-sectional method, which merely groups together countries that are at different stages of financial development, cannot satisfactorily address the inherent country-specific effects that underlie the relationship between financial development and economic growth (see also Odhiambo, 2009c; Ghirmay, 2004). Other studies have also relied on a bivariate causality model, which has been found to suffer from the omission-of-variable bias – because the introduction of additional variables – affecting both financial development and economic growth in the bivariate-causality setting does not only alter the direction of causality between the two variables; but may also change the magnitude of the results.

To fill this lacuna, the current study aims to examine the causal relationship between financial development and economic growth in Uganda, using the autoregressive distributed lag (ARDL) bounds-testing approach to cointegration and the error-correction mechanism (ECM). In order to ascertain the robustness of the empirical results, the study uses five proxies of financial development. To address the omission-of-variable bias, which is associated with some of the previous studies, the study has used two macro-economic variables as intermittent variables between the various proxies of financial development and economic growth – thereby creating a system of multivariate equations.

Using the 1980-2015 dataset, the empirical results of this study show that the causal relationship between financial development and economic growth in Uganda varies widely, depending on the variable used as a proxy for financial development.

Uganda makes a compelling case study because currently it does not have a rich empirical coverage on finance-growth nexus, yet it is one of the countries that are striving to improve economic growth and development.

At the apex of the financial sector in Uganda is the Bank of Uganda (BoU), which is the Central Bank of the Republic of Uganda whose primary purpose is to foster price stability and a sound financial system (BOU, 2018). According to the International Monetary Fund "IMF" (2003), Uganda's financial system is still underdeveloped, and it consists of a) formal institutions; b) semiformal financial institutions; and c) informal financial institutions. The formal institutions include; i) banks, ii) Microfinance Deposit-taking institutions, iii) Credit Institutions, iv) Insurance companies, v) Development Banks, vi) Pension Funds and vii) Capital Markets. Semiformal institutions include i) Savings and Credit Cooperative Associations (SACCO), and ii) other Microfinance institutions. Finally, informal institutions are mostly village savings and loans associations (BOU, 2018; IMF, 2003).

In the early 1990s, there were six banks in Uganda (BOU, 2018). Of these six, four were foreign banks in Uganda, i.e. Standard Chartered, Standard Bank, Barclays and Baroda; and two large indigenous banks (Uganda Commercial Bank "UCB" and the Co-operative Bank "Co-op"). By 1996, the number of commercial banks had increased to 20 while by the end of 2005, the banking system had grown substantially. According to the BOU (2018), currently, Uganda has 24 banks, four (4) credit institutions, five (5) microfinance depository institutions, 1,900 Saccos, Public Pension Fund, Social Security Fund, 60 private retirement benefits schemes and seven (7) mobile money providers.

The rest of the study is organised as follows: Section 2 reviews the literature on the causal relationship between financial development and economic growth, while section 3 discusses the estimation techniques used to examine the finance-growth causality in the study country as well as the analysis of results. Section 4 concludes the study.

2. Literature Review

From the empirical front, four views exist on the causality between financial development and economic growth. The first view is the supply-leading response, where financial development Granger-causes economic growth. Studies consistent with this view include: Jung (1986); King and Levine (1993); Odedokun (1996a); Odedokun (1996b); Ahmed and Ansari (1998); Rousseau and Wachtel (1998); Ghali (1999); Beck *et al*. (2000); Graff (2002); Shan and Morris (2002); Jalilian and Kirkpatrick (2002); Christopoulos and Tsionas (2004); Majid (2008); Odhiambo (2009a); Akinlo and Egbetunde (2010); Osuala *et al*. (2013) and Omri *et al*. (2015). These studies are summaries in Table 1.

TABLE 1: Studies in Favour of Unidirectional Causality from Financial Development to Economic Growth

Author(s)	**Region/Country**	**Methodology**	**Direction of Causality**
Jung, 1986	56 Countries (19 of which are industrial)	Cross-section	Finance → Growth (supply-leading pattern occurs more often than demand-following pattern in LDCs)
King and Levine, 1993	80 countries	Cross-section	Finance → Growth
Odedokun, 1996a	LDCs: 71 countries	Time-series	Finance → Growth (evidence of supply-leading response is found in 85% of the sample countries; the impact of financial development is found to be higher on low income LDCs than in high income LDCs)
Odedokun, 1996b	81 countries	Cross-section	Finance → Growth
Ahmed and Ansari, 1998	South-Asia: India, Pakistan, and Sri Lanka	Cross-section	Financial → Growth
Rousseau and Wachtel, 1998	5 countries (United States, United Kingdom, Canada, Norway, and Sweden)	Time-series	Finance → Growth
Ghali, 1999	Tunisia	Time-series	Finance → Growth
Beck *et al.*, 2000	63 counties	Cross-section and panel	Finance → Growth
Graff, 2002	93 countries	Cross-section	Finance → Growth (but unstable)
Shan and Morris, 2002	19 OECD countries and China	Time-series	Finance → Growth (for one country)
Jalilian and Kirkpatrick, 2002	42 countries (including 26 developing and 16 developed countries)	Panel	Finance → Growth

Author(s)	Region/Country	Methodology	Direction of Causality
Christopoulos and Tsionas, 2004	10 developing countries (Colombia, Paraguay, Peru, Mexico, Ecuador, Honduras, Kenya, Thailand, Dominican Republic and Jamaica)	Panel	Finance → Growth
Majid, 2008	Malaysia	Time-series	Finance → Growth
Odhiambo, 2009a	Zambia	Time-series	Finance → Growth
Akinlo and Egbetunde, 2010	10 Sub-Saharan African countries	Time-series	Finance → Growth (Central African Republic, Congo Republic, Gabon, and Nigeria)
Osuala *et al*. (2013)	Nigeria	Time-series	Finance → Growth (causality only from total number of deals ratio to economic growth)
Omri *et al*. (2015)	Twelve MENA countries	Panel	Finance → Growth

The other view, which is relatively prominent in the finance-growth causality nexus history is the demand-following response, where Granger-causality is found to be unidirectional, flowing from economic growth to financial development. Studies in support of this view include: Shan *et al*. (2001); Shan and Morris (2002); Odhiambo (2004); Ang and McKibbin (2007); Güryay *et al*. (2007); Odhiambo (2008a); Odhiambo (2008b); Odhiambo (2009b); Odhiambo (2009c); Akinlo and Egbetunde (2010); Marques *et al*. (2013). Table 2 is a summary of these studies

TABLE 2: Studies in Favour of Unidirectional Causality from Economic Growth to Financial Development

Author(s)	**Region/Country**	**Methodology**	**Direction of Causality**
Shan *et al*., 2001	9 OECD countries and China	Time-series	Growth → Finance (for three countries)
Shan and Morris, 2002	19 OECD countries and China	Time-series	Growth → Finance (for 5 countries)
Odhiambo, 2004	South Africa	Time-series	Growth → Finance
Ang and McKibbin, 2007	Malaysia	Time-series	Growth → Finance
Güryay *et al*., 2007	Northern Cyprus	Time-series	Growth → Finance
Odhiambo, 2008a	Kenya	Time-series	Growth → Finance
Odhiambo, 2008b	Kenya	Time-series	Growth → Finance
Odhiambo, 2009b	Kenya	Time-series	Growth → Finance
Odhiambo, 2009c	South Africa	Time-series	Growth → Finance
Akinlo and Egbetunde, 2010	10 Sub-Saharan African countries	Time-series	Growth → Finance (for Zambia)
Marques *et al*. (2013)	Portugal	Time-series	Finance ↔ Growth

The third view is the bidirectional causality view. According to this view, financial development and economic growth Granger-cause each other. Studies in support of this third view include: Wood (1993); Akinboade (1998); Luintel and Khan (1999); Shan *et al*. (2001); Sinha and Macri (2001); Shan and Morris (2002); Fase and Abma (2003); Calderon and Liu (2003); Shan and Jianhong (2006); Abu-Bader and Abu-Qarn (2008); Akinlo and Egbetunde (2010); Cheng (2012); and Jedidia *et al*. (2014). Table 3 summarises studies in favour of the bidirectional Granger-causality between financial development and economic growth.

TABLE 3: Studies in Favour of Bidirectional Causality between Financial Development and Economic Growth

Author(s)	Region/Country	Methodology	Direction of Causality
Wood, 1993	Barbados	Time-series	Finance ↔ Growth
Akinboade, 1998	Botswana	Time-series	Finance ↔ Growth
Luintel and Khan, 1999	10 developing countries	Time-series	Finance ↔ Growth
Shan *et al*., 2001	9 OECD countries and China	Time-series	Finance ↔ Growth (for five countries)
Sinha and Macri, 2001	8 Asian countries	Time-series	Finance ↔ Growth
Shan and Morris, 2002	19 OECD countries and China	Time-series	Finance ↔ Growth (for 4 countries)
Fase and Abma, 2003	8 Asian countries	Time-series	Finance ↔ Growth
Calderon and Liu, 2003	109 developing and industrial countries	Pooled data	Finance ↔ Growth
Shan and Jianhong, 2006	China	Time-series	Finance ↔ Growth
Abu-Bader and Abu-Qarn, 2008	Egypt	Time-series	Finance ↔ Growth
Akinlo and Egbetunde, 2010	10 Sub-Saharan African countries	Time-series	Finance ↔ Growth (for Chad, South Africa, Kenya, Sierra Leone and Swaziland)
Cheng (2012)	Taiwan	Time-series	Finance ↔ Growth
Jedidia *et al*. (2014)	Tunisia	Time-series	Finance ↔ Growth

Then, there is the fourth but unpopular view, commonly known as the neutral view, where financial development and economic growth are independent and do not Granger-cause each other. Although unpopular, there is empirical evidence lending support to this view. The evidence comes from Shan *et al*. (2001); Nyasha and Odhiambo (2015); and Nyasha and Odhiambo (2018), among others; and is summarised in Table 4.

TABLE 4: Studies in Favour of Neutrality between Financial Development and Economic Growth

Author(s)	Region/Country	Methodology	Direction of Causality
Shan *et al.* (2001)	9 OECD countries and China	Time-series	Finance ≠ Growth (for two countries)
Nyasha and Odhiambo (2015)	South Africa	Time-series	Finance ≠ Growth (between bank-based financial development and economic growth)
Nyasha and Odhiambo (2018)	Six countries	Time-series	Finance ≠ Growth (for some countries)

3. Estimation Techniques and Empirical Analysis

3.1. Cointegration analysis – the ARDL-bounds-testing procedure

In order to overcome the traditional weaknesses associated with many cointegration techniques, the study uses the recently introduced ARDL-bounds testing approach to examine the long-run relationship between financial development and economic growth. The ARDL-bounds testing approach is based on the work of Pesaran and Shin (1999) and Pesaran *et al.* (2001).

Further, the study attempted to address the omission-of-variable bias associated with bivariate Granger causality model by incorporating other control variables to create a multivariate Granger-causality model. These intermittent variables were gross domestic savings and inflation and were chosen based on their theoretical and empirical influence on both economic growth and financial development (see Nyasha and Odhiambo, 2015; Chirwa and Odhiambo, 2016).

In order to provide comprehensive empirical evidence on the finance-growth nexus in Uganda, the study used five proxies of financial development, which were incorporated into the model one at a time. Consequently, the finance-growth causality nexus in Uganda was examined using five (5) models. The function of the generic model can be expressed as Y/N = f(FD, GDS, INF), where **Y/N** is economic growth, proxied by real GDP per capita; **FD** is financial development, **GDS** is gross domestic savings expressed as a ratio of GDP and **INF** is inflation.

Financial development (**FD**) is proxied by money supply (**M2**) in Model 1; deposit money bank assets as percentage of bank assets (**DMBA**) in Model 2; liquid liabilities to GDP (**LL**) in Model 3; private credit by deposit money banks to GDP (**PCDMB**) in Model 4; and bank deposits to GDP (**BD**) in Model 5.

The Granger-causality estimation between variables is preceded by an examination of whether a long-run equilibrium relationship exists among the variables in the model. In testing this cointegration, the study uses the ARDL bounds testing procedure, borrowing from Pesaran *et al*. (2001); and the generic cointegration model for this study is expressed in the form of a set of four cointegration equations as follows:

$$\Delta Y/N_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta FD_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta INF_{t-i} + \alpha_4 Y/N_{t-1} + \alpha_5 FD_{t-1} + \alpha_6 GDS_{t-1} + \alpha_7 INF_{t-1} + \mu_{1t} \quad \ldots\ldots\ldots\ldots (1)$$

$$\Delta FD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta FD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta INF_{t-i} + \beta_5 FD_{t-1} + \beta_6 Y/N_{t-1} + \beta_7 GDS_{t-1} + \beta_8 INF_{t-1} + \mu_{2t} \quad \ldots\ldots\ldots\ldots (2)$$

$$\Delta GDS_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta FD_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta INF_{t-i} + \pi_5 GDS_{t-1} + \pi_6 Y/N_{t-1} + \pi_7 FD_{t-1} + \pi_8 INF_{t-1} + \mu_{3t} \quad \ldots\ldots\ldots\ldots (3)$$

$$\Delta INF_t = \Omega_0 + \sum_{i=1}^{n} \Omega_{1i} \Delta INF_{t-i} + \sum_{i=0}^{n} \Omega_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \Omega_{3i} \Delta FD_{t-i} + \sum_{i=0}^{n} \Omega_{4i} \Delta GDS_{t-i} + \Omega_5 INF_{t-1} + \Omega_6 Y/N_{t-1} + \Omega_7 FD_{t-1} + \Omega_8 GDS_{t-1} + \mu_{4t} \quad \ldots\ldots\ldots\ldots (4)$$

Where:

Y/N = Economic growth= real GDP per capita

FD = Financial development

Model 1: FD = M2 = money supply;

Model 2: FD = DMBA = deposit money bank assets (% of bank assets) ;

Model 3: FD = LL = liquid liabilities to GDP

Model 4: FD = PCDMB = private credit by deposit money banks to GDP

Model 5: FD = BD = bank deposits to GDPGDS = Gross domestic savings

GDS = Savings = gross domestic savings to GDP

INF = Inflation rate

INF = Inflation

a_0, β_0, π_0 and Ω_0 = respective constants;

$a_1 - a_4$, $\beta_1 - \beta_4$, $\pi_1 - \pi_4$, and $\Omega_1 - \Omega_4$ = respective short-run coefficients;

$a_5 - a_8$, $\beta_5 - \beta_8$, $\pi_5 - \pi_8$, and $\Omega_5 - \Omega_8$ = respective long-run coefficients

Δ = difference operator;

n = lag length;

t = time period; and

μ_{it} = white-noise error terms.

The generic ECM-based Granger-causality model in this study is specified as:

$$\Delta Y/N_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta Y/N_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta GDS_{t-i} + \sum_{i=1}^{n} \alpha_{4i} \Delta INF_{t-i} + \alpha_9 ECM_{t-1} + \mu_{1t} \ldots \ldots \ldots \ldots \quad (5)$$

$$\Delta FD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta FD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta INF_{t-i} + \beta_9 ECM_{t-1} + \mu_{2t} \ldots \ldots \ldots \ldots \quad (6)$$

$$\Delta GDS_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta FD_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta INF_{t-i} + + \pi_9 ECM_{t-1} + \mu_{3t} \ldots \ldots \quad (7)$$

$$\Delta INF_t = \Omega_0 + \sum_{i=1}^{n} \Omega_{1i} \Delta INF_{t-i} + \sum_{i=0}^{n} \Omega_{2i} \Delta Y/N_{t-i} + \sum_{i=0}^{n} \Omega_{3i} \Delta FD_{t-i} + \sum_{i=0}^{n} \Omega_{4i} \Delta GDS_{t-i} + \Omega_9 ECM_{t-1} + \mu_{4t} \ldots \ldots \quad (8)$$

Where:

ECM = error-correction term;

a_9, β_9, π_9 and Ω_9 = respective coefficients for the error-correction terms;

μ_{it} = mutually uncorrelated white-noise residuals; and all other variables and characters are as described in equations 1-4.

3.2. Data Source

Annual time-series data, which cover the period 1980–2015, are utilised in this study. The data used in this study were obtained from different sources, including the World Bank’s World Databank (previously known as World Development Indicators Online) and from Financial Development and Structure Dataset (World Bank, 2017).

3.3. Data Analysis and Empirical Results

Results of Unit Root Tests

To confirm the appropriateness of the ARDL approach usage in this study, the data were first tested for stationarity using three unit root tests – Augmented Dickey-Fuller (ADF), Dickey-

Fuller generalised least squares (DF-GLS) and the Phillips-Perron (PP). The results are summarised in Table 5.

TABLE 5: ***Results of Stationarity Tests for all Variables***

Panel A: Augmented Dickey-Fuller (ADF)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
Y/N	-0.204	-0.609	-4.111***	-4.172***
M2	-1.003	-3.034	-5.450***	-5.404***
DMBA	0.456	-2.554	-4.754***	-4.862***
LL	-0.150	-3.914**	-6.093***	-5.952***
PCDMB	0.479	-2.175	-4.335***	-4.378***
BD	0.146	-3.300*	-5.239***	-5.168***
GDS	-1.152	-2.967	-5.239***	-5.178***
INF	-1.948	-2.322	-4.952***	-4.887***
Panel B: Dickey-Fuller generalised least squares (DF-GLS)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
Y/N	0.049	-1.500	-4.163***	-4.309***
M2	-1.061	-2.544	-5.022***	-5.434***
DMBA	0.568	-1.690	-4.179***	-4.957***
LL	-0.232	-2.152	-3.184***	-5.106***
PCDMB	0.611	-1.592	-3.892***	-4.482***
BD	0.158	-1.961	-3.567***	-5.004***
GDS	-0.791	-3.078*	-6.539***	-5.340***
INF	-1.731	-2.407	-3.075***	-5.013***

Panel C: Phillips-Perron (PP)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
Y/N	0.057	-1.021	-4.118***	-4.169***
M2	-0.993	-3.092	-5.891***	-5.887***
DMBA	0.301	-2.560	-4.811***	-4.862***
LL	-0.264	-3.896**	-6.071***	-5.958***
PCDMB	0.286	-2.183	-4.402***	-4.369***
BD	-0.058	-3.282*	-5.261***	-5.219***
GDS	-0.895	-2.967	-7.523***	-7.995***
INF	-2.063	-2.516	-5.273***	-5.094***

Note: ***, ** and * denote stationarity at 1%, 5% and 10% significance level

As revealed in Table 5, the results of the three stationarity tests confirm that the data in this study is integrated of order either zero or one. Hence, the ARDL approach to cointegration can be utilised – as the condition that the data should not be integrated of order more than one has been met.

Results of Cointegration Tests

The null hypothesis of no cointegration is tested against the alternative hypothesis of cointegration. The rejection of the null hypothesis and confirmation of cointegration among variables can only take place when the calculated F-statistic of joint significance is above the upper bound critical F-statistic value provided by Pesaran *et al.* (2001). However, if the computed F-statistic is less than the lower bound critical value, the null hypothesis cannot be rejected; and it can be concluded that the variables in the model are not cointegrated. In the unlikely event that the computed F-statistic lies between the upper and lower bounds, the cointegration outcome is regarded as inconclusive. The results of the cointegration test carried out in this study are summarised in Table 6.

TABLE 6: Results of *Bounds F-test for Cointegration*

Dependent Variable	Function	F-statistic	Cointegration Status
		Model 1	
Y/N	F(Y/N|M2, GDS, INF)	1.95	Not cointegrated
M2	F(M2|Y/N, GDS, INF)	5.96***	Cointegrated
GDS	F(GDS|Y/N, M2, INF)	8.72***	Cointegrated
INF	F(INF|Y/N, M2, GDS)	1.76	Not cointegrated
		Model 2	
Y/N	F(Y/N|DMBA, GDS, INF)	2.16	Not cointegrated
DMBA	F(DMBA|Y/N, GDS, INF)	0.43	Not cointegrated
GDS	F(GDS|Y/N, DMBA, INF)	7.41***	Cointegrated
INF	F(INF|Y/N, DMBA, GDS)	3.00	Not cointegrated
		Model 3	
Y/N	F(Y/N|LL, GDS, INF)	2.33	Not cointegrated
LL	F(LL|Y/N, GDS, INF)	1.31	Not cointegrated
GDS	F(GDS|Y/N, LL, INF)	7.85***	Cointegrated
INF	F(INF|Y/N, LL, GDS)	2.61	Not cointegrated
		Model 4	
Y/N	F(Y/N|PCDMB, GDS, INF)	4.08*	Cointegrated
PCDMB	F(PCDMB|Y/N, GDS, INF)	0.26	Not cointegrated
GDS	F(GDS|Y/N, PCDMB, INF)	6.56***	Cointegrated
INF	F(INF|Y/N, PCDMB, GDS)	2.59	Not cointegrated
		Model 5	
Y/N	F(Y/N|BD, GDS, INF)	2.16	Not cointegrated
BD	F(BD|Y/N, GDS, INF)	0.69	Not cointegrated
GDS	F(GDS|Y/N, BD, INF)	8.21***	Cointegrated
INF	F(INF|Y/N, BD, GDS)	3.12	Not cointegrated

Asymptotic Critical Values						
Pesaran *et al*. (2001), p.300 Table CI(iii) Case III	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	4.29	5.61	3.23	4.35	2.72	3.77

Note: * and *** denote statistical significance at 10% and 1% levels, respectively

The cointegration results in Table 6 confirm that in Models 2, 3 and 5, there is one cointegrating vector while in Models 1 and 4, there are two cointegrating vectors. The results, therefore, suggest that there exists a long-run equilibrium relationship among the variables in each of the five models.

Although cointegration has been established among the variables in all the models, the direction of causality between any two variables cannot be foretold. Existence of causality only indicates that Granger-causality exists in at least one direction. The study, therefore, proceeds to estimate Granger causality between variables. The short-run causality is determined based on the significance of the Wald Test or Variable Deletion Test's F-statistics of the explanatory variables. However, long-run causality is confirmed by the negative sign and the significance of the error-correction term's coefficient. The error-correction is incorporated only in the equation where cointegration has been confirmed (see, among others, Nyasha *et al*., 2017).

ECM-Based Granger-Causality Results

The ECM-based Granger causality results for Models 1 - 5 are reported in Tables 7a – e, respectively.

TABLE 7: ***Results of Granger-Causality Tests***

a) Model 1

Dependent Variable	**F-statistics [probability]**				**ECT_{t-1} [t-statistics]**
	$\Delta Y/N_t$	**$\Delta M2_t$**	**ΔGDS_t**	**ΔINF_t**	
$\Delta Y/N_t$	-	0.199 [0.659]	0.270 [0.608]	0.197 [0.660]	-
$\Delta M2_t$	0.275 [0.604]	-	4.521** [0.043	0.6378 [0.432]	-0.589*** [-4.328]
ΔGDS_t	0.550 [0.465]	9.517*** [0.005]	-	4.279** [0.048]	-1.304*** [-6.792]
ΔINF_t	6.481** [0.017]	10.655*** [0.000]	0.382 [0.541]	-	-

b) Model 2

Dependent Variable	**F-statistics [probability]**				**ECT_{t-1} [t-statistics]**
	$\Delta Y/N_t$	**$\Delta DMBA_t$**	**ΔGDS_t**	**ΔINF_t**	
$\Delta Y/N_t$	-	6.863** [0.016]	0.965 [0.337]	3.152** [0.034]	-
$\Delta DMBA_t$	2.915* [0.099]	-	0.196 [0.661]	0.001 [0.970]	-
ΔGDS_t	4.154* [0.051]	1.244 [0.275]	-	4.409** [0.045]	-0.848*** [-4.361]
ΔINF_t	5.870** [0.024]	0.020 [0.889]	3.460** [0.024]	-	-

c) Model 3

Dependent Variable	**F-statistics [probability]**				**ECT_{t-1} [t-statistics]**
	$\Delta Y/N_t$	**ΔLL_t**	**ΔGDS_t**	**ΔINF_t**	
$\Delta Y/N_t$	-	6.544** [0.018	0.756 [0.394]	3.120** [0.036]	-
ΔLL_t	0.790 [0.545]	-	1.441 [0.260]	4.789** [0.041]	-
ΔGDS_t	3.919* [0.058]	4.493** [0.043]	-	4.121* [0.052]	-0.8534*** [-4.659]
ΔINF_t	4.323** [0.024]	0.022 [0.884]	3.096* [0.090]	-	-

d) Model 4

Dependent Variable	F-statistics [probability]				ECT_{t-1} [t-statistics]
	$\Delta Y/N_t$	$\Delta PCDMB_t$	ΔGDS_t	ΔINF_t	
$\Delta Y/N_t$	-	0.067 [0.798	0.073 [0.790]	3.832* [0.061]	-0.353*** [-3.348]
$\Delta PCDMB_t$	0.701 [0.410]	-	0.745 [0.978]	1.110 [0.301]	-
ΔGDS_t	5.034** [0.033]	0.127 [0.724]	-	3.933* [0.058]	-0.805*** [-4.2971]
ΔINF_t	3.446** [0.034]	0.339 [0.566]	2.183 [0.136]	-	-

e) Model 5

Dependent Variable	F-statistics [probability]				ECT_{t-1} [t-statistics]
	$\Delta Y/N_t$	ΔBD_t	ΔGDS_t	ΔINF_t	
$\Delta Y/N_t$	-	2.809* [0.083]	1.017 [0.325]	3.198** [0.034]	-
ΔBD_t	0.046 [0.831]	-	3.426* [0.076]	2.589* [0.095]	-
ΔGDS_t	5.349** [0.029]	4.817** [0.037]	-	3.379* [0.077]	-0.980*** [-4.986]
ΔINF_t	4.386** [0.023]	0.057 [0.814]	2.950* [0.098]	-	-

Note: *, ** and *** denote statistical significance at 10% , 5% and 1% levels, respectively

The results of Model 1, reported in Table 7a, show that in Uganda, there is no Granger-causality between financial development and economic growth when money supply (M2) is considered a proxy of financial development. These results hold irrespective of whether estimation is done in the short run or in the long run. Although these results are not as expected, they are not unusual (see, among others, Shan *et al*., 2001; Nyasha and Odhiambo, 2015; 2018). Model 1 results further reveal that there is: (i) short-run and long-run bidirectional Granger-causality between savings and financial development (M2); (ii) short-run and long-run unidirectional Granger-causality from inflation to savings; (iii) short-run unidirectional Granger-causality from economic growth to inflation; (iv) short-run unidirectional Granger-causality from financial development (M2) to inflation; and (v) no causality between economic growth and savings.

The results of Model 2, reported in Table 7b, show that in Uganda, there is bidirectional Granger-causality between financial development and economic growth when financial development is proxied by deposit money bank assets as a ratio of bank assets (DMBA). However, these results apply only in the short run. These results are consistent with the feedback hypothesis where economic growth and financial development are mutually causal; and are consistent with results of several other studies (see Akinlo and Egbetunde 2010; Cheng, 2012; Jedidia *et al*., 2014, among others). Model 2 results further reveal that there is: (i) short-run bidirectional Granger-causality between economic growth and inflation; (ii) long-run and short-run unidirectional Granger-causality from economic growth to savings; (iii) short-run bidirectional Granger-causality between inflation and savings; (iv) long-run unidirectional Granger-causality from inflation to savings; and (v) no causality between savings and financial development (DMBA); and between inflation and financial development (DMBA).

For Model 3 (reported in Table 7c), the empirical results show that in Uganda, there is short-run unidirectional Granger-causality from financial development to economic growth when liquid liabilities (LL) are used to proxy financial development. These results are consistent with the supply-leading hypothesis (see, among others, Osuala *et al*., 2013; Omri *et al*., 2015). Model 3 results further show that in Uganda, there is: (i) short-run and long-run unidirectional Granger-causality from financial development (LL) to savings; (ii) short-run bidirectional causality between economic growth and inflation and between inflation and savings; (iii) long-run unidirectional Granger-causality from inflation to savings; (iv) short-run unidirectional Granger-causality from inflation to financial development (LL); and (v) short-run and long-run unidirectional Granger-causality from economic growth to savings.

For Model 4, the results displayed in Table 7d show that in the study country, there is no Granger-causality between financial development and economic growth when financial development is proxied by private credit by deposit money banks as a ratio to GDP (PCDMB). These results apply regardless of whether estimation is in the short run or in the long run. Although not as expected, these results are not unusual (see, among others, Shan *et al*., 2001; Nyasha and Odhiambo, 2015; 2018). Model 4 results further reveal that there is: (i) short-run bidirectional Granger-causality between inflation and economic growth; (ii) long-run unidirectional Granger-causality from inflation to economic growth; (iii) short-run and long-run unidirectional Granger-causality from economic growth to savings and from inflation to savings; and (iv) no causality between financial development (PCDMB) and savings; and between financial development (PCDMB) and inflation.

Finally, the empirical results for Model 5 (reported in Table 7e) show that there is unidirectional Granger-causality from financial development to economic growth in Uganda when bank deposits to GDP ratio (BD) is used as a proxy for financial development. These results lend support to the supply-leading hypothesis (see among others, Osuala *et al.*, 2013; Omri *et al.*, 2015). Model 5 results further confirm that in Uganda, there is: (i) short-run and long-run unidirectional Granger-causality from economic growth to savings; (ii) short-run bidirectional Granger-causality from economic growth to inflation; from financial development (BD) to savings and from inflation to savings; (iii) long-run unidirectional Granger-causality from financial development (BD) to savings and from inflation to savings; and (iv) short-run unidirectional Granger-causality from inflation to financial development (BD).

Overall, the results of the study reveal that in Uganda, the causal relationship between financial development and economic growth is not clear-cut as it varies depending on the proxy of financial development used. When using money supply (M2 – Model 1) and private credit by deposit money banks to GDP ratio (PCDMB – Model 4), no causality was found between financial development and economic growth. When using deposit money bank assets to bank assets ratio (DMBA – Model 2) to proxy financial development, causality between financial development and economic growth was found to be mutually causal. Finally, when using liquid liabilities to GDP (LL – Model 3) and bank deposits to GDP (BD – Model 5) as proxies of financial development, Granger-causality was found to be unidirectional from financial development to economic growth. Based on the findings of the study, it is recommended that when drafting financial development and economic growth related policies, authorities in Uganda may need to be clear on which proxy of financial development should be targeted as policy implementation outcome may vary depending on the targeted financial development proxy.

4. Conclusion

In this study, we have explored the dynamic causal relationship between financial development and economic growth in Uganda during the period from 1980 to 2015. Although the finance-growth nexus debate had been raging for decades, Uganda, just as many other low-income African countries, has not yet received adequate coverage on the subject, despite the numerous strands of studies that support. The justification for this study was further motivated by the inconclusive findings from previous studies that have been conducted on this subject. In an effort to eliminate variable-omission-bias, which has been found in some previous studies, two intermittent variables, namely savings and inflation, were used to create a multivariate Granger-causality model. Moreover, unlike some previous studies, five proxies of financial sector development were used in the current study in a stepwise fashion. These include money supply (M2) in Model 1; deposit money bank assets as percentage of bank assets (DMBA) in Model 2; liquid liabilities to GDP (LL) in Model 3; private credit by deposit money banks to GDP (PCDMB) in Model 4; and bank deposits to GDP (BD) in Model 5. Using the ARDL approach, the findings of this study revealed that the direction of causality between financial development and economic growth in Uganda is not clear-cut. In the main, the causality between financial development and economic growth in Uganda was found to vary from one model to the other, depending on the proxy used for financial development. When financial development was proxied by liquid liabilities to GDP (LL – Model 3) and bank deposits to GDP (BD – Model 5), a unidirectional Granger-causality from financial development to economic growth was found to predominate. When deposit money bank assets to bank assets ratio (DMBA – Model 2) was used as a proxy for financial development, a bi-directional causality between financial development and economic growth was found to prevail. Finally, when money supply (M2 – Model 1) and private credit by deposit money banks to GDP ratio (PCDMB – Model 4) were used as proxies for financial development, no causality was found to exist between financial development and economic growth in either direction. These results apply irrespective of whether the causality is conducted in the short run or in the long ruin. Based on these results, it is recommended that when drafting policies aimed at boosting economic growth, policymakers should target growth-led financial development proxies as policy implementation outcome may vary depending on the targeted financial development proxy.

Reference List

Abu-Bader, S. and Abu-Qarn, AS. 2008. Financial development and economic growth: The Egyptian experience. *Journal of Policy Modelling*, 30, 887-898.

Ahmed, SM. and Ansari, MI. 1998. Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3), 503-517.

Akinboade, OA. 1998. Financial development and economic growth in Botswana, a test for causality. *Savings and Development*, 3(22), 331-348.

Akinlo, AE. and 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), 17-28.

Ang, JB. and McKibbin, WJ. 2007. Financial liberalization, financial sector development and growth: Evidence from Malaysia. *Journal of Development Economics*, 84(1), 215-233.

Bank of Uganda. 2018. Various Issues. [Online] Available from <https://www.bou.or.ug/bou/home.html> [Accessed 15 January 2018].

Beck, T., Levine, R., and Loayza, N. 2000. Finance and the sources of growth. *Journal of Financial Economics*, *58*, 261-300.

Calderon, C. and Liu, L. 2003. The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72(1), 321-334.

Cheng, S. 2012. Substitution or complementary effects between banking and stock markets: Evidence from financial openness in Taiwan. *Journal of International Financial Markets, Institutions & Money*, 22, 508-520.

Chirwa and Odhiambo, 2016) macroeconomic determinants of economic growth: A review of international literature. *South East European Journal of Economics and Business*, 11(2), 33-47, DOI: 10.1515/jeb-2016-0009

Christopoulos, DK. and Tsionas, EG. 2004. Financial development and economic growth: Evidence from panel root and cointegration tests. *Journal of Development Economics*, 73, 55-74.

Fase, MMG. and Abma, RCN. 2003. Financial environment and economic growth in selected Asian countries. *Journal of Asian Economics*, 14(1), 11-21.

Ghali, KH. 1999. Financial development and economic growth: The Tunisian experience. *Review of Development Economics*, 3(3), 310-322.

Ghirmay, T. 2004. Financial development and economic growth in Sub-Saharan African countries: Evidence from time-series analysis. *African Development Review* 16, 415-432.

Graff, M. 2002. Causal links between financial activity and economic growth: Empirical evidence from a cross-country analysis, 1970-1990. *Bulletin of Economic Research,* 54(2), 119-133.

Guryay, E., Safakli, OV. and Tuzel, B. 2007. Financial development and economic growth: Evidence from Northern Cyprus. *International Research Journal of Finance and Economics*, 8, 57-62.

International Monetary Fund. 2003. Financial system stability Assessment. *IMF Country Report No. 03/97.*

Jalilian, H. and Kirkpatrick, C. 2002. Financial development and poverty reduction in developing countries. *International Journal of Finance and Economics*, 7(2), 97-108.

Jedidia, KB., Boujelbène, T. and Helali, K. 2014. Financial development and economic growth: New evidence from Tunisia. *Journal of Policy Modeling*, 36(5), 883-898.

Jung, WS. 1986. Financial development and economic growth: International evidence. *Economic Development and Cultural Change*, 34, 333-346.

King, RG. and Levine, R. 1993. Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics*, 108 (3), 713-737.

Lucas, R. 1988. On the mechanism of economic development. *Journal of Monetary Economics*, 22(1), 3-42.

Luintel, KB. and Khan, M. 1999. A quantitative reassessment of the finance growth nexus: Evidence from a multivariate VAR. *Journal of Development Economics*, 60(2), 381- 405.

Majid, MSA. 2008. Does financial development matter for economic growth in Malaysia? An ARDL bound testing approach. *Journal of Economic Cooperation*, 29(1), 61-82.

Marques, LM., Fuinhas, JA. and Marques, AC. 2013. Does the stock market cause economic growth? Portuguese evidence of economic regime change. *Economic Modelling*, 32, 316-324.

McKinnon, RI. 1973. *Money and Capital in Economic Development, Washington*: The Brookings Institution.

Nyasha, S. and Odhiambo, NM. 2015. Banks, stock market development and economic growth in South Africa: a multivariate causal linkage. *Applied Economics Letters*, 22(18), 1480-1485.

Nyasha, S. and Odhiambo, NM. 2018. Finance-growth nexus revisited: Empirical evidence from six countries. *Scientific Annals of Economics and Business,* 65(3), 247-268.

Nyasha S., Gwenhure, Y. and Odhiambo, NM. 2017. Financial development and economic growth in Ethiopia: A dynamic causal linkage. International Economics (DG-Economia Internazionale), 70(1), 73-102.

Odedokun, MO. 1996a. Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs. *Journal of Development Economics*, 50(1), 119-146.

Odedokun, MO. 1996b. Financial policy and efficiency of resource utilization in developing countries. *Growth and Change*, 27(3) 269–297.

Odhiambo, NM. 2004. Is financial development still a spur to economic growth? A causal evidence from South Africa. *Savings and Development*, 28(1), 47-62.

Odhiambo, NM. 2008a. Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25, 704-713.

Odhiambo, NM. 2008b.Financial development in Kenya: A dynamic test of the finance-led growth hypothesis. *Economic Issues*, 13 (2), 21-36.

Odhiambo, NM. 2009a. Interest Rate Liberalization and Economic Growth in Zambia: A Dynamic Linkage. *African Development Review*, 21(3), 541-557.

Odhiambo, NM. 2009b. Finance-growth nexus and inflation dynamics in Kenya: An empirical investigation. *Savings and Development*, 33(1), 7-25.

Odhiambo, NM. 2009c. Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. *Journal of Socio-Economics*, 38, 320-325.

Omri, A., Daly, S., Rault, C. and Chaibi, A. 2015. Financial Development, Environmental Quality, Trade and Economic Growth: What Causes What in MENA Countries? *Energy Economics*, 48, 242-252.

Osuala, AE., Okereke, JE. and Nwansi, GU. 2013. Does stock market development promote economic growth in emerging markets? A causality evidence from Nigeria. *World Review of Business Research*, 3(4), 1-13.

Pesaran, MH. and Shin, Y. 1999. An autoregressive distributed lag modelling approach to cointegration analysis, in *Econometrics and Economic Theory in the 20th Century*: The Ragnar Frisch Centennial Symposium, eds. Storm, S., Cambridge University Press, Chapter 11, pp.1-31.

Pesaran, MH., Shin, Y. and Smith, R. 2001. Bound Testing Approaches to the Analysis of Level Relationship. *Journal of Applied Econometrics*, 16, 174-189.

Rousseau, L. and Wachtel, P. 1998. Financial intermediation and economic performance: Historical evidence from five industrialised countries. *Journal of Money, Credit and Banking,* 30, 657-78.

Shan, J. and Jianhong, Q. 2006. Does financial development 'lead' economic growth? The case of China. *Annals of Economics and Finance,* 1, 231-250.

Shan, JZ. and Morris, AG. 2002. Does financial development 'Lead' economic growth. *International Review of Applied Economics*, 16(2), 153-168.

Shan, JZ., Morris, AG. and, Sun, F. 2001. Financial development and economic growth: An egg and chicken problem? *Review of International Economics*, 9(3) 443-454.

Shaw, ES. 1973. *Financial Deepening in Economic Development. New York*: Oxford University Press.

Sinha, D. and Macri, J. 2001. Financial development and economic growth: The case for eight Asian countries. Munich Personal RePEc Archive, Paper No. 18297.

Wood, A. 1993. Financial development and economic growth in Barbados: Causal evidence. *Savings and Development*, 17 (4), 379-390.

World Bank, 2017. Financial Structure Data Base. [Online] Available from <https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database> [Accessed 15 November 2017].