The Role of Mobile Money In Financial Inclusion in Lesotho

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Contents

1.0 A Panel Analysis on the effect of Public and Publicly Guaranteed external debt on GDP per capita Growth in the East African Community Member Countries 5

2.0 Economic growth and external debt in Selected SSA Countries 24

3.0 Micro and Macro Drivers of Credit Risk: The Case of Zimbabwean Banking Industry (2009-2013) 51

4.0 The Role of Mobile Money In Financial Inclusion In Lesotho 77

5.0 Sectoral effects of Monetary Policy in Uganda: A DSGE Analysis 100

6.0 Towards A Supportive Regulatory Environment for Digital Financial Services In MEFMI Countries 120

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1.0 A PANEL ANALYSIS ON THE EFFECT OF PUBLIC AND PUBLICLY GUARANTEED EXTERNAL DEBT ON GDP PER CAPITA GROWTH IN THE EAST AFRICAN COMMUNITY MEMBER COUNTRIES[1]

By Elsie Kharunda and Grace A Tinyinondi[2]

Abstract
An Autoregressive Distributed Lag model (ARDL) is used to investigate the impact of Public and Publicly Guaranteed (PPG) external debt on economic growth in the East African Community (EAC) member Countries; Burundi, Kenya, Rwanda, Tanzania and Uganda spanning 1971 to 2014. The findings suggest existence of an inverted U-shaped relationship between PPG external debt and economic growth as well as a positive stimulus from debt relief in these countries over this period. The results show that prior to HIPC debt relief, the contribution of PPG external debt to GDP to GDP per capita growth is not significant; however, its contribution is positive and significant post-HIPC.

Keywords: Public External Debt, Economic Growth, EAC countries

1.1 INTRODUCTION

The issue of public debt in developing countries has continued to receive a lot of attention since the IMF and World Bank debt relief initiatives in the 1990s and has been widely researched. The slow economic growth and persistent poverty in the Low-Income Countries (LICs) were attributed to the unsustainable external debt situation. Consequently, the International Monetary Fund (IMF) and World Bank and some developed countries provided the LICs with debt relief in the form of public debt restructuring and forgiveness as well as technical support to undertake structural and economic reforms (Andrews et al., 1999). The IMF and the World Bank jointly established the Heavily Indebted Poor Countries (HIPC) debt relief initiative in September 1996 with the primary objective of reducing the poor countries' debt burdens to sustainable levels to enable them have more resources to implement policies required to overcome constraints to sustainable economic growth. The

[1]This paper is a revised form of "The Impact of Public External Debt on GDP per capita Growth in the East African Community (EAC) Member countries" presented at the Inaugural Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI) Research and Policy Seminar, 10 December 2015, Harare, Zimbabwe. The authors gratefully acknowledge the reviewers comments and suggestions, which significantly contributed to improving the quality of this manuscript.

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The views as expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the Bank of Uganda.

HIPC Initiative was supplemented by the Multilateral Debt Relief Initiative (MDRI)[3] in 2005 to accelerate progress toward the United Nations Millennium Development Goals (MDGs).

Within the East African region, apart from Kenya, all the other East African Community[4] (EAC) member countries are beneficiaries of the HIPC debt relief. In May 2000, Uganda qualified for HIPC debt relief after meeting the requirements for completion point, which entailed a track record of good performance under programs supported by loans from the IMF and the World Bank; satisfactory implementation of key reforms agreed at the decision point; and adoption and implementation of the Poverty Reduction Strategy Paper for at least one year, making it the first EAC country to benefit from the HIPC debt relief initiative. Tanzania attained its completion point in November 2001 while Rwanda and Burundi reached their completion points later in April 2005 and January 2009 respectively (IMF, 2016). According to debt sustainability analyses conducted in the late 1990s, Kenya's public external debt was considered to be sustainable, which made it ineligible for HIPC debt relief. However, Were (2001) found that Kenya's total external debt had a negative impact on its economic growth and argued that debt relief would have alleviated the high poverty levels in Kenya estimated at 62 percent of Kenya's population (of about 30 million) living on less than $2 a day, and that of more than one quarter living below $1 a day. Public external debt constitutes the bulk of public debt in the EAC countries, largely made up of concessional loans that have been mainly used to finance education and health expenditures, physical infrastructure and problems of drought and famine (AFRODAD, 2003).

The recent research on the issue of public debt has focused on assessing whether debt relief has benefited the recipient countries, and this has mainly been done through an investigation of the effect of public debt on economic growth in these countries. This direction of the research is made all the more relevant by the recent global economic developments and outlook. EAC member countries have been among the fastest growing in Sub-Saharan Africa (SSA). Their economies grew at an average rate of 5.8 percent over the five years (2010-2014), which was higher than the average growth rate of 5.2 percent in the Sub-Saharan Africa and 2.0 percent in the advanced economies (IMF, 2015). However, the IMF's April 2016 Regional Economic Outlook indicated a slowdown in growth in SSA as a region to 3.5 percent in 2015 and was projected to decline further in 2016 to 3.0 percent growth. The IMF attributed the projected slowdown in growth in SSA to the impact of a sharp decline in commodity prices, mainly oil and highlighted the tightening of global financial conditions as one of the risks to the growth outlook. There were also concerns that public external debt levels in African countries were rising again after debt relief (Cropley, 2015).

The studies on debt and economic growth in developing countries have majorly focused on total external debt. However, Public and Publicly Guaranteed (PPG) external debt accounts for most of the external debt held by the EAC countries

[3]The MDRI allows for 100 percent relief on eligible debts by three multilateral institutions—the IMF, the World Bank, and the African Development Fund (AfDF)—for countries completing the HIPC Initiative process.

[4]The Treaty establishing the EAC was signed on 30th November 1999.

(76.9 percent by 2014) and therefore its effect on economic growth holds important policy insights. The World Bank defines Public and publicly guaranteed debt as comprising long-term external obligations of public debtors, which constitute the general government and autonomous public bodies, as well as private debt that has been guaranteed for repayment by a public entity. The literature shows that a Laffer curve relationship exists between debt and economic growth such that debt has a positive effect on economic growth up to a point after which further accumulation in debt leads to a decline in economic growth (Pattillo et al., 2002). This paper therefore seeks to contribute towards the understanding of the effect of PPG external debt on economic growth, particularly in light of the recent concerns of slower growth, both global and regional, and tightening in external financing. The main research question we seek to answer in this paper is; what is the effect of PPG external debt on economic growth in the EAC countries? The study aims at providing important insights into the level of PPG external debt that is consistent with economic growth in the EAC member countries.

The rest of the paper is organized as follows; Section 2 discusses the relevant literature, Section 3 explains the data and methodology used, Section 4 focuses on discussion of results while Section 5 provides recommendations and conclusion.

1.2 LITERATURE REVIEW

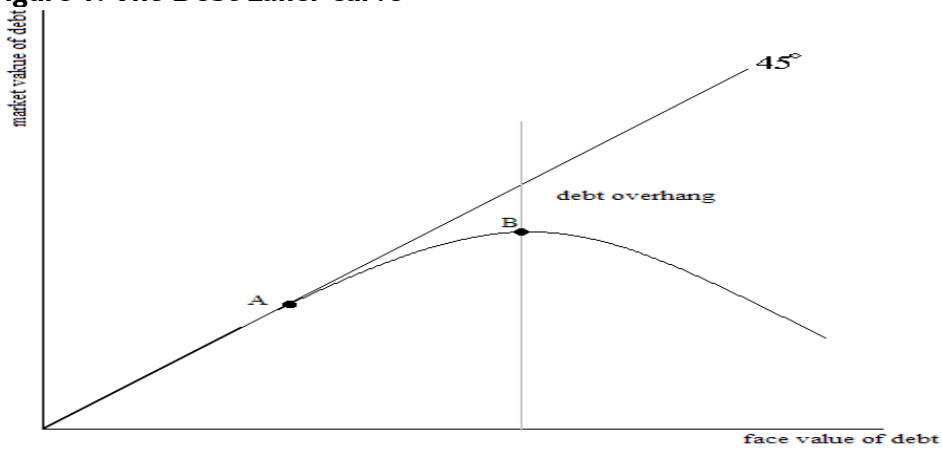
1.2.1 Theoretical Framework

The theoretical literature on the public debt-economic growth linkage provides varied views. The post-Keynesian growth theory advances a positive direct effect of external debt on economic growth. The post-Keynesian Harrod-Domar model (1939, 1946) explains an economy's growth rate in terms of its level of saving and the capital output ratio. Based on the model, the rate of growth in an economy can be increased in two ways; by increasing the level of savings in the economy and by increasing the capital-output ratio. The model implies that for the developing countries where labor supply is plentiful but physical capital is scarce, economic growth may be slowe. The developing countries also lack sufficiently high incomes to enable satisfactory rates of saving; therefore, accumulation of physical capital stock through investment is low. Hence, economic growth can only be boosted by policies that increase investment by increasing savings and using that investment more efficiently through technological advancements. In conclusion, it is implied from the model that; if external debt can raise capital accumulation, then economic growth can be achieved.

The "debt overhang" effect is one of the theoretical perspectives used to explain the adverse effect of debt on economic growth. Debt overhang refers to a situation where the expected repayment on external debt falls short of the contractual value of the debt Krugman (1988). This is a result of large debt attracting high debt service costs from creditors whose aim is to maximize the present value of the debt. In turn, high debt service costs discourage any additional domestic and foreign investments due to the expected low rate of return from productive investments relative to the cost of debt. The implication of the debt overhang theory is that high debt levels discourage growth through their negative effect on a country's levels of both present and future investment.

Sachs (1989) introduced the debt Laffer curve concept derived from the tax Laffer curve hypothesis to further explain the debt overhang. The debt Laffer curve in Figure 1 portrays the relationship between the face and market values of debt and the point at which a country is likely to experience a debt overhang situation.

Figure 1: The Debt Laffer curve



Source: Adapted from Sydorchuk (2016)

From the origin to point A, the market value of debt is equal to the face value of the debt. However, when the face value of the debt increases beyond point A, the market value of the debt continues to increase but at a decreasing rate until the threshold point B. The reason for the slow increase is that as a country's debt accumulates, it becomes harder to finance it because of the increased debt servicing obligations that effectively act as a tax on investment, policy reforms or other activities that require up-front costs in exchange for future benefits (Pattillo et al., 2002). Beyond point A, the marginal return on debt starts diminishing as well. If the face value of debt continues to increase past a certain threshold B, the absolute increase in the face value of the debt cannot compensate for the marginal decrease in market value of the debt and thus a country will be said to be suffering a debt overhang.

Finally, most recent studies have tried to reconcile the two arguments by developing models with non-linear effects of debt on growth. This threshold school of thought emphasizes the non-linear relationship between debt and growth. In the theoretical model developed by Calvo (1998), the relationship between debt and growth encounters three distinct phases. The first phase is where growth is an increasing function of debt; at this point external debt is considered as a capital inflow with a positive effect on domestic savings and investment and thus on growth which leads to poverty reduction through appropriate targeting of domestic savings and investment. The second phase is the intermediate region where the economy can exhibit low growth paths. The third phase is where growth is a decreasing function of the debt since a higher distortionary tax burden on capital is required to service debt, which leads to a lower rate of return on capital, and lower investment and growth. The model links the debt and growth problem to capital flight.

The debt overhang theory and the threshold school of thought effectively combine the theories of the debt-economic growth linkage; the post-Keynesian growth theory which predicts a positive effect (Harrod-Domar (1939, 1946), the debt overhang theory which emphasizes the negative effects (Krugman, 1988; Sachs, 1989) and the non-linear school of thought (Calvo, 1998). This paper shall therefore employ the

debt overhang theory and the threshold school of thought to analyze the effect of PPG external debt on economic growth in the EAC partner states.

1.2.2 Empirical Literature on public debt and economic growth

The empirical literature finds evidence of a non-linear relationship between external debt and economic growth; positive at low levels of external debt and negative beyond a certain threshold of external debt. Pattillo et al. (2002) investigate the impact of external debt on growth using a panel data set of 93 developing countries over the period 1969-1998. The variables included in the model are; per capita GDP growth, secondary enrollment rate, investment rate, population growth rate, nominal debt to exports and GDP, debt service to exports, terms of trade, fiscal balance to GDP and openness as ratio of GDP. The model used both three-year and ten-year averages of the variables in order to net out the business cycle effects. The panel specifications were estimated using simple OLS, Instrumental variables, fixed effects and Generalized Method of Moments (GMM) and their results are consistent across the methods. The findings showed evidence of a nonlinear effect of debt on growth, debt levels beyond 160-170 percent of exports and 35-40 percent of GDP had a negative impact on per capita growth. On the quantitative effect of debt on growth, their results suggest that doubling debt slows per capita growth by about half to a full percentage point.

To assess the impact of external debt on growth, Clements et al. (2003) used the standard growth model augmented with debt variables. The empirical analysis was based on data for 55 LICs. It covered the period 1970-1999 and the analysis was based on fixed effects and the system Generalised Method of Moments (GMM). The external debt stock burden indicators applied in the model included: the face value of the stock of external debt as a share of GDP, the net present value of the stock of external debt as a share of GDP, the face value of the stock of external debt as a share of exports of goods and services and the net present value of debt as a share of exports of goods and services. To net out the effects of short term fluctuations, the authors used three-year averages for panel regressions. Both estimation procedures supported the debt overhang hypothesis of debt having a negative effect on growth only after it reaches a threshold level.

Clements et al. estimated the threshold level at around 50 percent of GDP for the face value of external debt, and at around 20-25 percent of GDP for its estimated net present value. The threshold level for external debt to exports was estimated at 100-105 percent of exports. Clements et al. also argued that external debt has indirect effects on growth through its effects on public investment particularly the effect of debt service on public investment. They found that on average, a one percent increase in debt service as a share of GDP reduced public investment by about 0.2 percent and that a reduction of debt service by six percent of GDP increased investment by 0.75 to 1 percent of GDP and raised per capita income growth by about 0.2 percent.

Pattillo et al. (2004) utilized growth accounting decompositions to investigate the channels through which debt affects growth. Their analysis was based on 61 developing countries over the period 1969–98 and revealed that, on average for high-debt countries, doubling debt would reduce output growth by about 1 percentage point and that the effect was through a reduction in total factor productivity growth (about two-thirds) and physical capital accumulation (about one-third). The authors concluded that high debt negatively impacts on economic growth through a strong negative effect on physical capital accumulation and total factor productivity growth.

Emsen et al. (2012) employed a panel autoregressive distributed lag model (ARDL) to analyze the ARDL relationship between debt and economic growth in 27 transition countries that were moving from a socialist to a liberal system of economy. The authors found that for the period analyzed, (1991 - 2009) external debt to GNI had a positive and significant effect on economic growth in the transition countries in the long run. In the short turn, external debt to GNI was found to be negative and statistically significant. The authors therefore concluded that the transition countries were still at the positive slope side of the debt Laffer curve.

Babu et al. (2014) used annual data for the period 1970-2010 to analyze external debt and economic growth in the EAC. The study was based on the Solow growth model augmented for debt and used a panel fixed-effects model to estimate the effect of external debt as a share of GDP on economic growth. The variables included in their model are; government size, openness, level of investment and terms of trade, all these variables are associated with growth. Their results indicated that on average for the five EAC countries included in the study, a unit increase in government external debt leads to a 0.1416 decrease in economic growth when other independent variables in the model are held constant.

This study builds on the empirical literature on external debt and growth and specifically contributes to a deeper understanding of the impact of PPG external debt, which is the main form of external debt in the EAC countries. We adopt a parsimonious model to estimate the effect of PPG external debt on economic growth in these countries. The dependent variable is GDP per capita growth and the main explanatory variables are PPG external debt and gross fixed capital formation, which is included based on Pattillo et al. (2004) who found that physical capital accumulation was one of the two key channels through which debt affects economic growth. The following section explains the methodology adopted.

1.3 METHODOLOGY AND DATA

1.3.1 The Empirical Framework

We adapt Emsen, Karakov, Kabadayi and Uzun (2012) empirical analysis to analyze the relationship between PPG external debt and growth in the five EAC countries. The debt stock indicators, PPG external debt stock to Gross Domestic Product (GDP) and PPG external debt stock to exports, provide a measure of the debt burden and are therefore used to analyze the debt overhang effect, while the debt flow indicator, the ratio of PPG external debt service to exports, provides an indication of the high cost of debt associated with the debt overhang, which results into a crowding out of investment (Pattillo et. al. 2004; Wamboye, 2012). We use the quadratic function of PPG external debt ($PPGExtdebt_{it}^2$) to capture the non-linear relationship between debt and economic growth in the EAC member countries. For the measure of economic growth, we use GDP per capita growth (Percapitag), which has been employed by growth models to assess convergence in per capita income of countries (Wamboye, 2012). The basic model is therefore stated as follows:

$$Percapitag_{it} = \beta_0 + \beta_{it}\, PPGExtdebt_{it} + \beta_{it}\, PPGExtdebt_{it}^2 + \varepsilon_{it} \text{----------} (1)$$

(i = 1, 2 and t = 1970, 1971, ..., 2014)

We include gross fixed capital formation as an additional explanatory variable and thus the parsimonious model to estimate the effect of PPG external debt on GDP per capita growth in the five EAC countries is stated in Equation 2 as:

$$Percapitagit = \beta_0 + \beta_{it} X_{it} + \varepsilon_{it} \text{----------} (2)$$

(i = 1, 2, ..., 5 and t = 1970, 1971, ..., 2014)

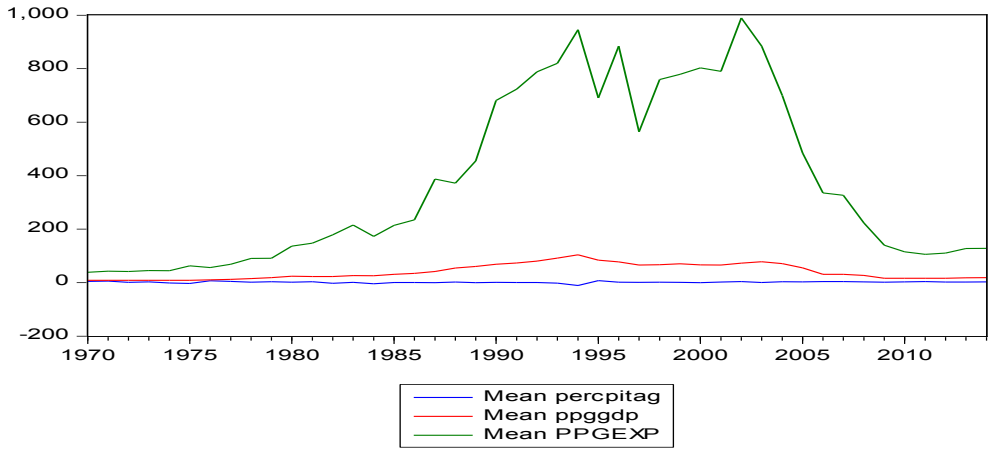
Where Percapitag is the independent variable, denoting GDP per capita growth, β_0 is the intercept, X_{it} is the vector of control variables (PPG to GDP, (PPG to GDP)^2, PPG to exports, (PPG to exports)^2, debt service to exports and gross fixed capital formation), β_{it} is the vector of estimated coefficients of the control variables and ε_{it} is the error term. Two specifications of equation (2) are estimated in order to analyze the debt overhang effect as measured by PPG external debt to GDP and PPG external debt to exports.

1.3.2 Data Used in the Study

The empirical analysis investigates the effect of PPG on economic growth in the five EAC member countries, Burundi, Kenya, Rwanda, Tanzania and Uganda. PPG external debt is the dominant type of external debt in these countries, on average accounting for 76.9 percent of the total external debt by 2014. The data used is from the World Bank Development Indicators (WDI) database, covering the period 1970 to 2014.

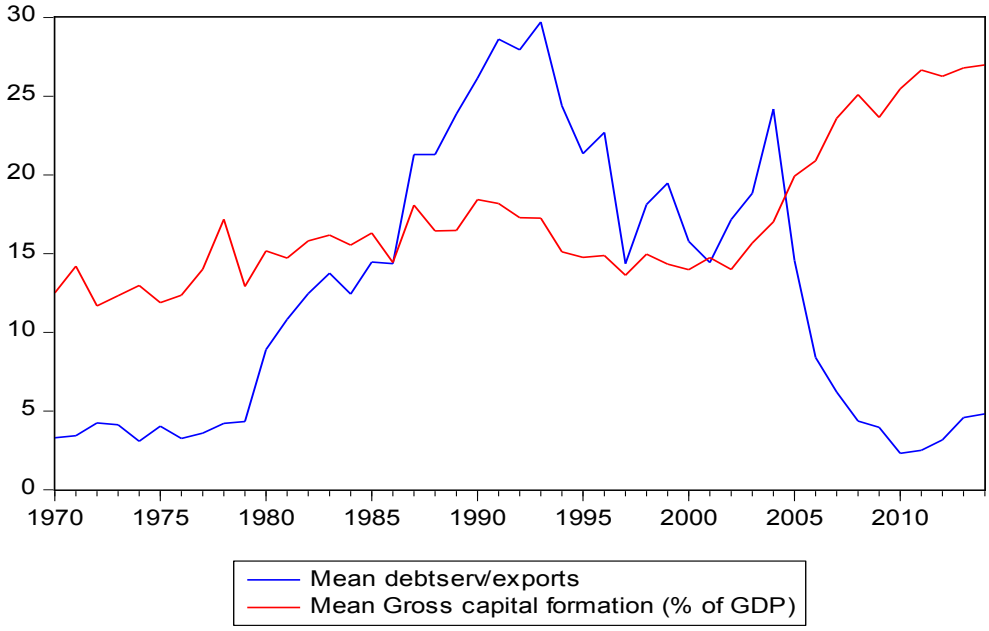
PPG external debt for the EAC countries peaked at about 104 percent of GDP in 1994 and closed at 19 percent of GDP in 2014, by which time all the EAC countries, with the exception of Kenya, had benefited from the public external debt relief initiatives (Figure 2). PPG external debt to exports for the EAC countries peaked at an average of 990 percent in the year 2000 and dropped to an average of 128 percent by 2014. GDP per capita growth for the EAC countries peaked at an average of 8 percent in 1995 and since then declined to an average of 3 percent in 2014. The peak in PPG external debt to GDP in 1994 corresponded to negative 10 percent growth in GDP per capita mainly contributed by a sharp decline in GDP per capita growth in Rwanda.

Figure 2: Trend in GDP per capita growth, PPG external debt to GDP and PPG external debt to exports for the EAC countries (values are in percent)



Average gross capital formation recorded its highest level in 2014 at 27.0 percent of GDP and recorded its lowest level of 11.7 percent of GDP in 1993 (Figure 3). The average debt service to exports peaked at 29.7 percent in 1993 from 3.1 percent in 1974 and closed at 4.8 percent in 2014. These trends are consistent with the high growth in the EAC countries in recent years and the public external debt relief which significantly reduced their external debt service payments. The trends in the variables included in this Study suggest that periods of low debt and debt service correspond to high growth in GDP per capita and gross fixed capital formation. The summary statistics and descriptions of all the variables are provided in the Appendix.

Figure 3: Trend in PPG external debt service to exports and gross fixed capital formation as a percent of GDP (values are in percent)



1.3.3 Panel unit root tests

As a first step to estimating the empirical model, we assessed the stationary properties of the variables to determine the appropriate econometric method to estimate our model. The panel unit root tests reveal that the independent variable (GDP per capita growth) and some of the explanatory variables (PPG external debt to exports and debt service to exports) are stationary {I(0)}while explanatory variables PPG external debt to GDP and gross fixed capital formation are not stationary {I(1)} (**Table 1**). Since the variables are a mixture of I(1) and I(0), this study uses the Pesaran et al. (2001) panel Autoregressive Distributed Lag (ARDL) model, which estimates the long run relationship between I(0) and I(1) variables.

Table 1: Unit Root Test Results.

Variable	LLC (level)	LLC (first difference)	Order of integration
GDP per capitag	-9.711***	-12.231***	I(0)
PPGEXP	-1.608***	-10.997***	I(0)
PPGGDP	-0.829	-11.180***	I(1)
GFCGDP	1.789	-18.858***	I(1)
DEBTSERVEXP	-1.711***	-15.083***	I(0)

Notes. Δ is first difference operator; * is the level of significance at 10%, and *** is the level of significance at 1%. Newey-West bandwidth selection with Bartlett kernel is used for the LLC

1.3.4 ARDL Model

The ARDL developed by Pesaran et al. (2001) is a least squares regression containing the explanatory variable and one or more of its lags. The ARDL model is denoted as ARDL (p, q1,….., qk), where p is the number of lags of the dependent variable, q1 is the number of lags of the first explanatory variable, and qk is the number of lags of the k-th explanatory variable. The ARDL cointegrating regression form (adapted from Eviews® Users Guide II, 2016) is given by:

$$\Delta y_t = \alpha + \sum_{i=1}^{p-1} \gamma_i{}^* \Delta y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \Delta x_{j,t-i,} \beta_{j,i}{}^* - \widehat{\Phi} EC_{t-1} + \varepsilon_t \quad \text{----------(3)}$$

Where:

$$EC_t = y_t - \alpha - \sum_{j=1}^{k} x_{j,t'} \hat{\theta}_j \quad ;$$

$$\widehat{\Phi} = 1 - \sum_{i=1}^{p} \hat{\gamma}_i \quad ;$$

$$y_i{}^* = 1 - \sum_{m=i+1}^{p} \hat{\gamma}_m \quad \text{and}$$

$$\beta_{j,i}{}^* = \sum_{m=i+1}^{q_j} \beta_{j,m}$$

The ARDL Model for the study on PPG external debt and growth is therefore as follows:

$$\Delta gdppercapita_t = \alpha + \sum_{i=1}^{p-1} \gamma_i{}^* \Delta gdppercapita_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \Delta x_{j,t-i,} \beta_{j,i}{}^* - \widehat{\Phi} EC_{t-1} + \varepsilon_t \quad \text{----(4)}$$

Where $X_{j,t-i,}$ is the vector of explanatory variables; public debt indicators (public external debt to GDP (PPGGDP) and public external debt to exports (PPGEXP)), gross fixed capital formation, trade as percentage of GDP (GFCGDP) and debt service to exports (DEBTSERVEXP). We selected a maximum of 1 lag for all the variables in order to minimize the loss of data, thus making the ARDL model ARDL (1, 1,1,1,1,).

1.4 EMPIRICAL RESULTS

The results of the estimated Panel ARDL model are presented in Tables 2 and 3.

1.4.1 Some robustness tests

The main robustness checks for non-linear regression model are cross-section dependence and log likelihood. Generally, panel models are associated with cross-sectional dependence, which arises from factors such as common shocks or unobserved common factors that may be in the estimated error term and correlated with the other explanatory variables and result in biased standard errors and thus misleading t-statistics and conclusions (De Hoyos and Sarafidis, 2006). The cross-sectional dependence test developed by Breusch and Pagan (1980) is well suited to this study since T=187 > N=5. The p-value of the Breusch-Pagan LM cross-section dependence (correlation) test is not significant at 1 percent, 5 percent and 10 percent levels of significance, we therefore fail to reject the null hypothesis of no cross dependence (Tables 2 and 3). For the two model specifications, PPG external debt to GDP and PPG external debt to exports, the values of the log likelihood, which provides an indication of the overall fit of the model specification to the data are not very different, 471.3 and 485.4, respectively, supporting the assumption that the two measures can be used to estimate the debt overhang effect.

1.4.2 Results for Model 1: Effect of PPG external debt to GDP on GDP per capita

The results for equation 4 show evidence of both the debt overhang and crowding out effects in the EAC Countries over the period 1971 to 2014. The negative and statistically significant error correction coefficient (-0.841) indicates that the variables have a long run relationship with economic growth with a fast adjustment to equilibrium of 84 percent (Table 2). The long run coefficient on public external debt to GDP is positive and significant and that on the quadratic form of the public external debt to GDP is negative and significant, providing evidence of the debt overhang effect. The coefficient on public external debt to GDP indicates that a one percentage point increase in public external debt to GDP is associated with a 0.1 percentage point increase in per capita GDP. The coefficient on debt service is also significant and negatively signed as expected, providing evidence of the crowding out effect. The gross fixed capital formation, however, is not significant. In the short run, PPG external debt has a negative and statistically significant effect on GDP per capita while gross fixed capital formation has a significant positive effect. The finding that the effect of PPG external debt is statistically significant in both the short and long run suggests that it has a strong causal effect on GDP per capita.

The results for the period preceding HIPC debt relief (1970 to 1999) show that the public external debt effect on per capita GDP growth is positive but not significant; however, the coefficient on the quadratic form of public external debt is negative and significant. This result is reversed for the period after HIPC debt relief (2000 to

2014), which shows a positive and significant effect of public external debt on per capita GDP and a negative but statistically insignificant effect of the quadratic form of public external debt. The result may be interpreted to indicate the improved effectiveness of public external debt post HIPC debt relief, indeed, the coefficient of public external debt improves from 0.057 to 0.135 between the two periods. However, the coefficient of gross capital formation declined between the two periods from 0.419 to 0.143 percentage points.

Table 2: Effect of PPG external debt to GDP on GDP per capita

Independent variable	**Entire period 1971-2014**	**1971-1999 (pre-HIPC)**	**2000-2014 (post-HIPC)**
Coefficient and (p-value)			
PPGGDP	0.087 (0.001) ***	0.057 (0.236)	0.135 (0.000) ***
PPGGDP ^ 2	-0.001 (0.000) ***	-0.001 (0.012) ***	-0.001 (0.281)
DEBTSERVEXP	-0.103 (0.010) ***	-0.121 (0.045) **	-0.478 (0.000) ***
GFCGDP	0.064 (0.198)	0.419 (0.004) ***	0.143 (0.000) ***
COINT	-0.841 (0.000) ***	-0.908 (0.000) ***	-0.990 (0.002) ***
Δ PPGGDP	0.003 (0.978)	-0.182 (0.479)	-0.236 (0.061) *
Δ PPGGDP ^ 2	-0.001 (0.385)	-0.000 (0.918)	0.002 (0.108)
Δ DEBTSERVEXP	0.035 (0.401)	-0.015 (0.823)	0.025 (0.820)
Δ GFCGDP	0.068 (0.269)	-0.250 (0.145)	0.316 (0.090) *
C	0.080 (0.616)	-3.998 (0.002) ***	-0.973 (0.396)
Observations	187	112	75
Result for debt overhang effect	Debt overhang present: significant coefficients for PPGGDP and PPGGDP ^ 2	No evidence of debt overhang: insignificant coefficient for PPGGDP but significant for PPGGDP ^ 2	No evidence of debt overhang: significant coefficient for PPGGDP but not for PPGGDP ^ 2
Result for crowding out effect	Crowding out effect present: significant coefficient for DEBTSERVEXP	Crowding out effect present: significant coefficient for DEBTSERVEXP	Crowding out effect present: significant coefficient for DEBTSERVEXP
Breusch-Pagan LM cross-section dependence	$\chi 2$ (10) = 12.212 (0.271)		
Log likelihood	-471.276	-286.668	-120.997

Source: Authors' computations

*significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent
Δ reports short run results

1.4.3 Results for Model 2: Effect of PPG external debt to exports on GDP per capita

The results for equation 4 show evidence of the debt overhang effect as measured by public external debt to exports in the EAC Countries over the periods 1971 to 1999 and 2000 to 2014, but not for the entire period 1970 to 2014 (Table 3). The coefficients for public external debt to exports and its quadratic form for the entire period 1970 to 2014 are correctly signed but not statistically significant. Pre-HIPC, the coefficient on public external debt to exports is positive and significant (0.014) and thereafter deteriorates post-HIPC to 0.003. The coefficient on debt service, which is significant and negatively signed pre-HIPC becomes positive and significant post-HIPC, providing evidence of the crowding out effect of public external debt pre-HIPC, but not post-HIPC. This result may be attributed to the debt relief which has significantly reduced the debt service obligations of these countries, and thus reduced the crowding out of private investments. In addition, in this model specification, the gross fixed capital formation is positive, but statistically insignificant in the pre-HIPC period, but positive and statistically significant post-HIPC.

Table 3: Effect of PPG external debt to exports on GDP per capita

Independent variable	**Entire period 1971-2014**	**1971-1999 (pre-HIPC)**	**2000-2014 (post-HIPC)**
Coefficient and (p-value)			
PPGEXP	0.001 (0.596)	0.014 (0.008) ***	0.003 (0.000) ***
PPGEXP ^ 2	-0.000 (0.953)	-0.000 (0.015) **	-0.000 (0.001) ***
DEBTSERVEXP	-0.178 (0.001) ***	-0.365 (0.000) ***	0.046 (0.001) ***
GFCGDP	-0.035 (0.403)	0.049 (0.565)	0.267 (0.000) ***
COINT	-0.829 (0.000) ***	-0.816 (0.000) ***	-0.854 (0.000) ***
Δ PPGEXP	0.002 (0.589)	0.018 (0.054) *	-0.053 (0.306)
Δ PPGEXP ^ 2	-0.000 (0.066) *	-0.000 (0.010) ***	0.000 (0.321)
Δ DEBTSERVEXP	0.180 (0.035) **	0.124 (0.166)	-0.203 (0.118)
Δ GFCGDP	0.125 (0.001) ***	-0.186 (0.084) *	0.361 (0.008) ***
C	3.249 (0.000) ***	1.323 (0.047) **	-4.080 (0.007) ***
Observations	187	112	75
Result for debt overhang effect	No evidence of debt overhang: insignificant coefficients for PPGGDP and PPGGDP ^ 2	Debt overhang present: significant coefficients for PPGGDP and PPGGDP ^ 2	Debt overhang present: significant coefficients for PPGGDP and PPGGDP ^ 2

Result for crowding out effect	Crowding out effect present: significant coefficient for DEBTSERVEXP	Crowding out effect present: significant coefficient for DEBTSERVEXP	Crowding out effect present: significant coefficient for DEBTS ERVEXP
Breusch-Pagan LM cross-section dependence	$\chi 2$ (10) =9.881 (0.451)		
Log likelihood	-485.367	-293.540	-109.104

Source: Authors' computations

*significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent
Δ reports short run results

1.5. CONCLUSION AND RECOMMENDATIONS

This study examined the impact of PPG external debt on economic growth in the five EAC member countries, Burundi, Kenya, Rwanda, Tanzania and Uganda with a view to answering one major research question as mentioned in Section 1 above, i.e. what is the effect of PPG external debt on economic growth in the EAC countries?

The main finding is that there exists debt overhang and crowding out effects over the period 1971 to 2014 in the EAC countries. This finding is consistent with the empirical literature which has established a non-linear relationship between public debt and economic growth. The results show that on average, for the five countries, a one percentage point increase in PPG external debt to GDP reduces GDP per capita by 0.2 percentage points in the short run but increases GDP per capita by 0.1 percentage points in the long run. Doubling PPG external debt in the long run has a negative effect on GDP per capita growth. The results point towards a quantitative effect of debt relief but may also suggest that the structural reforms that accompanied the debt relief led to better utilization of the borrowed funds as suggested by the improvement in the investment coefficient between the two periods.

The main policy recommendation arising from our analysis and findings is that the EAC countries should evaluate and strengthen the institutional and public finance management frameworks and macroeconomic policies and link them to effective utilization of PPG external debt. Future research in the form of country specific analyses on the PPG external debt-growth nexus should provide even deeper policy insights for the EAC countries.

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Appendices

Appendix 1: Variable Description and Notation

Variable	Notation
GDP per capita growth (annual %)	PERCAPITAG
External debt stocks, public and publicly guaranteed (PPG) (DOD, current US$) (% of GDP)	PPGGDP
External debt stocks, public and publicly guaranteed (PPG) (DOD, current US$) (% of exports)	PPGEXP
Debt service, public and publicly guaranteed (PPG) (DOD, current US$) (% of exports)	DEBTSERVEXP
Gross capital formation (% of GDP)	GFCGDP

Appendix 2: Summary of Descriptive Statistics

	PERCPITAG	PPGGDP	PPGEXP	DEBTSERVEXP	GFCGDP
1970-2014					
Mean	1.5	43.8	418.7	13.3	17.9
Median	1.5	31.8	189.9	10.3	17.5
Maximum	37.1	159.5	2,854.9	92.7	33.2
Minimum	-47.7	0.9	7.7	0.4	2.8
Std. Dev.	6.1	35.9	506.5	13.0	6.7
Skewness	-1.5	1.1	2.1	2.1	-0.1
Kurtosis	29.6	3.4	8.0	10.0	2.4
Observations	192	192	192	192	192
Pre-HIPC Debt Relief (1970-1999)					
Mean	0.8	46.2	419.3	15.6	15.7
Median	0.5	37.8	223.2	13.4	15.1
Maximum	37.1	136.2	2,144.9	54.0	29.8
Minimum	-47.7	0.9	7.7	0.4	3.2
Std. Dev.	7.5	36.8	440.5	11.7	5.9
Skewness	-1.1	0.9	1.5	0.8	0.1
Kurtosis	21.4	2.9	5.2	3.1	2.4
Observations	117	117	117	117	117
Post-HIPC Debt Relief (2000-2014)					
Mean	2.6	40.1	417.6	9.7	21.4
Median	2.6	20.6	158.2	5.3	21.7
Maximum	10.7	159.5	2,854.9	92.7	33.2
Minimum	-4.4	10.8	50.8	0.7	2.8

	PERCPITAG	PPGGDP	PPGEXP	DEBTSERVEXP	GFCGDP
Std. Dev.	2.6	34.5	598.3	14.2	6.4
Skewness	0.0	1.5	2.4	3.7	-0.7
Observations	75	75	75	75	75

Appendix 3: Correlation Matrix

1970-2014					
	PPGGDP	PPGEXP	DEBTSERVEXP	GFCGDP	PERCPITAG
PPGGDP	1				
PPGEXP	0.9	1			
DEBTSERVEXP	0.8	0.8	1		
GFCGDP	-0.2	-0.4	-0.3	1	
PERCPITAG	-0.2	-0.2	-0.1	0.2	1
Pre-HIPC Debt Relief (1970-1999)					
	PPGGDP	PPGEXP	DEBTSERVEXP	GFCGDP	PERCPITAG
PPGGDP	1				
PPGEXP	0.8	1			
DEBTSERVEXP	0.8	0.7	1		
GFCGDP	0.2	-0.1	0.1	1	
PERCPITAG	-0.2	-0.2	0.0	0.1	1
Post-HIPC Debt Relief (2000-2014)					
	PPGGDP	PPGEXP	DEBTSERVEXP	GFCGDP	PERCPITAG
PPGGDP	1				
PPGEXP	0.9	1			
DEBTSERVEXP	0.8	0.8	1		
GFCGDP	-0.7	-0.7	-0.6	1	
PERCPITAG	-0.4	-0.4	-0.4	0.2	1

2.0 ECONOMIC GROWTH AND EXTERNAL DEBT IN SELECTED SSA COUNTRIES

By Marshall Makate[5], Nyasha Mahonye[6], Leonard Mandishara[7]

Abstract

This study uses panel data to examine the relationship between external debt and economic growth in a sample of 40 Sub-Saharan African countries. Using fixed effect, two stage least squares and system generalized method-of-moments techniques, empirical estimates indicate the existence of a negative relationship between external debt and economic growth. Specifically, a one percent increase in foreign debt significantly reduces economic growth by nearly four percentage points. Fixed effect regression estimates revealed a non-linear association between foreign debt with per capita output growth, primarily characterized by a maximum turning point of nearly 35% of Gross National Income and statistically significant. Concerning other explanatory variables, the findings indicate that export growth and private savings all positively correlate with economic growth. We failed to find any statistically significant pathways through which external debt might influence economic growth. Our findings, to a broader extent underscore the need for coordinated regional approach to building the much-needed capacity for better external debt management strategies in Sub-Saharan Africa.

Keywords: External debt; threshold; per capita GDP growth; System-Generalized Method-of-Moments; Sub-Saharan Africa.

2.1 INTRODUCTION

Lack of concrete policy prescriptions on the appropriate level of total public debt is heightened by the dearth of empirical research on the connection between economic growth and debt. Several governments have often resorted to limiting the accumulation of domestic debt given the potentially deleterious impacts it may have on the macro-economy (Christensen, 2005; C. M. Reinhart & Rogoff, 2010b). However, are large or smallholdings of external debt bad or good for developing economies? Is there a particular threshold beyond which the observed relationship between external debt and national output changes? Until recently, limited consideration has been given to these issues in the context of developing countries, despite the potentially significant implications on macroeconomic stability, fiscal sustainability, capital accumulation, and economic growth.

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This study, examines the relationship between external debt and economic growth to enrich our understanding of this link in the context of developing countries, especially in Sub-Saharan Africa (SSA). The literature in macroeconomics has established numerous mechanisms through which public debt (external debt included) might influence economic growth (as measured by growth in Gross Domestic Product (GDP)). High stocks of government debt may lead to high-interest rates, crowding out private investment which consequently depresses economic growth (C. M. Reinhart & Rogoff, 2010b). Public debt can have non-linear effects on output through its impact on public investment and total factor productivity (Checherita-Westphal & Rother, 2012). In addition, debt might negatively influence economic growth if a country's external debt exceeds its ability to repay the debt, "the debt overhang hypothesis". Once a country experiences debt overhang, it diminishes its capacity to grow since a significant portion of its national output will be devoted to repayment of the debt which consequently discourages investment (Clements et al., 2003; Krugman, 1988; Sachs, 1989). However, high accumulation of external debt might promote short-run economic growth if the borrowed funds are used efficiently (Jayaraman & Lau, 2009). Given the disproportionate share of debt burdens as well as unstable growth patterns in developing countries, there is a need to understand the role of external and domestic debt holdings in influencing economic growth patterns in developing countries.

The central objectives of this study are three-fold. First, to examine the critical role played by external debt on economic growth in 40 countries in SSA. The analysis focuses on the essential role played by external debt on economic growth since data on domestic debt is not readily available for most countries in SSA. Second, to explore the potential channels through which external debt might influence economic growth in the studied countries. Lastly, we attempt to establish the threshold of external debt beyond which economic growth starts to be negatively impacted in the sampled countries in SSA.

2.1.1 Background and motivation of the research work

The Southern Africa Development Community (SADC) and other regional economic integration blocks in SSA have set some macroeconomic convergence targets, which include a public debt to GDP ratio of about 60% (for SADC countries) (Southern African Development Community, 2013). This objective came to light shortly after realising that debt management is indeed a critical component for sustainable economic growth. Thus, prudent management of public debt is essential in achieving progressive economic growth. In this regard, most countries in SSA were below the set target of the 60% threshold by 2013 except Seychelles (approximately 79%) and Zimbabwe (approximately 66%) (Southern African Development Community, 2013). It is essential to note that the 60% benchmark becomes satisfactory if and only if it is accompanied by significant improvements in the way the economy is managed. In other words, a country might still satisfy the 60% benchmark and yet with poor economy management practices. Whether the set benchmark of 60% is the critical point at which economic growth starts to decline in the context of SSA remains to be tested. Regarding recent statistics on external debt as a share of GDP, Mozambique and Zimbabwe ranked top among SADC countries holding larger proportions of

external debt relative to GDP in 2016 at 79.2% and 63.4%, respectively (Southern African Development Community, 2016). According to Renhairt and Rogoff (2010b) who studied panel data for selected developed and emerging economies, when gross external debt reaches 60% of GDP, annual growth declines by about two percent; for levels of external debt in excess of 90% of GDP, growth rates are roughly cut in half. However, the specific threshold beyond which external debt negatively impact economic growth in the case of SSA might be different. However, the general observation that a higher level of either domestic debt or external debt to GDP ratio beyond an optimally determined benchmark is harmful to economic performance may not be questionable even in the case of SSA. Regardless, both domestic and external borrowing remain attractive alternatives for Southern Africa Countries. It is also important to note that public debt has been accruing in these countries as part of the efforts to addressing chronic budget deficits.

Debt defaults in Heavily Indebted Poor Countries (henceforth, HIPCs) and the recent crisis in European countries such as Portugal, Ireland and Italy, Greece and Spain have inspired studies by Reinhart and Rogoff (2010). The economic growth trajectories in times of debt matter as studied by Reinhart and Rogoff (2010) who shows a rather weaker association between economic growth and external debt especially for debt/GDP ratios lower than 90%. We test the conclusions of Reinhart and Rogoff (2010) in the context of selected developing countries in SSA. Many of these countries have been classified by the IMF as HIPCs and have a history of high default rates as well as high external debt stocks. Also, given that previous studies have reported sluggish growth for some countries in SSA (Azam et al., 2002; Collier & Gunning, 1999; Sachs & Warner, 1997), it will be interesting to examine whether external debt has had any effect whatsoever on the growth trajectories of these countries in SSA. If external debt impacts economic growth, we examine whether it has a non-linear effect and quantify the specific threshold beyond which it begins to adversely impact economic growth including the possible channels of transmission. To the best of our knowledge, these issues have not been adequately addressed in the context of SSA countries.

2.2 ECONOMIC PERFORMANCE IN SUB-SAHARAN AFRICA

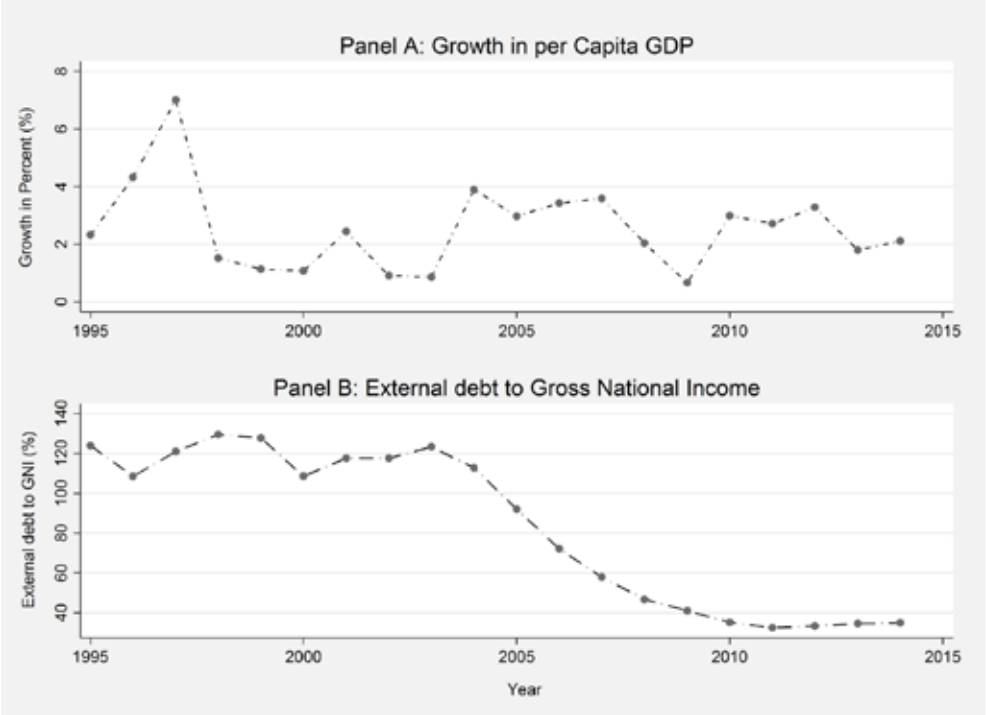
In this section, we provide an overview of the economic outlook in SSA by way of descriptive statistics presented in tables and figures for the overall pooled sample of countries under study. Starting with the estimates presented in Table 1, we demonstrate the variability in our data, both within and across countries hence justifying the inclusion of these variables in the econometric analysis. Concerning external debt stocks (expressed as percent of Gross National Income (GNI)), the overall standard deviation reveals sufficient heterogeneity in the levels of external debt (from 90.10% between and 81.73% within countries).

Table 1: Summary statistics for selected variables, 1995-2014

		Standard deviations			
Variables	Mean	Overall	Between	Within	Observations
Annual GDP growth (%)	5.15	8.53	3.68	7.71	911
GDP per capita (constant 2011 $U.S.)	4086.96	5797.89	5404.85	2188.59	912
GDP per capita growth (%)	2.55	8.03	3.32	7.32	911
External debt stocks (% of total exports)	348.67	501.39	347.99	358.20	698
External debt stocks (% of GNI)	83.61	118.62	90.10	81.73	842
Primary school enrollment (%)	93.68	25.98	23.60	13.67	744
Annual population growth (%)	2.50	0.92	0.70	0.59	937
Gross fixed capital formation (% of GDP)	21.82	17.50	13.47	11.26	830
Gross domestic savings (% of GDP)	9.43	23.83	19.80	14.48	827
Private sector credit (% of GDP)	19.41	22.87	21.60	6.74	868

Figure 1 displays the trends in GDP per capita growth and external debt as share of GNI over time. Panel A of Figure 1 shows the general trend in GDP per capita growth since 1995. The evolution of annual GDP per capita growth shows an initial growth rate of about 2% in 1995 peaking to about 7% in 1997 before declining to below 2% in 1998. The 1990s period coincides with the structural adjustment program period inspired by the World Bank and IMF to improve economic growth in many African countries. In addition, this period coincides with the Asian and Russian crises, which to some extent have had spillover effects on economic growth in Africa. Even though the mentioned crises could have impacted economic activity in SSA, we do not formally test this claim since it is beyond the scope of the present analysis. While some countries might have benefited from these initiatives, others had modest to low benefits. The period after 2000 shows a modest growth in per capita GDP averaging about 3% or less. We note a significant drop in per capita GDP growth from 2007 to 2009, a period when the world experienced the financial economic crisis. In the case of Africa, per capita GDP growth in 2009 dropped to about 1% as noted in Figure 1. From 2009 thereafter, growth in per capita income slightly recovered an average of about 2%.

Figure 1: Trends in per capita GDP and external debt to GNI ratio in sub-Saharan Africa



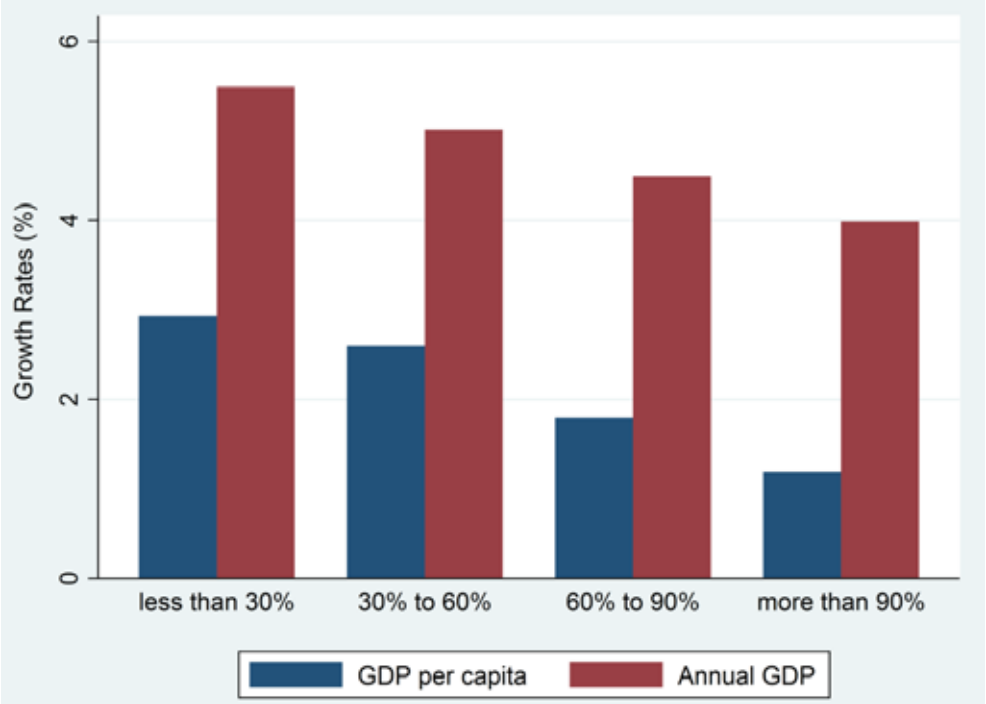
Source: World Development Indicators (WDI), 1995-2015: authors own calculations

Panel B of Figure 1 shows the evolution of external debt to GNI in sub-Saharan Africa between 1995 and 2014. Between 1995 and 2003, countries in Sub-Saharan Africa held debt stocks averaging about 100% or more of GNI. From 2003 thereafter, we observe a persistent decline in the share of external debt stocks to levels below 40% of GNI. There are two potential explanations here. First, it is plausible that

the volume of exports to the rest of the world has gradually been increasing over time, which increases the GNI with very little accumulation of external borrowings. Second, the decline in the share of external debt might indicate an increasingly declining share of external debt held by countries in SSA following the debt relief process. In addition, we provided a correlation matrix in Appendix Table A2 for selected variables used in the analysis. The results are statistically significant and reveal a negative relationship between external debt and per capita GDP growth. This observed negative relationship gives a hint on the important relationship between debt and economic growth. Regarding other variables such as institutional variables, we find a positive association between economic growth, government effectiveness and gross fixed capital formation. This suggests that countries with higher levels of government effectiveness are likely to experience higher economic growth and likely to have higher levels of investment as proxied by gross fixed capital formation. However, these results are to be interpreted with caution as they merely represent correlations and not suggestive of any causality.

In Figure 2, we illustrate a descriptive summary on the relationship between external debt categories and GDP per capita growth for all the 40 countries under analysis covering the period 1995-2015. As in C. M. Reinhart and Rogoff (2010b), we categorized external debt (% of GNI) into four categories: (1) below 30%; (2) between 30 and 60%; (3) between 60 and 90%; and (4) above 90% (C. Reinhart & Rogoff, 2010a; C. M. Reinhart & Rogoff, 2010b). The vertical bars show the average GDP growth per capita or overall GDP growth stratified by the debt thresholds.

Figure 2: Relationship between GDP growth, per capita GDP growth and different thresholds of external debt (% of GNI) in sub-Saharan Africa countries



Source: World Development Indicators (WDI), 1995-2015; authors own calculations

It appears from Figure 2 that countries with low levels (below 30%) of external debt stocks experienced high growth in per capita and overall GDP of about 3.5 and 6.1% respectively. On the other end of the spectrum, we observe that countries with higher stocks of debt seem to experience sluggish growth rates in output averaging around 1.5% for per capita GDP and around 4% for overall GDP growth. This evidence is consistent with the hypothesis that external debt levels have a deleterious impact on economic growth. Even though Figure 2 shows rather closely matching levels of annual growth in GDP, there are significant differences in the case of per capita GDP growth. This suggests that the impact of external borrowings might seemingly show minimal impacts on overall GDP growth but with equally dire effects on the per capita levels of GDP.

2.3 EMPIRICAL LITERATURE

Traditionally, governments in most developing countries have often relied on external sources of funding for their fiscal and monetary operations (Bua et al., 2014). While external sources of finance remain an important aspect of economic development, recent focus in these countries has shifted to domestic markets (C. M. Reinhart & Rogoff, 2011). In recent times, there has been considerable debate on the question of whether domestic debt should constitute a larger portion of government debt than external debt (and vice versa) (Abbas & Christensen, 2010). The lack of concrete policy prescriptions is further heightened by the dearth of empirical research on this issue. Governments have often resorted to limiting the accumulation of domestic debt given the potential deleterious impacts it has on the macro-economy (Christensen, 2005; C. M. Reinhart & Rogoff, 2010b). Besides, the question of whether a causal relationship exists between debt and economic growth is still a matter of debate in the empirical literature (Panizza & Presbitero, 2013; Panizza & Presbitero, 2014).

Reinhart and Rogoff (2010) looked at economic growth and inflation at different levels of government and external debt. Their analysis showed a weak relationship between government debt and real GDP especially for debt/GDP ratios below a threshold of 90 percent. The study by Egert (2015) put a variant to Reinhart and Rogoff dataset and shows that a negative nonlinear relationship between the public debt-to-GDP ratios is extremely difficult and sensitive to modelling choices and data coverage. The estimations by Caner, Grennes and Koehler (2010) recommended a public debt-to-GDP ratio of about 77 percent. Thus, debt levels beyond this thereshold imply that each successive percentage point of public debt costs approximately 0.017 percentage points in annual real GDP growth. The effect was more pronounced in emerging markets where the threshold stood at about 64 percent (i.e. debt-to-GDP ratio).

In another study, Ferraz and Duarte (2015) explored the link between economic growth and public debt using time series data spanning 1974-2014. Their analyses established a negative relationship between economic growth and public debt. This relationship was more pronounced in Portugal, Ireland, Italy, Greece and Spain (i.e. PIIGs) than the case of Portugal alone. Using a panel dataset of six countries in the Pacific Islands (PIC), Jayaraman and Lau (2009) failed to find a statistically significant long-term relationship between debt and economic growth; although a short run bi-directional, causal relationship was verified. Their findings were mostly explained by the fact that external debt in the PICs mostly contributed positively to economic growth in the short term and as such led to more favorable borrowing conditions on loans, which contributed to further accumulations of external debt.

The current study examines the relationship between economic growth and external debt for a sample of countries officially classified as HIPCs (i.e. Burundi, Malawi, Mozambique, Rwanda, Tanzania, Uganda, and Zambia including others (see Table A3 in the Appendix). Even though some countries like Zimbabwe do not appear on the HIPCs list, they still owe enormous amounts of external debt to international

money-lending institutions (Southern African Development Community, 2016). In some way, we build on previously related studies in SSA by testing the effect of external debt on economic including determining the possible mechanisms through which external debt might affect economic growth. Table A1 in the appendix provides a high-level overview or summary of relevant published scientific research articles on debt and economic growth.

2.4 THEORETICAL MODEL

The analysis in this study adopts the standard neoclassical growth model as the theoretical framework in which economic growth is presumed to be a function of capital, labor and technology (Robert J Barro, 2004). The basic production function takes the following form:

Where represents the output produced at time , is the capital input at time (e.g. stock of buildings, machines etc.), denotes the labor at time , and is the level of technology at time. The labor and capital inputs are assumed to be paid by their marginal productivity. The production function specified in equation (1) is assumed to satisfies the usual properties and for brevity we omit the specific technical details here (for more details see e.g. Robert J Barro (2004)). In this model, labor grows at the same rate as the exogenous population growth rate. We augment equation (1) to include external debt and other explanatory variables assumed to influence economic growth. The augmented production function is therefore expressed as follows:

Where is the external debt to gross national income ratio or expressed as a percentage of exports of goods and services and is the vector of other explanatory factors at time that are believed to impact economic growth. These factors include the growth rate in population to account for the size of countries. Population growth might positively influence economic growth through its influence on the human capital development. However, its exact impact on economic growth is still unclear. Additionally, we include a proxy for human capital development as measured by the primary school enrolment rate. A high level of education has a positive influence of physical and human capital accumulation in an economy and thus positively affect growth (Robert J Barro, 2004; Checherita-Westphal & Rother, 2012; Panizza & Presbitero, 2014; Pattillo et al., 2002). We also include controls for the quality of institutions as proxied by government effectiveness and an index of corruption, which might plausibly influence economic growth (Mbate, 2013). Specifically, we expect countries with higher ratings on government effectiveness to exhibit higher growth rates while those with high corruption ratings perform poorly. In addition, we control for export growth, gross capital formation as a share of GDP, gross domestic savings as share of GDP, which are all presumed to positively influence economic growth (Robert J Barro, 2004; Robert J. Barro, 2015; Checherita-Westphal & Rother, 2012; Panizza & Presbitero, 2014). Increasing export revenues might help boost financial resources for domestic projects, which in turn increases economic growth.

2.5 METHODOLOGY AND DATA

We use an annual panel data set of about 40 countries in SSA spanning the period 1995-2014. The primary source for this data is the World Development Indicator (WDI) database created by the World Bank (World Bank, 2016). Following the theoretical framework as laid out earlier, our empirical model takes the form as specified in Abbas and Christensen (2010) and the rich economic growth literature (Baum et al., 2013; Mbate, 2013; Panizza & Presbitero, 2014; Siddique et al., 2016). The dynamic panel data model we estimate thus takes the following form:

Where represents the GDP per capita growth for the country in period/year , is the GDP per capita growth in period (initial period of analysis), is the external debt term expressed as a share of GNI, and is the vector of explanatory variables as mentioned earlier. We also note that external debt depends on its own lagged values and other factors as shown in equation (4) including unobserved factors influencing both growth and external debt thus, emphasizing the potential endogeneity of the external debt variable. The parameter is the country-specific trend term to control for any time and country-specific time trends, is a measure of unobserved country fixed-effects while is a measure of unobserved time fixed effects that control for differences in technologies over time and other unmeasured country features, and is a stochastic error term.

As highlighted in Cameron and Trivedi (2005), estimating equation (3) via static panel data techniques such as ordinary least squares (OLS), within estimators and random effects techniques all result in inconsistent estimates. The inconsistency arises due to the potential endogeneity nature of the external debt variables, which if left uncorrected results in misleading coefficient estimates. A potential source of endogeneity bias is the possibility of reverse causation where negative or unsatisfactory growth rates of GDP per capita might induce governments to borrow large amounts of debt. Previous research on economic growth mostly uses instrumental variable (IV) techniques to deal with the noted potential endogeneity bias (Abbas & Christensen, 2010; Baum et al., 2013; Checherita-Westphal & Rother, 2012; Mbate, 2013). The analysis in this study uses system generalized method-of-moments (henceforth, System-GMM) techniques as first established by Blundell and Bond (1998) to diminish the possible influence of endogeneity. One of the advantages of the system GMM technique over the traditional IV estimator is its ability to account for the dynamic nature of the data, and problems associated with reverse causality. Thus, the model (our preferred specification) takes the following form:

Identification of equation (5) requires the use of appropriate instrumental variables for the debt variables for each country. As is standard practice in this literature, we instrument the external debt variable using its own time lags (Abbas & Christensen, 2010; Checherita-Westphal & Rother, 2012; Eberhardt & Presbitero, 2015; Panizza & Presbitero, 2014). Equation (5) is the primary model to examine the effect of external debt on economic growth. In addition, variations of this model are used to explore the mechanisms through which external debt impacts economic

growth with the only difference being that the dependent variable(s) in this case becomes the considered mechanisms. Addressing the other objective of the study, external debt variable in equation (5) is replaced with external debt thresholds to assess the possible external debt cut-point at which external debt may negatively impact economic growth. In this regard, our estimates are robust to potential heteroscedasticity and clustering at the country level.

2.5.1 Robustness checks

To check the reliability of our empirical estimates, we conduct several sensitivity checks. First, we used a categorical measure of debt to assess the impact of various debt thresholds on economic growth. Our categorization of external debt closely follow that in C. M. Reinhart and Rogoff (2010b) who categorized external debt into four thresholds (i.e. less than 30% of GNI, 30-60%, 60-90%, and above 90%). We acknowledge the possibility that these thresholds may not necessarily be applicable in the case of developing countries such as in SSA. Nevertheless, we are primarily interested in testing how these thresholds relate to economic growth. Second, we considered a different measure of external debt defined as the share of external debt to a country's exports of goods and services. The aim is to assess the implications of external debt in relation to a country's ability to pay (measured by its export revenue). We expect to observe those countries with very high levels of debt relative to their exports to experience stifled growth levels since high levels of external debt are more likely to diminish their capacities to service their debt. Third, we included private sector credit in equation (3) to check the robustness of our estimates to a slightly modified specification. Overall, the results indicate that our primary estimates reported in Table 3 are weakly robust to the suggested sensitivity checks.

2.5.2 Results

Economic growth and external debt

Table 2 presents the results of the main analysis for the relationship between external debt and GDP per capita growth (i.e. economic growth). Columns (1) and (2) show the coefficient estimates together with their standard errors (column (2)) from an ordinary least squares (OLS) regression model. The results indicate a negative association between external debt and economic growth and statistically significant at the 5% level. The results from the fixed effect model shown in columns (3) and (4) show that the estimates are nearly similar to the OLS model. The only observed difference between the two models being in the standard errors. Specifically, the standard errors for the fixed effect model are slightly lower than they are in the OLS model suggesting better precision of the fixed effect model relative to the OLS. However, the OLS model shows a slightly higher R-squared (0.498) compared to the 0.333 for the fixed effect model. The 2SLS fixed effect model results also reveal a negative association between external debt and economic growth. We found that a 1% rise in external debt reduces economic growth by nearly 1.0 percentage points and statistically significant at the 10% level. The results from the system GMM (our preferred specification) show a similar pattern though the decline in output

following a rise in external debt is much higher compared to the estimates reported in the OLS, fixed effect and 2SLS models. Following a 1% increase in debt, we observe a 4-percentage point decline in output and statistically significant at the 5% level.

The findings here are consistent with recent observations by Siddique et al. (2016) who examined the impact of debt in a sample of 40 highly indebted poor countries (HIPC) over the period 1970-2007. Their analysis revealed that debt (% of GDP) had a negative association with economic growth both in the short and long-run periods. Thus, our findings are consistent with the debt overhang hypothesis that a country experiences what is termed debt overhang when its stock of external debt exceeds its own ability to repay this debt. This forces a large share of its GDP to be devoted to the payment of the debt and hence stifling economic growth (Krugman, 1988; Sachs, 1989).

Table 2: External debt and economic growth in sub-Saharan Africa

	OLS		Fixed effects		IV/2SLS		System GMM	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial per capita GDP growth	0.021	(0.097)	0.021	(0.092)	0.019	(0.066)	-0.227***	(0.057)
External debt	-0.015**	(0.006)	-0.015**	(0.006)	-0.010*	(0.006)	-0.040**	(0.020)
Export growth	0.060***	(0.015)	0.060***	(0.014)	0.060***	(0.012)	0.048***	(0.010)
Domestic savings	0.058**	(0.022)	0.058***	(0.021)	0.064***	(0.021)	0.048	(0.030)
Primary school enrollment	0.029	(0.029)	0.029	(0.027)	0.031	(0.023)	0.039	(0.041)
Population growth	0.532	(0.402)	0.532	(0.383)	0.552*	(0.290)	0.429	(0.360)
Government effectiveness	4.734	(7.742)	4.734	(7.386)	4.784	(6.955)	5.021	(8.076)
Corruption	-2.075	(5.385)	-2.075	(5.137)	-1.884	(4.455)	-0.824	(5.623)
Expenditures on health	0.098	(0.272)	0.098	(0.259)	0.108	(0.259)	-0.040	(0.232)
Number of observations	511		511		509		415	
Number of instruments							34	
Hansen test p-value							0.405	
AR(1) p-value							0.0918	
AR(2) p-value							0.632	
R-squared	0.498		0.333		0.333			
Number of countries	40		40		39		38	

*Note: ***Significant at 1% level; **significant at 5% level; *significant at 10% level.*

Reported are regression coefficient estimates and standard errors in parentheses. The standard errors are robust and adjusted for finite sample bias including clustering at the country level. All the regressions include controls for year fixed effects country fixed effects and country-year fixed effects.

Table 2 also shows the influence of the other variables used in the model. Specifically, as expected, we found a positive correlation between the level of domestic savings and economic growth and all significant at the 10% level. In addition, we observed that countries with high levels of growth in exports are liable to experience higher levels of economic growth and this result is statistically at the 1% level in all the models. This result highlights the importance of exports in economic development of the African region. We failed to find a statistically significant impact of primary school enrollment, population growth, government effectiveness, corruption and health expenditures on economic growth. Our findings here are also consistent with the findings in previously related studies in this area (Abbas & Christensen, 2010; Checherita-Westphal & Rother, 2012; Eberhardt & Presbitero, 2015; Panizza & Presbitero, 2014). It is also important to note that the R-squared reported in Tables 2, 3 and 4 are on the low end. This observation is mostly due to the fact that the R-squared reported in the case of panel data models are cross-sectional in nature and do not necessarily have any serious implications on model fitness. Thus, the reported R-squared are not interpreted for that reason.

External debt threshold analysis and robustness checks

One of the primary goals of this analysis was to quantify the threshold at which external debt (% of GNI) begins to negatively impact annual GDP growth. In Table 3, we commence with a very basic model that considers the external debt variable grouped into four categories. The results shown in column (1) reveal that compared to countries holding external debt levels lower than 30%, countries that hold excessively higher proportions of external debt are likely to experience negative growth rates and statistically significant at the 5% level. Specifically, we established that a 1% rise in external debt translates to an approximate 2.51% decline in GDP growth for countries holding levels of external debt 90% and above compared to those holding just less than 30%. However, this result does not capture the non-linear effect of external debt and neither does it answer the question concerning the specific threshold at which external debt begins to reduce growth in GDP. To explore this possibility, we estimate a variant of the model specified in equation (3) but this time including a squared term of external debt and specified as follows:

$$growth_{it} = \alpha + \gamma growth_{it-1} + \psi Debt_{it} + \delta Debt_{it}^2 + \beta X'_{it} + v_t + \varepsilon_{it} \quad (6)$$

where $Debt_{it} = \log\left(\frac{debt}{GNI}\right)_{it}$, $Debt_{it}^2 = \log\left(\frac{debt}{GNI}\right)_{it}^2$, $growth_{it}$ is the per capita GDP growth as in equation (3), and is the previous growth level of per capita GDP in country. With very little algebraic manipulations, the optimal threshold of external debt (% of GNI) is easily found by calculating the first derivative of equation (6) with respect to and equating to zero and solving for the threshold as follows:

$$\frac{\partial growth_{it}}{\partial(Debt_{it})} = \frac{\partial(\alpha + \gamma growth_{it-1} + \psi Debt_{it} + \delta Debt_{it}^2 + \beta X'_{it} + v_t + \varepsilon_{it})}{\partial(Debt_{it})} \quad (7)$$

$$0 = \psi + 2\delta Debt_{it} \Leftrightarrow Debt_{it} = \frac{-\psi}{2\delta} \quad (8)$$

Given that we external debt is expressed in logarithms, we adjust for this to get the external debt threshold as follows:

$$\text{External debt threshold} = \exp\left(\frac{-\psi}{2\delta}\right) \tag{9}$$

Results in **Table 3,** columns (2) and (3) consider alternative measures of external debt as proxied by the share of external debt to exports of goods and services in the economy and multilateral debt as additional robustness checks. The results suggest a negative correlation with economic growth though not statistically significant. We are not deeply concerned about the insignificance of these estimates given the problems with missing observations in the alternative measures of external debt considered.

Table 3: External debt and economic growth in sub-Saharan Africa - robustness

	(1)		(2)		(3)	
Initial per capita GDP growth	0.009	(0.092)	-0.112*	(0.057)	0.027	(0.092)
External Debt/GNI						
30-59%	-0.327	(0.672)				
60-89%	-1.578*	(0.663)				
90%+	-2.510**	(0.858)				
Export growth	0.060***	(0.014)	0.036**	(0.011)	0.061***	(0.014)
Domestic savings	0.048*	(0.023)	0.066*	(0.028)	0.060*	(0.024)
Primary school enrollment	0.033	(0.029)	0.016	(0.027)	0.028	(0.027)
Population growth	0.739	(0.393)	0.348	(0.267)	0.566	(0.390)
Government effectiveness	3.843	(7.377)	15.340	(9.000)	5.673	(7.301)
Corruption	-1.576	(4.918)	-11.803	(9.206)	-2.395	(5.456)
Expenditures on health	0.174	(0.266)	0.009	(0.261)	0.117	(0.238)
External debt to exports			-0.000	(0.003)		
Multilateral debt					-0.022	(0.031)
Year fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Country-year specific fixed effects	Yes		Yes		Yes	
Observations	511		434		513	
R-squared	0.336		0.288		0.330	

Note: ***Significant at 1% level; **significant at 5% level; *significant at 10% level. Reported are regression coefficient estimates and standard errors in parentheses. The standard errors are robust and adjusted for finite sample bias including clustering at the country level. The dependent variable in all the specifications is GDP per capita growth. The reference group for external debt to GNI is the category "below 30%" level. The dependent variable in all the models is economic growth as measured by per capita GDP growth as mentioned earlier.

The results exploring the potential non-linear association between external debt (% of GNI) are furnished in Table 4. The estimates presented here are from fixed effect regression models estimated using equation (6). We tested several specifications of the fixed effect models to establish a possible range of the external debt threshold in the sample of countries under study. First, column (1) presents estimates of a more parsimonious specification in which we only control for the initial level of GDP growth, external debt, external debt squared, and year fixed effects. The results indicate that external debt (% of GNI) begins to detrimentally influence GDP growth at a threshold of nearly 34.61% and statistically significant at the 5% level. Second, the results in column (2) when we add annual population growth in addition to the variables controlled in column (1) shows that the threshold changes to about 21.35% and statistically significant at the 5% level. The estimates in columns (3) and (4), when we include the square of population growth and the level of government effectiveness. The corresponding thresholds of external debt are approximately 20.59 and 18.34%, respectively. Finally, columns (5) and (6) include additional controls such as political stability score and the overall governance score[8], respectively. The external debt thresholds we found are 23.62 and 24.29%, respectively and statistically significant at the 10% level. Overall, our analysis shows that the specific threshold at which external debt begins to have a deleterious effect on GDP growth ranges from 18.34 to 34.61% and obviously depends on the model specification. The more parsimonious specifications where we control for fewer variables appear to result in a higher external debt threshold compared to models where more variables are included. Another caveat in our results pertains to the mix of countries in our sample. Obviously, the question of a specific external debt threshold is country-specific. Hence, the reader should interpret our estimates with caution and merely take them as a guide to countries in SSA.

Putting our threshold analysis estimates into perspective, we believe that the observation of a non-linear effect of external debt might a result of the pressures exerted by the interest repayments associated with externally borrowed funds. The realization of an external debt threshold underscores the importance of establishing specific external debt benchmarks that limit external borrowing and thus preserve domestic fiscal integrity. While the empirical literature especially in low-income countries suggests an external debt (% of GDP) threshold in the 30-37% range, our findings in the 18-35% range of external debt to GNI are broadly consistent with these previous studies (see for example, (Clements et al., 2003)). Most importantly, as we have established in the analysis, the specific threshold computed largely depends on the specific empirical model that is estimated.

[8]The governance score is found through Principal Components Analysis (PCA) of all the governance indicators including regulatory quality, government effectiveness, rule of law, control of corruption, political stability, and voice and accountability score.

Table 4: Fixed effects estimates: What is the threshold at which external debt (% of GNI) begins to negatively impact GDP growth in sub-Saharan Africa

Specifications	(1)		(2)		(3)		(4)		(5)		(6)	
Initial per capita GDP growth	0.182**	(0.065)	0.148*	(0.062)	0.139*	(0.065)	0.128	(0.066)	0.139*	(0.065)	0.128	(0.068)
Log external debt (% of GNI)	1.218	(1.808)	1.652	(1.835)	1.650	(2.008)	1.815	(1.900)	1.391	(2.040)	1.316	(2.026)
Log external debt (% of GNI) squared	-0.574**	(0.182)	-0.535**	(0.174)	-0.522*	(0.196)	-0.535**	(0.187)	-0.482*	(0.203)	-0.465*	(0.207)
Annual export growth			0.058***	(0.011)	0.058***	(0.012)	0.058***	(0.012)	0.057***	(0.012)	0.058***	(0.012)
Annual population growth			1.892*	(0.785)	3.169*	(1.315)	3.177*	(1.265)	2.972*	(1.291)	2.887*	(1.300)
Population growth squared					-0.177	(0.215)	-0.158	(0.200)	-0.146	(0.217)	-0.118	(0.210)
Government effectiveness score							-5.880	(23.008)				
Government effectiveness score squared							21.632	(28.930)				
Political stability score									1.599	(8.277)		
Political stability score squared									0.863	(11.219)		
Good governance score											0.640*	(0.252)
Good governance score squared											0.008	(0.133)
External debt (% of GNI) threshold	34.61%		21.35%		20.59%		18.34%		23.62%		24.29%	
Year fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	751		721		703		703		703		703	
Mean of the dependent variable	4.547		4.641		4.604		4.604		4.604		4.604	
Number of countries	43		41		40		40		40		40	
R-squared (within countries)	0.128		0.271		0.272		0.279		0.273		0.278	

Notes: ***Significant at 1% level; **significant at 5% level; *significant at 10% level. In parentheses are robust standard errors and clustered at the country level. All the models allow for two lags of the logarithm of external debt variable.

Potential mechanisms through which external debt might influence economic growth

One of the goals of this study was to examine the potential channels through which external debt might impact economic growth. We considered four potential passageways: (i) private investment (proxied by gross fixed capital formation); (ii) private gross savings; (iii) private credit and (iv) export growth. We present these results in Table 5. We failed to find any statistically meaningful channels through which external debt influences economic growth. These results warrant further investigations to determine other possible ways through which external debt affects economic growth. Even though we failed to find a statistically plausible channel here, countries in SSA should focus on designing policies that help boost exports and generate own revenue to sustain their fiscal activities. The over-reliance on external debt might not be a good thing for the future generations as it unnecessarily over-burdens it through interest rate payments.

Our analysis is certainly without its limitations. First, we failed to address the issue of missing observations in some of our variables, which could potentially impact our estimates. Given, the potential biases created by addressing these missing observations, we abstained from doing so and base our analysis on variables for which we had non-missing data. Second, we certainly acknowledge the fact that our external debt threshold estimates largely depend on the specific model chosen and the variables included. Thus, our model and variables choice might potentially bias our conclusions. Since, the fixed effect models we employ here are frequently used in the empirical literature, we believe this will not seriously bias our conclusions. Lastly, there might be need for individual country-specific analysis in studies of this nature, given the varying circumstances of countries. However, despite the noted concerns, we still make a valuable contribution to the empirical literature especially in developing countries.

Table 5: Mechanisms through which external debt might influence economic growth

	Private sector credit		Export growth		Gross capital formation		Domestic savings	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Export growth	-0.015*	(0.008)	.	(.)				
External debt	-0.007	(0.009)	-0.058	(0.057)	0.001	(0.011)	-0.008	(0.017)
Domestic savings			0.744***	(0.257)	0.200***	(0.059)	.	(.)
Primary school enrollment	-0.051	(0.036)	-0.123	(0.133)	-0.012	(0.032)	0.004	(0.034)
Population growth	1.577*	(0.898)	-1.267	(4.005)	0.696*	(0.359)	-1.075	(1.016)
Government effectiveness	8.805	(8.308)	23.128	(31.180)	4.794	(5.976)	13.008	(8.839)
Corruption	5.121*	(3.108)	-50.097***	(15.163)	-3.230	(6.619)	4.225	(10.633)
Expenditures on health	0.086	(0.391)	-0.105	(1.829)	0.381	(0.260)	-0.060	(0.619)
Observations	500		499		464		464	
R-squared	0.714		0.199		0.838		0.526	
Number of countries	39		38		37		37	

Note: ***Significant at 1% level; **significant at 5% level; *significant at 10% level. Reported are regression coefficient estimates and standard errors in parentheses. The standard errors are robust and adjusted for finite sample bias including clustering by country. All regressions include year fixed effects country fixed effects and country-year specific effects. The dependent variables are shown as column headers e.g. in columns (1) and (2) the dependent variable is private sector credit.

2.6 CONCLUSION AND POLICY IMPLICATIONS

This study used longitudinal country-level data to search for a systematic relationship between external debt (% of GNI) and economic growth (proxied by per capita GDP growth) in a sample of about 40 SSA countries. Our results show that previous levels of external debt positively correlate with per capita GDP growth while current external debt levels appear to negatively correlate with output growth, an impact we consistently observe in our primary estimates shown in Table 3. An exploration of the specific threshold beyond which external debt begins to deleteriously impact per capita output growth reveals thresholds ranging from 18-35%. The existence of an external debt threshold underscores the need for policy makers to take cognizance in drafting policies that focus on balancing the need for external sources of finance and fiscal integrity, which might be undermined by future interest rate payments.

The results here to a broader extent call for a coordinated regional approach to building the much-needed capacity for better external debt management strategies in the SSA region. The presence of a threshold beyond which output is negatively impacted might be an indication to governments to shift focus on the domestic financial resources and the creation of enabling environments for economic prosperity. Policy efforts should emphasize on improving the legal, institutional and regulatory quality frameworks including making necessary productive infrastructural investments geared towards pooling resources for longer-term economic prosperity with less-reliance on external resources. Not mentioning the essential role played by the respective governments of ensuring business-enabling economic and political environments – all-important ingredients for economic prosperity in Africa.

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APPENDICES

Table A1: Summary of Studies on Debt and Economic Growth: An Overview

Brief Description of Empirical Studies	Region	Estimation type	Major statistically significant variables	Main findings
Jayaraman and Lau. 2009	Pacific Islands	FMOLS and Dynamic VECM	Dependent variable: Real GDP, independent variables: external debt, budget deficit	External debt generates short-term growth and enhances HIPCS reputation and consequently higher growth results in further rise in external debt level.
Siddique, Selvanathan and Selvanathan. 2016	HIPCS	Panel ARDL model	Dependent variable: GDP, independent variables: Capital formation, debt, Total trade and population	Long run and short run negative influence of debt on GDP exists significantly in debt driven economies.
Ferraz and Duarte.2015	PIIGS	ADF-GLS tests	Dependent variable: Real GDP growth rates, and independent variable: public debt	Negative relationship exists between economic growth and public debt.
Egert. 2015	OECD	Multi-step approach	Dependent variable: GDP growth, independent variable: public debt	The non-linear relationships can also kick in at low level of public debt.
Velde, 2014	SSA	Sovereign bonds in SSA, Currency risks and macroeconomic volatility		Sovereign debt present African with relatively inexpensive new source of external finance for economic growth.
Sy. 2015	Africa	Content analysis	Dependent variable: GDP, independent variables: fiscal policy variables and sovereign bonds	Accelerated and sustained pace of fiscal reform can help in debt management and can enhance growth projections.
Blommestein and Horman. 2007	Africa	Content analysis	Public debt and bond markets instruments	Low bond markets have gained strength in terms of liquidity and maturity structure.
Maana, Owino and Mutai. 2008	Kenya	Modified Barro growth regressions		Domestic debt has positive but insignificant impact on growth in Kenya.

Brief Description of Empirical Studies	Region	Estimation type	Major statistically significant variables	Main findings
Cerra, Rishi and Saxena. 2016	DCs and EM	OLS and 2SLS	Executive power, capital flight, fiscal deficits, currency crises, domestic credit growth, total debt, short-term debt, government expenditure and growth.	The study found that countries with weak institutions have a greater propensity to accumulate debt because of weak institutions spur capital flight, which, in turn, creates a financing need.
Moss and Chiang. 2003	DCs	Pooled OLS, FE and SGMM.	Dependent variable: Real per capita GDP growth, independent variables: debt, investment and capital stock	Inverse relationship exists between initial debt and subsequent growth. The higher the initial debt the larger negative effect on subsequent growth through slowing down labor productivity, reduced investment and slower growth of capital stock.
Iyoha. 1999	SSA	Historical and policy simulations. Correlation and summary statistics.	GDP, labour force, per capita gross domestic investment and total debt.	The study confirms that excessive high stock of debt depresses investment and lowers the rate of economic growth.
Checherita and Rother. 2010	EURO	2SLS and GMM	Dependent variable: Per capita GDP growth, independent variables: debt, budget deficit, private saving, total factor productivity, sovereign long-tern nominal and real interest rate.	The study found non-linear relationship between debt and growth and the turning point is at about 90%-100% of GDP.
Reinhart and Rogoff. 2010	44 countries, Global dataset	SGMM	Dependent variable: Per capita GDP growth, independent variables: debt, budget deficit, private saving, total factor productivity, sovereign long-tern nominal and real interest rate.	They used historical dataset and they found the relationship between debt and GDP to be weak at low level.

Brief Description of Empirical Studies	Region	Estimation type	Major statistically significant variables	Main findings
Abbas and Christensen. 2010	LICs and EM	Granger Causality Test	Dependent variable: Per capita GDP growth, independent variables: debt, budget deficit, private saving, total factor productivity, sovereign long-tern nominal and real interest rate.	Some evidence exists of domestic debt having negative impact on economic growth at higher level but positive at low level if its marketable.
Pattillo, Poirson and Ricci. 2004	61 developing countries	Simple OLS, 2SLS and differenced and system GMM	Dependent variable: Per capita GDP growth, independent variables: debt, budget deficit, private saving, total factor productivity, sovereign long-tern nominal and real interest rate.	High debt has negative effect on economic growth through private capital formation.
Cordella, Ricci and Ruiz-Arranz. 2005	HIPCS	Pooled OLS and SGMM	Dependent variable: Average growth rate in GDP per capita, independent variables: population growth, growth in TOT, secondary enrollment, investment, central government balance, inflation, external debt stock, debt service and rule of law, legal origin ethnic fractionalization and distance from equator.	The findings suggest negative marginal relationship between debt and growth at intermediate levels of debt only.
Rijckeghem and Weder. 2009	Developing Countries	Non-parametric techniques	Dependent variable: Real GDP growth rate, independent variables: Foreign and domestic debt, broad money, inflation, US treasury bill rate, political constraint, control of corruption and current account balance	Political factors matter in debt management.
Eberhardt and Presbitero. 2015	Global	ECM, 2FE	Dependent variable: GDP aggregate, independent variables: capital stock, total debt stock and population	There is support for negative relationship between debt and growth across countries.

Brief Description of Empirical Studies	Region	Estimation type	Major statistically significant variables	Main findings
Panizza. 2008	DCs	Content analysis	Foreign debt and domestic debt	Debt structure matters and donors play a key role in debt sustainability.
Tchereni, Sekhampu and Ndovi. 2013	Malawi	OLS (VECM)	Dependent variable: GDP growth rate, independent variables: foreign debt, inflation rate, exchange rate, prime lending rate public and private investment.	Foreign debt has negative insignificant relationship with economic growth.
Alfonso, and Alves. 2015	EURO	OLS, OLS-FE, 2SLS and GLS	Dependent variable: Per capita GDP growth rate, independent variables: government debt, interest rate, domestic credit to private sector, inflation and institutional variables.	Incremental debt is harmful to economic growth.

Table A2: Correlation matrix of selected variables for the pooled sample of countries, 1995-2014

	Variables	1	2	3	4	5	6	7	8
1	GDP per capita growth	1							
2	External debt (% of GNI)	-0.1969*	1						
3	Primary school enrollment	0.0776	-0.2553*	1					
4	Annual population growth	0.0155	0.1045	-0.1275*	1				
5	Gross fixed capital formation	0.2285*	-0.3281*	0.2013*	0.0406	1			
6	Private sector credit	-0.0456	-0.3982*	0.095	-0.3831*	0.1912*	1		
7	Government effectiveness	0.1538*	-0.2358*	0.1957*	-0.2508*	0.3325*	0.3592*	1	
8	Corruption	0.1049	-0.2364*	0.0755	-0.3285*	0.2812*	0.4506*	0.7268*	1

Table A3: List of countries used in the analysis

Benin	Liberia
Botswana	Madagascar
Burkina Faso	Malawi
Burundi	Mali
Cabo Verde	Mauritania
Cameroon	Mauritius
Chad	Mozambique
Comoros	Niger
Congo, Dem. Rep.	Nigeria
Congo, Rep.	Rwanda
Cote d'Ivoire	Senegal
Djibouti	Sierra Leone
Eritrea	South Africa
Ethiopia	Sudan
Gabon	Swaziland
Gambia, The	Tanzania
Ghana	Togo
Guinea-Bissau	Uganda
Kenya	Zambia
Lesotho	Zimbabwe

3.0 MICRO AND MACRO DRIVERS OF CREDIT RISK: THE CASE OF ZIMBABWEAN BANKING INDUSTRY (2009-2013)[9]

Katuka Blessing[10] and Dzingirai Canicio[11]

Abstract

There was troublesome development in non-performing loans since the inception of multiple-currency regime in Zimbabwe. The study investigated determinants of non-performing loans in Zimbabwe using a panel of eight (8) banks. Using decomposed monthly data from 2009 to 2013, a combination of static and dynamic panel regression models were applied. Findings revealed that non-performing loans are influenced by microeconomic, macroeconomic and political factors. Results supported quiet life hypothesis. Based on this hypothesis, we identified that interest rates had strong positive nexus with non-performing loans and that they create a platform that threatens realization of the financial inclusion objective in Zimbabwe due to recurring cycles in Non-performing loans (NPLs).Interestingly both dynamic models managed to capture influence of Government of National Unity (GNU) on NPLs in Zimbabwe. We found negative association between GNU and NPLs and results were in line with our expectations. Negative connection means that GNU had a potential to reduce non-performing loans in banks. Capital adequacy and loan-to-deposit variables have significant influence on credit risk, although the Loan-to-deposits ratio (LTD) variable was only significant in two static models. Macroeconomic factors have influence on non-performing loans and they include unemployment rate, inflations rate and real GDP growth rate. According to study results, real GDP growth rate is significant in dynamic models only. Ability of dynamic models to detect GNU and real GDP growth rate undoubtedly proved how robust and superior dynamic models are over static models. Overall, we found systematic risk to be the major driver of credit risk than idiosyncratic risk. To promote financial inclusion in Zimbabwe, we recommended that banks should review interest rates downwards to levels between 5.78 - 8.1% to reduce borrower default rate by between 20-50%, update credit policies periodically to detect changes in customers' characteristics as well as improving capital adequate ratios which will discourage moral hazard in banks. There is need for banks to shift their credit culture to values driven culture. Current profit and market share driven credit cultures compromises banks' assets quality in the long-run.

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[9]This paper is a revised form of "The Impact of Public External Debt on GDP per capita Growth in the East African Community (EAC) Member countries" presented at the Inaugural Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI) Research and Policy Seminar, 10 December 2015, Harare, Zimbabwe. The authors gratefully acknowledge the reviewers comments and suggestions, which significantly contributed to improving the quality of this manuscript.

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The views as expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the Bank of Uganda.

[11]The MDRI allows for 100 percent relief on eligible debts by three multilateral institutions—the IMF, the World Bank, and the African Development Fund (AfDF)—for countries completing the HIPC Initiative process.

The Treaty establishing the EAC was signed on 30th November 1999.

3.1 INTRODUCTION

3.1.1 Background of the study

Financial institutions such as banks play linchpin role in an economy[12]. Banks' credit risk profile is therefore a policy concern considering how excessive exposure to credit risk can affect the whole financial system and the economy at large. The 2007-2008 financial crises proved how fast excessive exposure to credit risk can weaken the banking industry as well as the economy. More often, banks are reportedly to have failed as a result of excessive exposure to credit risk through high levels of non-performing assets[13]. Nyamutowa and Masunda (2013) identified that credit risk is among leading risks in commercial banks operating in Zimbabwe. Banks' credit risk profile determines the degree of pollution on bank balance sheet through bad loans and advances on the assets side. High credit risk brings dire outcomes not only to banks but also its customers and other stakeholders as well by exacerbated systemic financial fragility and spill over effects through its contagion effect as well as systemic risk (Panageas, 2010; Acharya et al., 2011; Aiyar, 2012; De Haas et al., 2012; Acharya et al., 2014; Acharya et al., 2015).

Excessive exposure to credit risk led to episodes of bank failures in Zimbabwe both post and prior to adoption of the multi-currency regime and this disrupted financial intermediation as well as the overall development process of the economy[14]. Reserve Bank of Zimbabwe (RBZ) (2015) indicated that the impact of NPLs are, *inter alia*, decline in financial intermediation, erosion of bank assets and capital base, resulting to liquidity challenges and adoption of cautious behaviour, as confidence in financial system declines and all these outcomes negatively impact on financial inclusion in Zimbabwe. It is argued that financial inclusion has an impact on reduction of poverty and income inequality (Burgess and Pande, 2005; Brune et al., 2011; Allen et al., 2013). Credit crunch has a potential to rise as banks with high NPLs become reluctant to take up new risk and create new loans. Unavailability of credit to finance working capital and investments might trigger the second-round business failure and this deteriorates quality of bank loans which results in a re-emerging of banking failure (RBZ, 2015).

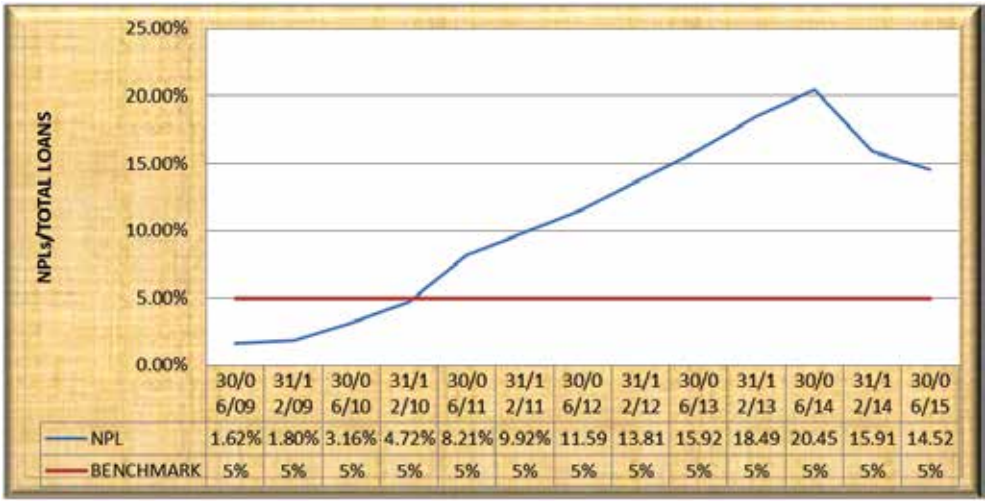
Generally, non-performing loans were on the rise since 2009up to June 2014 (Figure 1).

[12]See, for example, Katuka (2015), Bucur and Dragomirescu (2014). All these authors emphasized on the importance of banks in an economy.

[13]See, for example, RBZ (2006), Waemustafa and Sukri (2015), RBZ (2015), Messai and Jouini (2013), Heffernan (2005) and many others.

[14]For detailed information about post and prior dollarization bank failures, read RBZ (2006), Dzingirai and Katuka (2014) and Mabvure et al. (2012) etc.

Figure 1: Trend of Non-performing loans (2009-2015)



Source: RBZ (2015)

Figure 1 shows that NPLs were on rise since 2009 to June 2014 and that the graph reached a turning point when non-performing loans begin to decline in June 2014 to June 2015. This might be due to reduced lending caused by banks credit risk aversion after the end of the GNU in 2013. Rise in NPLs during GNU was largely driven by aggressive lending that most dominating banks adopted, along with poor risk management systems (Chikoko *et al*., 2012).This is also an indication that credit risk dynamically influences itself once it has gained momentum. Although there was noticeable decline in NPLs since June 2014, the trend decreased at a decreasing rate between December 2014 and June 2015. From the trend, it is clear that the whole banking industry has been operating above thresholds, where NPLs were above 15% but less than 25%. Moreover, from December 2010, NPLs trends were above the Bank of International Settlement (BIS) benchmark of 5%.

Furthermore, RBZ (2015) statistics show that since the adoption of the multiple currencies in 2009, the average daily interest rate, proxied by weighted lending rate recorded a low rate 9.5% in February 2011 and a highest figure of 16.04% in March 2012 with an average of 13.35% over the period 2011-2015. On the other hand, World Bank (2015) statistics showed that the average daily rate for Africa was 8.1%, with daily highest and lowest rates of 19.71% and 5.59%, respectively, whilst for the whole world, it was 5.78% with daily highest and lowest average rates of 60.61% and 3.7%, respectively, for the period 2009-2015.

3.2 PROBLEMS STATEMENT

Banks are key providers of funds to individuals, SMEs and corporates which drive economic growth in developing countries such as Zimbabwe. Figure 1 indicated that the Zimbabwean banking sector's NPLs were above thresholds as well as BIS benchmark. In this regard, it is important to know the drivers of NPLs and how best this cancan be mitigated in order to improve financial inclusion in Zimbabwe which have been found to be critical on poverty eradication. It is also critical to know the

specific variables that banks need to keep an eye on to curb credit risk in Zimbabwe. Furthermore, it is useful to assess whether the credit risk currently bedevilling the Zimbabwean banking industry is macro or micro-induced or it is a combination of both.

3.3 RESEARCH OBJECTIVES

- The paper was prepared to achieve the following objectives:
- To identify major internal and external determinants of NPLs in Zimbabwe.
- To determine whether Zimbabwean banking industry's NPLs are macro or micro-induced or it isa combination of both.
- To develop strategies for curbing the increase in NPLs.

3.4 SIGNIFICANCE OF THE STUDY

Limited studies has been conducted to identify factors influencing credit risk in Zimbabwe. Chikoko, Mutambanadzo and Vhimisai (2012), Mabvure et al. (2012) and Mukoki and Mapfumo (2015) made significant contributions to identifying drivers of credit risk in Zimbabwean banking system. However, these studies applied models that were not adequate enough to comprehensively explain the causes of NPLs in Zimbabwe, especially on whether they are idiosyncratically or systematically induced or both. Existing literature gap from the aforesaid studies is that they did not capture the effects of changes in both the political landscape and policies. To our knowledge, no study has employed a dynamic model to study traits of NPLs overtime using Zimbabwean banking industry. Furthermore, identification of credit risk determinants of a more robust panel observation of banks using both static and dynamic econometric modelling helps regulatory authorities, banks and other players in the financial system to devise sound and more informed policies that reduce NPLs as well as preventing possible systemic crises posed by the contagion effect.

3.5 LITERATURE REVIEW

3.5.1 Theoretical Review

Many researchers showed much interest in understanding and testing concentration-fragility and concentration-stability theories. Concentration-fragility hypothesis (CFH) states that highly concentrated banking systems are much more fragile[15]. Under CFH, smaller banks have high chances to assume excessive risk due to high competition. According to Carletti (2005), it is lower margins that worsen excessive risk taking.

Another theory on the level of credit risk has emanates from the structure of the banking industry (Bains, 1951). The theory is known as the structure-conduct-performance (SCP) paradigm. It postulates that the level of non-performing loans is a true reflection of the market structure in which banks operate, that is, incidences of credit and systemic risk are high under monopolistic market structure than under a perfect competition. This is mainly due to inefficiency induced by lack of

[15]Refer to Deltuvaite (2010) and Elferink (2011) for detailed explanation on these two theories.

competition and greediness manifested through excess cost of borrowing above marginal cost (no marginal cost pricing).

Another theory of interest is the quiet life hypothesis developed by Hicks (1935). The theory states that firms with high market power take advantage of gains from non-competitive pricing in more relaxed environment in which less effort is put to minimize cost (Muharrami and Kent, 2009). Through high market power, banks charge high interest rates to cover up for management's slackness. This increases the probability of default by borrowers due to increased chances of adoption of high risk projects. In addition, slack managers would not do diligent vetting of borrowers, since at high cost of borrowing mostly risky borrowers have higher chances of being awarded loans leading to adverse selection and moral hazard incidences.

There are other theories that explain the relationship between cost efficiency and loan quality. Berger and DeYoung (1997) developed theories that explain the efficiency-risk relationship and these theories answer the question of whether banks are bad managers or skimpers. Three hypotheses were developed which are bad management hypothesis, bad luck hypothesis and skimping hypothesis.

Bad management hypothesis posits that low-cost efficiency signals poor managerial practices by bank managers (moral hazard) which also imply inadequate efforts being undertaken to analyse, monitor and control loan resulting in deterioration in loan quality in the long run (Mamonov, 2013). This hypothesis simply explains that low efficiency positively influences NPLs. Poor management may be a result of poor loan appraisal skills. Another possible cause of poor management is inadequate allocation of resources to be used to monitor loans (Podpiera and Weil, 2007).

In Zimbabwe, banks have formal risk reporting structures with each risk factor being analysed independently. This then implies that banks clearly separate all risks into categories hence lower chances of under provisioning resources for loans monitoring. Banks also form credit committees to manage credit risk. In order to ensure that credit risk exposure is within acceptable parameter, banks frequently produce arrears reports, facilities management reports, guarantees reports, insider loans reports, inspection reports, early alert reports and underwriting standards[16]. All these reports provided banks with a clear picture on credit risk hence the need to know why credit risk trended with such systems in place.

A supportive study on the issue of poor managerial practices in credit risk management was developed by Chikoko *et al.* (2012). According to the study, most banks continued to use the credit policies of the Zimbabwe dollar era and this was prominent in local banks, of which all were aggressively lending. Also, banks used reactive rather than proactive approach and these explain poor managerial practices hence matching bad management hypothesis.

[16]Read Nyamutowa and Masunda (2013).These authors explained much on risk categories faced by banks operating in Zimbabwe as well as types of reports there were used in banks to identify and manage credit risk.

Skimping hypothesis is another version of theory that Berger and DeYoung (1997) formulated to explain efficiency-risk relationship. The theory holds that high cost efficiency in the short run leads to deterioration in loan quality in the long run. To improve efficiency in the short term, bank managers may attempt to reduce expenses relating to borrowers' screening process which will eventually erode loan quality due to adverse selection. Skimping hypothesis posits that the amount of resources allocated to monitoring loans affects both NPLs and bank efficiency (Podpiera and Weil, 2007). The authors argued that there is a trade-off between short-term operational costs and long-term NPLs. Specifically, if bank managers strongly emphasize on short term profits, they may be motivated to reduce short term operating expenses by reducing resources allocated to monitoring loans. The overall goal of bank managers, under this hypothesis, is for banks to be perceived as cost-efficient in the short run since they would be using less inputs to produce same output burgeon. The result will be an increase in NPLs in the long run hence leading to the assumption that high cost efficiency should increase NPLs (Podpiera and Weil, 2007). Skimping hypothesis assumes positive relationship between cost efficiency and NPLs.

In Zimbabwe, most banks emphasize on short-term profitability at the expense of long term asset quality. Evidence shows that 40% of banks followed current profits credit culture, 33% are market share driven and 27% are value driven[17]. Clearly banks operating in Zimbabwe have high affinity for short term profitability as explained in skimping hypothesis and this heightens NPLs which affect loans pricing and hence degree of financial inclusion in Zimbabwe, thus exacerbating poverty and retards growth (World bank, 2014; UNDP, 2014).

Another version of theory from Berger and DeYoung (1997) is the bad luck theory which states that adverse macroeconomic conditions reduce the ability of borrowers to honour their debt obligations which erodes loan quality and cause banks to increase expenses devoted to monitoring borrowers (Mamonov, 2013). Berger and DeYoung (1997) cited closure of companies as familiar example of events that may raise NPLs. Applying this knowledge to the Zimbabwean context, most banks have corporate divisions and a lot of companies failed economically and financially and this contributed to a surge in NPLs. Bad luck and bad management hypotheses assume negative efficiency-risk relationship whilst skimping hypothesis assumes positive association. The bad luck hypothesis assumes NPLs arise from external forces which lead to banks incur high loan monitoring cost when dealing with problem loans.

Keeton and Morris (1987) discussed the moral hazard hypothesis which assumes that banks with low capital increases the riskiness of their loan portfolio in response to moral hazard which ultimately spur non-performing loans in the long-run. Berger and DeYoung (1997) found a negative relationship between capital ratios and non-performing loans. Moral hazard hypothesis states that low capitalization in banks leads to an increase in problem loans. Low capitalized banks increase their loan portfolio which builds up problem loans. During and after inception of the new currency regime in Zimbabwe, some banks were undercapitalized but total loans

[17]Read Chikoko, Mutambanadzo and Vhimisai (2012) on banks' credit culture in Zimbabwe.

escalated especially in locally banks. There was excessive insider lending and all these evidenced the existence of moral hazard in the banking industry. Adverse implications are that borrowers enjoyed when the new currency regime was introduced and suffered when NPLs were on rise which led to most groups being financially excluded in accessing financial services, particularly loans.

Generally, bank lending is cyclical implying that it follows movement in economic trends. Pro-cyclicality in lending refers to tendency of banks to lax lending standards during booms and stiffens during downturns (Athanasoglou, 2011). Pro-cyclical credit policy has implications on bank overall risk profile as well as performance. According to pro-cyclical credit policy, past earnings are positively related with problem loans (Belaid, 2014). The theory explains that bank managers advance credit to risky borrowers in order to convince the market for bank's profitability by inflating current earnings at the expenses of future problem loans (Belaid, 2014). The issue of lenient credit policies led to failure of several banks which include Interfin, Genesis and Renaissance to name a few. All these were not adhering to internal lending standards as well as regulatory lending standards and overly led to reduction in the number of financial service providers in the economy with some having their funds frozen during curatorship periods.

The Cognitive dissonance hypothesis states that banks justify past choices even if they had failed. Cognitive dissonance arises from misinterpretation or rejection of currently available information to justify the past choice (Athanasoglou, 2011). Use of Zimbabwean dollar era credit policies during early periods of inception of the multiple-currency regime may explain why banks believed in old credit policies than any new policies.

Empirical Review

The risk that the borrower may not service loans, either in full or not, is credit risk. A great deal of studies identified that bank credit risk is a function of either internal or external forces or a combination of both. Various models were applied in this research area, with some studies employing static models only and these include Poudel (2013), Zibri and Boujelbene (2011). In Zimbabwe, Mukoki and Mapfumo (2015) applied autoregressive distributed lag (ARDL) Bound Test while Chikoko et al (2012) used a survey approach and Mabvure et al (2012) used CBZ case study to explain the determinants of NPLs in Zimbabwe. Beck, Jakubik and Piloiu (2013) and Klein (2013) used a combination of both static and dynamic models.

There are studies that researched on the influence of macroeconomic environment on credit risk (Diaconasu, Popescu and Socolius, 2014; Gitonga, 2014; Castro, 2013; Bucur and Drogomirescu, 2014). Some studies looked into both micro and macroeconomic determinants of credit risk (Messai and Jouini, 2013; Gosh and Das, 2007; RBZ, 2015). In the same line of research, Ganic (2014) conducted a study on the influences of credit risk by incorporating bank-specific variables only. A well comprehensive study was performed by Garr (2013) and the study captured bank-specific, industry-specific and macroeconomic variables.

The commonly discussed macroeconomic determinants are real gross domestic product growth rate, inflation, unemployment rate, exchange rate fluctuations, market interest rate and broad money supply. The general hypothesis is that an increase in real GDP improves incomes for borrowers hence debt servicing capacity which imply reduced credit risk (Zibri and Boujelbene, 2011; Gosh and Das, 2007; Castor, 2012). However, Garr (2013) found positive connection between GDP growth rate and credit risk. A variety of studies rendered GDP growth rate as insignificant determinant of credit risk (Waemustafa and Sukri, 2015; Poudel, 2013; Bucur and Dragomirescu, 2014).

Inflation is also among macroeconomic determinants of credit risk. Several studies indicated that inflation negatively correlated with credit risk (Zibri and Boujelbene, 2011; Waemustafa and Sukri, 2015), while some studies provide mixed evidence. Waemustafa and Sukri (2015) noted that inflation has negative influence in conventional banks but does not influence banks in an Islamic banking model. Negative influence of inflation variable on credit risk implies that high inflation make debt servicing easier than low inflation because under high inflationary environment, the real value of outstanding loans deteriorates. However, this may not hold if the economy decides to quickly switch to using other countries' currencies as well as restating debts in the new currency. Gezu (2014) concluded that inflation does not have any significant impact on credit risk. Some studies found unemployment rate as a significant determinant of credit risk. Diaconasu, Popescu and Socolius (2014) foundthat unemployment rate positively relates to credit risk while Valahzaghard, Kashefi, Alikhani and Hosseini (2012) suggest that the variable does not have any impact on credit risk.

The bank internal environment also has an influence of the levels of credit. The internal drivers include, but not limited to, bank size, loan growth rate, loans to deposits ratio, capital adequacy ratio, and branch network. Literature indicates that big banks are able to control problem loans than small banks. Mukoki *et al*. (2015) explained that the specific determinants of NPLs in Zimbabwe's prominent banks were liquidity, return on equity (ROE), efficiency and interest rate spread. Survey from Chikoko *et al*. (2012) revealed that NPLs were resulting from, *inter alia*, lack of client knowledge, poor ethics and corporate governance, overcommitted clients, weak internal systems, high lending rates and over reliance on balance sheet strength. In terms of the influence of capital adequacy ratio, Makri *et al*. (2014), Hyun and Zhang (2013) and Shingjerji (2013) found negative relationship between capital adequacy ratio and NPLS. On the contrary, Djiogap and Ngomsi (2012) found positive linkage between capital adequacy and NPLs.

In the same area of research, Poudel (2013) and Ganic (2014) found that loan to deposit ratio has no influence on NPLs while Swamy (2012) and Boru (2014) found a negative influence of the aforesaid ratio to NPLs. There are also mixed findings on the effect of lending rates on NPLs. Zibri et al (2011) and Saba *et al.* (2012) found negative association whilst Ranja and Chandra (2003) and Farhan *et al*. (2012) found a positive linkage. Vigiazas and Nikolaidou (2011) used a multifactor model and identified that loan growth rate negatively relates with NPLs. Das and Ghosh (2007) indicated that branch network is an insignificant determinant of NPLs.

Knowledge Gap

A strand of literature in previous studies incorporated almost similar microeconomic and macroeconomic determinants of NPLs in their researches with less citation on the effects of political environment. This paper will add difference to existing literature by incorporating a political stability dummy variable which represents changes in political policies and systems. More so, a string of studies that were performed in Zimbabwe to analyse causes of NPLs applied static models and qualitative approaches which do not capture persistent growth in NPLs hence this paper covered the existing gap by using both static and dynamic models.

3.5.2 Methodologies and Data

This paper focused on microeconomic and external determinants of credit risk using both static and dynamic models. The paper used decomposed 480 monthly panel data observations from eight (8) commercial banks over the multiple currency era 2009-2013. Over this period, irrespective of adopting more stable currencies, nonperforming loans followed an upward spiral trend (see fig. 1). This behaviour on nonperforming is not clear whether it has memory of itself overtime or not. Data from commercial banks' websites is publicly available which addresses confidentiality issues. Eight (8) commercialbanks were selected and analyzed based on data availability. Although our sample was limited by data availability, banks that were selected had a total market share in excess of 70% based on market capitalization and more than half of 13 operational commercial banks by June 2015 (RBZ, 2015).

The variables included to assess systematic credit risk are: external variables to be incorporated are annual real GDP growth rate, annual inflation rate, unemployment rate, annual average lending rates and a political stability binary dummy variable, taking a value of 1 for Government of National Unity (GNU) era and 0 otherwise. We also included microeconomic determinants such as credit-to-deposit ratio and capital adequacy as control variables in the model. Macroeconomic data was generated from RBZ monetary policies, World Bank dataset and global finance website. Microeconomic or Bank specific data was generated from published financial statements obtained from banks' websites.

Static Model

The study performed correlation analysis and panel unit root test tests. Hausman test was performed to select the best model between random effect and fixed effect models. The test was performed under the following hypotheses:

H_0: Random effect model is appropriate

H_a: Fixed effect model is appropriate.

Hausman test supported the random effect model and we further performed BrueschandPagan LM test for random effects to see whether we selected the best model. Bruesch and Pagan LM Test were performed under the following hypothesis:

H_0: Pooled regression model is appropriate.

H_a: Random effect model is appropriate.

For the static case, static panel data regression allowed us to study individual behaviour in a repetitive environment (Baltagi, 2008; Cameron and Trivedi, 2009). The static model assumed that non-performing loans as a ratio of total loans disbursed are time invariant overtime that is, they do not have memory or built momentum on itself overtime. Descriptive and multiple regression techniques were used and we adopted the static model used by Poudel (2013) and the specific regression model is as follows:

$$NPL_{it} = \phi_i + \beta_1 RGDP_{it} + \beta_2 INFR_{it} + \beta_3 CAR_{it} + \beta_4 UR_{it} + \beta_5 IR_{it} + \beta_6 LTD_{it} + \beta_7 GNU + \beta_8 t + \varepsilon_{it} \quad --- (1)$$

Where:

Variable	Definition
NPL	Nonperforming loans/ Gross loans
RGDP	[(Current year real GDP/Previous year real GDP)-1]
INFR	Annual inflation rates as given in worldbank database
CAR	[(Tier 1 capital + Tier 2 capital)/ Risk weighted Assets]
UR	Unemployment rate as given in worldbank database.
IR	Average lending rates
LTD	Total loans/ Total deposits
GNU	Government of national unity

$i = 1.2,3,..., N$ are individual commercial banks, $t = 1.2,3,..., T$ represent respective time in months, βs are parameters, ϕ_i denotes the unobserved bank-specific effects such as managerial competency, organisational culture etc., which might correlated or uncorrelated with the regress and ε_{it} is the white noise, independently and identically distributed (IID) error term, that is, it has zero mean, constant variance and is uncorrelated across time and banks. The composite error term w_{it} is constituted by ϕ_i and ε_{it}, that is, $w_{it} = \phi_i + \varepsilon_{it}$. We discussed five static models namely least squares dummy variable (LSDV), pooled or ordinary least squares (OLS), generalized least squares (GLS), fixed effects (FE) and random effects (RE) models in order to shed more light on how they adequately explain NPL drivers in Zimbabwe.

Dynamic Model

Davidson and MacKinnon (2004) asserts that although generalized least squares (GLS), ordinary least squares (OLS) and weighted least squares (WG) have alternative version that are robust under heteroskedasticity disturbances, none of them has acceptable properties when a dynamic structure ($NPL_{i,t-1}$) is introduced in the model.

For the dynamic case, a dynamic panel data regression model is useful when the dependent variable depends on its own past realizations (Holtz-Eakin et al., 1988; Arellano and Bond, 1999; Arellano and Bover, 1995; Blundell and Bond, 1998), that

is, if high non-performing loans as a ratio of total loans in the past month lead to even higher ratios in the next month or low ratios in the preceding month caused even much lower ratios in the following month. In order to try to assess whether the ratio of non-performing to total loans disbursed evolve overtime the following dynamic panel regression was usedto perform this task:

$$NPL_{it} = \phi_i + \beta_0 NPL_{i,t-1} + \beta_1 RGDP_{it} + \beta_2 INFR_{it} + \beta_3 CAR_{it} + \beta_4 UR_{it} + \beta_5 IR_{it} + \beta_6 LTD_{it} + \beta_7 GNU + \beta_8 t + \varepsilon_{it} \quad ---(2)$$

Where:

Variable	Definition
NPL	Nonperforming loans/ Gross loans
RGDP	[(Current year real GDP/Previous year real GDP)-1]
INFR	Annual inflation rates as given in worldbank database
CAR	[(Tier 1 capital + Tier 2 capital)/ Risk weighted Assets]
UR	Unemployment rate as given in worldbank database.
IR	Average lending rates
LTD	Total loans/ Total deposits
GNU	Government of national unity

Since $NPL_{i,t-1}$ is correlated with ϕ_i because $NPL_{i,t-1}$ is a function of ϕ_i GLS and OLS procedures give biased and consistence estimators (Greene, 2008). In addition, because the transformed model, when using the deviation form model, the independent variable will be endogenous, that is, the mean of NPL_i is correlated with the mean of ε_i, which indicates that WG estimators are also biased and inconsistent. Alternatively, Blundell and Bond (1998) argued that the so-called "first-difference" transformation to remove bank specific individual effects ϕ_i can be used, but again, the WG and GLS estimators are inappropriate. The reason being that, in the first differenced dynamic model of equation (2), $\Delta NPL_{i,t-1}$ are correlated with $\Delta\varepsilon_{it}$. To solve this problem, we adopted the methodology proposed by Anderson & Hsiao in 1982 to control endogeneity using $\Delta NPL_{i,t-2}$ or $NPL_{i,t-2}$ as Instruments for $\Delta NPL_{i,t-1}$. In fact, according to Holtz-Eakin et al. (1988), lagged levels of the endogenous variable, three or more time periods before, can be employed as instruments and we had more available instruments than unknown parameters if the panel includes three or more time periods. We used the method proposed by Arellano and Bond (1991) that exploited all possible instruments. Using the Generalised Methods of Moments ((GMM) Hansen, 1982)), they found the moment conditions generated by lagged levels of the dependent variables (in this research context $NPL_{i,t-2}$, $NPL_{i,t-3}$, $NPL_{i,t-4}$,...) with $\Delta\varepsilon_{it}$. The estimators obtained are

known as difference GMM estimators. Having similarity with all instrumental variables regression, GMM estimators are unbiased. Comparisons of the performance of difference GMM, OLS and WG estimators was done by Arellano & Bond in 1991 using simulations and found that GMM estimators exhibit the smallest bias and variance.

Exceptions

Heteroskedasticity and time invariant independent variable

Different GMM do not provide good estimators if the errors are heteroskedastic, but we found our errors to be homoscedastic and we used one-step GMM estimators since the two-step GMM proposed by Windmeijer in 2005 provide estimators which are robust, but their standard errors will have downward bias. The second possible problem of dummy-variable inclusion (GNU) in the model was resolved by employing the approach proposed by Arellano and Bover (1995) as well as Blundel and Bond (1998) of using system GMM estimators.

Instrument Validation

After the difference and system GMM estimators were obtained, model validity was checked for autocorrelation and instrument subsets validity.

- The importance of detecting serial correlation in the error term was proposed by Arellano and Bond in 1991, after it was observed that its presence invalidates some of the instruments. If ε_{it} are serially correlated of order 1 (AR(1)), then $NPL_{i,t-2}$ is endogenous to $\Delta\varepsilon_{it}$ (due to the presence of $\varepsilon_{i,t-1}$ in the difference), and therefore, $NPL_{i,t-2}$ will be an invalid instrument. To do this task we used the difference $\Delta\varepsilon_{it}$ instead of ε_{it}. Alternatively, we tested autocorrelation of order 1 in level using AR (2) in differences and found that the null hypothesis of no autocorrelation was not rejected, and concludes that validation of instrumental variables was obtained.
- The Sargan test (Sargan, 1958) was used to validate instrument subsets. It was based on the null hypothesis that residuals are uncorrelated with instruments to be used and we found that this hypothesis was not rejected, implying that the validation of instruments was obtained.
- Variables and hypothesized relationships

Table 1 show a list of variables that will be used in the regression analysis along with hypothesized relationships.

Table 1: Definitions of variables and sources

Variable	**Proxy**	**Definition**	**Hypothesised relationship with credit risk**	**Source**	**Data Frequency** *(Decomposed using Eviews 7)*
NPL	Non-performing loans	Nonperforming loans/ Gross loans		Bank statements	Monthly
RGDP	Real GDP growth rate	[(Current year real GDP/Previous year real GDP)-1]	Negative	Global Finance	Monthly
INFR	Annual inflation rate	Annual inflation rates as given in worldbank database	Positive	Worldbank database	Monthly
CAR	Capital Adequacy Ratio	[(Tier 1 capital + Tier 2 capital)/ Risk weighted Assets]	?	Bank statements	Monthly
UR	Unemployment Rate	Unemployment rate as given in worldbank database.	Positive	Worldbank database	Monthly
IR	Interest rates	Average lending rates	Positive	Monetary policy statements	Monthly
LTD	Loan-to-deposit Ratio	Total loans/ Total deposits	Positive	Bank statement	Monthly
GNU	Government of national unity		Negative		Monthly

3.6 DIAGNOSTIC TESTS, DATA ANALYSIS AND RESULTS INTERPRETATION

3.6.1 Descriptive Statistics

Table1 presents common descriptive statistics of both dependant and independent variables.

Statistic	Npl	nnr	rgdp	ltd	lr	lnfr	Car	Gnu
Mean	.089249	5.602	.0908	.6293036	.1118	.00728	.1890625	.8833333
Minimum	0	5.3	.033	.166371	.075	-.077	.1114	0
Maximum	.2185514	6.4	.119	.9637259	.18	.049	.44	1
Observations	480	480	480	480	480	480	480	480
Std Dev	.0563829	.4044215	.0316013	.2156185	.0359953	.0446486	.0672788	.3213576

Table 2: Descriptive Statistics-Dependant and Explanatory variables

Generally descriptive statistics proved that NPLs were above the thresholds. Statistics showed that the average NPL was 8.92%, with a minimum of 0% and a maximum of 21.9%.Zero NPL was attributable to new loans on adoption of multiple-currency regime. This is an indication that NPLs were out of control in the Zimbabwean banking industry considering that non-performing loans level was far much above the prudential benchmark of 5% stipulated in Basel II (Basel, 2004). Research findings showed that the average real GDP growth rate is 9.08% with minimum and maximum values of 3.3% and 11.9% correspondingly. The average loan to deposit ratio is 62.9%. The lowest loan-to-deposit ratio in the Zimbabwean banking industry is 16.6% and a maximum of 96.37%. Statistics revealed that average inflation rate was 0.7% and maximum rate of 49%. In terms of capital adequacy, the study found that average capital adequacy ratio in banks was 18.9%. Minimum capital ratio was 11.14% and a maximum of 44%.

Correlation Analysis

We performed correlation analysis to eliminate variable exhibiting high correlation coefficients so that a reliable model can be produced.

Table 2: Correlation Matrix

	Gnu	car	Infr	Npl	Unr	Rgdp	Ltd	Ir
Gnu	1.0000							
Car	-0.0045	1.0000						
Nfr	0.1259	-0.5051	1.0000					
Npl	-0.7687	-0.3759	-0.1654	1.0000				
Unr	-0.5455	0.5122	-0.0932	-0.3018	1.0000			
Rgdp	0.5848	-0.1240	0.4337	-0.2402	-0.1345	1.0000		
Ltd	-0.0864	-0.6034	0.3137	0.3793	-0.3745	-0.0644	1.0000	
Ir	0.1568	-0.1303	0.2370	0.7147	-0.0617	0.3409	-0.0338	1.0000

Table 2 showed that correlation coefficients for all study variables are within the acceptable range of 0.8 to -0.8, indicating absence of severe multicollinearity. Hence, we considered them in further analysis to be performed before the final model. The highest Pearson correlation of 71.47% was found to exist between NPL and interest rate, while the least one of 0.45% exist between GNU and CAR.

Hausman Test

We performed model specification test to choose between random effect model and fixed effect model.

Table 3: Hausman Test

Variable	(b) Fixed	(B) Random	(b-B) Difference	Sqrt(diag(V_b-V_B)) S.E.
Unr	-.1851021	-.1848862	-.0002158	.0015658
Rgdp	.0646492	.0658991	-.0012499	.0040324
Ltd	-.0159317	-.014533	-.0013987	.0016168
Ir	.2309855	.2312674	-.0002819	.0024854
Infr	-1.597607	-1.598052	.000445	.0110362
Car	-.2665085	-.2661295	-.0003789	.002147
Gnu	3.64e-16	-1.01e-14	1.05e-14	.0001996
Months	1.47e-16	-2.78e-15	2.93e-15	.0000148

H0: Random effect model is appropriate
Ha: Fixed effect model is appropriate.

```
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
        =      1.07
Prob>chi2 =  0.9978
```

According to table 3, the probability value is more that 5% so we accepted the null hypothesis which supports the use of random effect model over fixed effect model.

Panel Unit Root Tests

Table 4: Panel Unit Root Test Results

Harris-Tzavalis			Im-Pesaran-Shin		Fisher-type	
Variable	p-value	Order of integration	p-value	Order of integration	p-value	Order of integration
Car	0.04497**	I(0)	0.000***	I(1)	0.000***	I(1)
Infr	0.0024**	I(0)	0.000***	I(1)	0.000***	I(1)
Ir	0.0001***	I(0)	0.0124**	I(0)	0.000***	I(1)
Ltd	0.04861**	I(0)	0.0245**	I(0)	0.000***	I(1)
Rgdp	0.0000***	I(0)	0.000***	I(1)	0.000***	I(1)
Unr	0.0000***	I(0)	0.000***	I(1)	0.000***	I(1)
Npl	0.0000***	I(0)	0.000***	I(1)	0.000***	I(1)

*NB: *** (**) (*) indicates stationarity at 1%, 5% and 10% respectively*

We performed three panel unit root tests namely Harris-Tzavalis, Im-Pesaran-Shin and Fisher-type to determine whether research data was stationary or not. The test indicated that order of integration of variables varies with the method used but overall it was found that most variables were integrated of order one. These unit root test results indicate that a GMM of a dynamic nature is applicable (Holtz-Eakin et al., 1988; Arellano and Bond, 1999; Arellano and Bover, 1995; Blundell and Bond, 1998, Baltagi, 2008).

Static and Dynamic Models

In our analysis, we performed seven regressions which we categorized into least squares dummy variable (LSDV), pooled or ordinary least squares (OLS), generalized least squares (GLS), fixed effects (FE), random effects (RE), difference generalized methods of moments(DIFFGMM) and system GMM (SYSTGMM). LSDV, OLS, GLS, FE and RE models are static in nature, that is to say, the models provided a snapshot of NPLs at a particular time. DIFFGMM and SYSTGMM are dynamic or time variant model, that is, they capture the evolution of NPLs over time. Diagnostic checks done in this study chose RE as the most appropriate static model, while in the dynamic case, the SYSTGMM was found to be the most appropriate one. Other models were used for robustness checks.

Table 5: Static and Dynamic Regression Results

Var	LSDV	OLS	GLS	FEM	REM	DIFFGMM	SYSTGMM
Unr	-0.1851***	-0.1798**	-0.1798**	-0.1851***	-0.1849***	-0.1478***	-0.1321***
Rgdp	0.0646	0.1169	0.1169	0.0646	0.0659	0.1085***	0.0681***
Ltd	-0.0159	0.0439***	0.0439***	-0.0159	-0.0145	0.0119	0.0102
Ir	0.2310**	0.2520*	0.2520*	0.2310**	0.2313**	0.1775***	0.1661***
Infr	-1.5976***	-1.6055***	-1.6055***	-1.5976***	-1.5981***	-1.3126***	-1.1327***
Car	-0.2665***	-0.1904***	-0.1904***	-0.2665***	-0.2661***	-0.1381***	-0.1402***
Gnu	5.847x10-16	3.665 x10-16	2.238 x10-12	3.642 x10-16	-4.965 x10-15	-0.1778***	-0.1222***
Months	2.287 x10-16	1.556 x10-16	6.630 x10-13	1.468 x10-16	-1.467 x10-15	-0.0464***	-0.060***
Banks							
2	0.0011						
3	0.0376***						
4	0.0208**						
5	0.0840***						
6	0.0003						
7	0.0052						
8	0.0955***						
						0.6422***	0.7657***
Const	1.0974***	1.0391**	1.0391**	1.1279***	1.1256***	0.8612***	0.7760***
N	480	480	480	480	480	464	472
R2	0.6936	0.3099	0.4588				
Adj-R2	0.6837	0.2982	0.4413				
Bruesch & Pagan LM Test for Random Effects H0: Pooled regression model is appropriate. Ha: Random effect model is appropriate. chibar2(01) = 4222.44*** Prob> chibar2 = 0.0000				Sargan Test of Over identifying Restrictions H0: Over identifying restrictions are valid chi2(173) = 103.8371 Prob> chi2 = 0.6035			
Test for Serial Correlation for Instrument validation Arellano-Bond test for AR(1) in first differences: z = -4.45 Pr>z= 0.000 Arellano-Bond test for AR(2) in first differences: z = -0.68 Pr>z= 0.536							

NB legend: * p<0.05; ** p<0.01; *** p<0.001

After performing the Hausman test, we further conducted Bruesch and Pagan LM test to choose between pooled and random effect models. The probability value is zero which is less than 5% hence we rejected null hypothesis in favour of the alternative hypothesis. Therefore, we conclude that the random effect is more appropriate in this research than the pooled OLS model. Furthermore, the insignificant Sargan and serial correlation test results indicate that the instruments used are valid.

Robustness Checks

This study used alternative static models namely LSDV, OLS, GLS, and fixed effect andDIFFGMM dynamic model to check whether coefficients were robust. Robustness of study variables was assured by similarity in significance, coefficients and direction of movements of variables in all three static models. Using the Wald and/or F-test for joint significance, we found that all models were equally significant at 1% (i.e. p - value = 0.0000).

Static models (OLS, Fixed Effect and Random Effect)

Bruesch and Pagan LM test for random effects supported the use of random effect model, just as with Hausman test. All static models revealed that unemployment (UNR) negatively correlate with non-performing loans and the variable is statistically significant at 0.1% in LSDV, FEM and REM. In OLS and GLS models, the variable has negative coefficient but significant at 1%. Based on the REM, a unit increasing unemployment increase the bank systematic risk by 18.49%. It conforms to the one found by Hyun and Zhang (2012). These authors explained that negative association between unemployment and NPLs implies that fluctuations in an economy quickly translate to meaningful effects on NPLs. Probably this is because only deserving borrowers have access to loans along with stringent client screening procedures. However, these results are against promoting financial inclusion in Zimbabwe as credit facilities will only be available to smaller population, that is, those employed. In line with Holmstrom and Tirole (1994, 1997) argument, financial exclusion especially of small firms is exacerbated in a financially constrained environment due to reputational risk since they do not have collateral. In addition, bank credit is out of reach since banks cannot afford the cost of monitoring such fragmented markets.

Concerning market interest rates, the study indicated that there is positive relationship between market interest rates and non-performing loans in all static models and the correlation matrix show a positive value of 0.71, an indication that interest rates increases credit risk by 71%. Thisfinding is in line with theoretical expectations and also conformed to findings made by Messai and Jouini (2013). Positive connection implies that an increase in interest rates will result in burgeoning non-performing loans and the variable is significant at 0.1%. According to results, high interest rates erode borrowers' repayment capacity which may delay or avoid realization of interest income resulting in surge in overdue loans with unearned interest. The result is also in line with Hicks' (1935) quiet life hypothesis. Tagging along similar lines of thought, high interest rates presented loan burden to borrowers as most banks were charging high rates averaging 13.35% during the period understudy when compared to world and Africa rates of 5.78 and 8.1% respectively. Banks reviewed lending rates downwards to 11.99% in December 2015 following RBZ

directive in September 2015 but these are above both average world and Africa rates. Although Zimbabwean economy is in a liquidity glitch, banks cannot increase their assets and profitability through high lending rates as this might work the other way, which is, eroding bank assets and low profitability due to bad debts written off.

Although Zimbabwean economy has been experiencing negative inflation rate for lengthy period of time, research findings indicated that inflation has negative influence on NPLs in all static and dynamic models and the variable is significant at 0.1% level. Our findings conformed to Waemustafa and Sukri (2015) on the effect of inflation in conventional banks. Negative association indicated that increase in inflation rate results in decrease in credit risk. According to these findings, a high level of inflation makes debt servicing easier by reducing the real value of outstanding loans, provided the loan agreements do not contain variable interest rate clauses leading to compensatory upward adjustment in interest rates. However, although debt servicing becomes easier, banks' assets will deteriorate in real terms.

To shed more light of bank-specific determinants, research results indicated that capital adequacy ratio negatively influence NPLs in Zimbabwe. The variable is statistically significant at 0.1% across all static models and findings are in line with Hyung and Zhang (2013) and Shingjerji (2013). High capital acts as bank safety net in case of contingency events but this study rendered high capital ratios as major driver of NPLs within bank setup or vice versa. From the study, increase in bank capital adequacy reduces NPLs. Bank capital adequacy ratio measures risk taking behaviour of any banking institution and according to results we found the banks with low capital adequacy ratio increase NPLs through moral hazard (risky loans). Evidence has it that most of failed banks were poorly capitalized, as indicated in RBZ publications, which support the view that bank with high capital adequacy ratio is less likely to venture into moral hazard than those with lower ratios. Both 2003-2004 and 2007-2008 Zimbabwean financial crises that Zimbabwean economy experienced were also related to moral hazard that resulted from banks venturing into risky activities. The LSDV results provide much interesting results which are included in all other static model results, that is, banks which have significant contribution to the level of credit risk in the Zimbabwean banking sector. Compared to bank 1, bank 3, bank 4, bank 5 and bank 8 significantly contributes 3.76%, 2.08%, 8.4% and 9.55% respectively of the systemic risk of the Zimbabwean banking sector.

Loan-to-deposit ratio (LTD) increases with non-performing loans. We found that LTD variable was significant in OLS and GLS models but insignificant in other statics models. All our static models rendered real GDP growth rate and GNU variables as insignificant determinants of NPLs in Zimbabwe. In the interest of brevity, NPLs are mainly driven by microeconomic and macroeconomic factors with political stability having no influence, that is, bank credit risk in Zimbabwe a result of both idiosyncratic and systematic risk factors. Systematic risk such as inflation and unemployment play a major impact on credit risk levels. However, these models do not have memory to capture persistent growth in non-performing loans therefore to circumvent this weakness we employed GMM models, which are dynamic in nature.

The Dynamic Model (GMM)

Using Arellano-Bond and Arellano and Bover or Blundell and Bond estimations, we identified that NPLs are a function of microeconomic, macroeconomic, political forces as well as build in momentum in itself. The significance of one-period lagged NPLs indicates that credit risk is a function of its past realization, that is, it evolves overtime. It has been found that 76.57 percent of credits risk in each month is driven by the credit risk in the previous month. The GMM models were significant at 1% and this is an indication that the model is reliable. Similarly, to findings from static models, we identified that average lending rates positively influence NPLs in Zimbabwe. The lending rates variable (IR) is statistically significant at 0.1% in both models which implies that it has much influence on level of credit risk in Zimbabwe. Positive relationship infers increase in lending rates results in increase in non-performing loans and this is in line with theoretical expectations as suggested Farhan *et al*. (2012) and Sakiru*et al.* (2011). In reiteration, high interest rates facilitate best platform for creating bad loans and hindering economic growth as well financial inclusion process in Zimbabwe.

To further explain credit risk determinants in Zimbabwe, research findings highlighted that changes in inflation rate have negative influence on non-performing loans. The study indicated that the inflation variable (INFR) negatively an associate with NPLs and the variable is significant at 0.1%. Surprisingly, both dynamic models found significant relationship between real GDP growth rate and NPLs. According to findings, real GDP increases with non-performing loans and findings are similar to those of Garr (2013). Concerning unemployment, the study suggests negative connection between unemployment rate and credit risk and this was line with findings drawn by Makri*et al.* (2014).

More interestingly we also found out that political stabilityhada negative influence on credit risk. GMM model captured influence of political stability dummy variable which was not recognized in all five static models discussed above. Our political policy dummy variable, Government of National Unity (GNU) has a negative coefficient and is significant at 0.1% level. GMM model suggest that GNU negatively influence bank credit risk profiles. Political stability necessitated by GNU boosted confidence of investors, increasing both employment levels, growth ultimately causing a reduction in credit risk as supported by correlation results in table 3 between GNU, and unemployment, real GDP and non-performing loans of -54.6%, 58.5% and -76.9% respectively.

These results have shown the robustness and superiority of a dynamic model over static model. Variables such as GNU, RGDP and past observationsare significant factors in the dynamic model though insignificant in the static models. There is also a drastic increase in the coefficients of both GNU and month when a dynamic model is adopted. These results imply that most researches which rely on static analysis have a specification bias posed by model under-fitting, and this compromised the reliability of results.According to Greene (2008), Baltagi (2009) and Gujarati (2013), this induces bias, inefficiency and inconsistency of estimators even if the sample size increases indefinitely, that is, they are not asymptotically unbiased and efficient.

3.7 CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

The Paper Investigated On The Determinants Of Credit Risk In Zimbabwe. Our Paper Suggested That Credit Risk Is Driven By Microeconomic, Macroeconomic And Political Stability Factors, That Is, It's A Combination Of Both Idiosyncratic And Systematic Risk Factors.Dynamic Models Identified That Gnu Has Negative Impact On Npls While All Static Models Rendered The Variable Insignificant, An Indication That Political Instability Exacerbates Systematic Risk Not At A Specific Time But Overtime. Static And Dynamic Models Found That Interest Rates Have positive influence on non-performing loans. High interest rates are direct threat to meeting financial inclusion objectives in economy.

The study identified that increasing capital adequacy ratio reduces credit risk in Zimbabwe. Previous studies indicated that banks with low capital adequacy ratio are likely to suffer increase in NPLs through moral hazard (issuing risky loans). Loans-to-deposit ratio has positive influence on non-performing loans. This ratio detects bank lending culture and most local banks were aggressively lending during the period under study, with most banks having higher ratios. Concerning macroeconomic influence on NPLs, inflation and unemployment negatively relate with NPLs in all static and dynamic models. Real GDP growth rate has apositive influence on NPLs. A negative relationshipbetween inflation and NPLs implies that increase in inflation rate can decrease NPLs. However high inflation rates are never favourable and the 2007-2008 hyperinflation evidences this. During periods of high inflation, real monetary value is lost thus only borrower benefit from rising nominal values.

Dynamic models yield superior results above static models. Some variables which were insignificant in static models become significant in the dynamic model, an indication that only relying of static models induces specification bias, which compromise much on the reliability of results and policy analysis.

Policy Implications and /or Recommendations

Econometric analysis provided a picture on direction and strength of influence of each factor considered in the models and based on findings that were discussed in previous section, we recommend the following:

- The study supported quiet life hypothesis thus we recommend banks operating in Zimbabwe to reduce lending rates to levels between average world and African rates of 5.78% and 8.1% respectively. Reduction in lending rates will improve borrowers' repayment capacity and hence boosting loan repayments which curtail NPLs in banks. Banks cannot increase their assets and profitability through high lending rates as this might work the other way, which is, eroding bank assets and low profitability. Reduction in interest rates will also discourage incentive for moral hazard in borrowers hence lessening chances to defaults. Overlay, the objective of financial intermediation and financial inclusion will be satisfied.
- Banks should endeavour to improve their capital adequacy ratios. According

to the study, low capital adequacy ratio creates incentive for moral hazard thus increasing bank capital would discourage such incentives.

- Banks to periodically monitor loan-to-deposit ratios and also ensure that any expansion in lending activities is adequately supported by capital growth. Banks that operates in Zimbabwe should consider shifting their culture from current profits credit culture to value driven credit culture.
- As part of developing proactive credit risk management systems, banks should periodically update credit policies in order toimprove their screening process in assessing loan applications. A combination of anxiety for current profits and outdated credit policies was adequate enough to justifying trending NPLs.
- Macro and political risks were identified as significant drivers of credit risk in Zimbabwe. Our research proved that inclusive government led to reduction in NPLs hence we recommend the Zimbabwean government to ensure political stability to boost investor confidence through all stakeholder involvement, especially on indigenisation policies and this will stimulate growth, employment and ultimately reduce default rates.
- The central bank must come up with a standard official discount rate. At the moment, the Reserve Bank of Zimbabwe does not have an official discount rate. The current official interest rate is the Weighted Lending Rate which makes it difficult for one to determine the bank margin or spreads as effective metric measure of competition and efficiency of banks to determine drives of credit risk in line with the SCP paradigm, quite life, the competition fragility hypothesis.

3.7.1 Contribution of the study

The study contributed to in-depth understanding of NPLs dynamics by banks and regulatory authorities in that it captured NPLs as a dynamic variable, a unique analysis that has never been performed in the Zimbabwean context.

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Appendices

Table 5: Data used in Figure 1

YEAR	NPL	BIS BENCHMARK
30/06/09	1.62%	5%
31/12/09	1.80%	5%
30/06/10	3.16%	5%
31/12/10	4.72%	5%
30/06/11	8.21%	5%
31/12/11	9.92%	5%
30/06/12	11.59%	5%
31/12/12	13.81%	5%
30/06/13	15.92%	5%
31/12/13	18.49%	5%
30/06/14	20.45%	5%
31/12/14	15.91%	5%
30/06/15	14.52%	5%

4.0 THE ROLE OF MOBILE MONEY IN FINANCIAL INCLUSION IN LESOTHO

By Lira P. Sekantši[18] and Sephooko I. Motelle[19]

Abstract
The prolific use of mobile telephones in developing countries has given birth to financial innovations such as mobile money. As a result, the use of mobile money has expanded the grid of financial services to include previously unbanked populations in Africa. This development is a harbinger for increased financial intermediation and positive spill-overs in terms of credit growth to entrepreneurs and faster economic growth. Based on monthly data for the period 2013m7 – 2015m12, this study employs time series techniques to unpack the proliferation of mobile money and its attendant impact on financial inclusion in Lesotho. The findings reveal existence of long-run steady state relationship between financial inclusion and mobile money in Lesotho and that mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho. Therefore, financial inclusion policies should be directed towards leveling the playing ground for mobile money to flourish to create a more financially inclusive society in Lesotho.

Key words: Financial inclusion, mobile money, credit growth

4.0 INTRODUCTION

Many developing countries especially in Africa are characterized by financial exclusion in the form of low access to financial services. This is mainly a result of banking infrastructure gaps that hinder an all-inclusive financial system (Andrianaivo & Kpodar, 2012). According to Beck & Maimbo (2013) approximately 2.5 billion people in the world lack access to financial services and have to rely on cash or informal financial services which are typically unsafe, inconvenient and expensive. However, more than half of households in developing countries do not have an account with a financial institution. In the case of Lesotho, approximately 38% of the adult population has a bank account, which indicates that the majority of the adult population still lacks access to basic banking services (Ketly & Kasi, 2015). The mainstream banking sector fails to deliver financial services to millions of consumers, especially those residing in rural areas. Banks are biased in favor of affluent consumers due to high costs of physical infrastructure and operational costs as well as low profits associated with serving the low income consumers (Dube et al, 2014). This lack of access to financial services not only limits the ability of the poor to save, repay debts and manage risk responsibly but also indirectly exposes them to poverty (see Donovan, 2012).

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The development of mobile money[20] has provided a glimpse of hope for the financially excluded members of the population. Mobile money is perceived as a solution that can circumvent poor banking infrastructure and geographical isolation and can offer low-cost distribution of financial services through the mobile phone network. In addition, the surge and near-universal use of mobile phones and the huge number of airtime distributors that can act as access points make mobile money a cost-effective solution to financial access (Ketly & Kasi, 2015). Furthermore, mobile money can act as the basic platform for a wide range of digital financial services that go beyond the basic mobile money product, including remittances. Following the successful adoption of mobile money in Kenya in 2007, numerous countries have scaled up their efforts to implement it in their jurisdictions to increase access to financial services.

In the case of Lesotho, Econet Telecom Lesotho (ETL) launched its mobile money service, Eco-cash, in October 2012 while Vodacom Lesotho (VCL) launched M-pesa in July 2013. By the end of December 2015, both Eco-cash and M-pesa had registered a total of 1.06 million customers and 3,479 agents; with customer and agent activity (90-days) standing at approximately 25% and 79%, respectively. Based on 2006 population census figure of 1.88 million inhabitants, the number of registered customers stood at approximately 57% of the population in December 2015. As a proportion of overall mobile network operator (MNO) subscribers, mobile money in Lesotho achieved approximately 48% market penetration in December 2015. Consistent with this, mobile money transactions volumes and values as well as trust account balances increased significantly. As a proportion of total commercial bank deposits, the value of mobile money transactions in Lesotho increased from approximately 7% in 2014 to 21% in 2015. As a proportion of national output, it increased from 2% of gross domestic product (GDP) in December 2014 to 7% in December 2015.

Against this background, it is clear that mobile money has become an important tool for delivering and facilitating financial services in Lesotho and thus can be used as vehicle to reduce financial exclusion. The limited access to financial services, on account of banking infrastructure gap in Lesotho, in relation to the growing mobile money uptake raises an interest to investigate the extent to which mobile money has increased financial inclusion[21]. This is because with the high mobile phone subscriber base of 97%(based on 2006 census) and large geographic coverage area with access to communications service (see Appendices 1 and 2), there is potential for mobile money to increase access to financial services further in Lesotho with resultant decrease in poverty and increase in economic growth. Therefore, in order to influence policymakers to promote and facilitate mobile money in Lesotho,

[20]Mobile money may be defined as the provision of a range of financial services including mobile payments and mobile transfers to consumers through mobile devices (phones). It encompasses common functions such as balance checks, funds transfer, depositing and withdrawing cash (cash-in and cash out), savings, access to credit, bill payments, airtime purchase and long distance remittance of funds.

[21]Financial inclusion may generally be defined as a process that ensures ease of access, availability and usage of the formal financial system for all members of an economy. It entails access to financial services such as payment services, remittance facilities, savings, credit and/or loans as well as insurance services offered by the formal financial system at costs that can be afforded by the poor and disadvantaged social groups. Of course, there are other types of informal financial services which are also perceived as important contributors to financial inclusion.

there is a need for an empirical study that provides evidence that mobile money increases financial inclusion. Nevertheless, there are currently no empirical studies that interrogate this relationship in the context of Lesotho.

The objective of this study is to investigate the role of mobile money in financial inclusion in Lesotho using on monthly data for the period July, 2013 to December, 2015. The rest of the paper is organized as follows: Section 2 reviews the literature on mobile money and financial inclusion while Section 4 describes the data and presents the analytical framework. Section 5 discusses the empirical results. Section 6 concludes the paper and offers a menu of recommendations.

4.1 LITERATURE REVIEW

4.1.1 Identification of Constraints of Financial Inclusion

An inclusive financial system has several benefits. First, it facilitates efficient allocation of productive resources and can potentially lower the cost of capital. Second, access to appropriate financial services can considerably improve the management of finances on daily basis. Third, it can also help in reducing the growth of informal sources of credit such as money lenders that are often found to be exploitative[22]. An all-inclusive financial system enhances efficiency and welfare by providing avenues for secure and safe saving practices and it also facilitates availability of efficient financial services (Sarma & Pais, 2011).

According to Dube et al (2014), financial inclusion does not only ensure access to basic financial services by all, but also promotes economic growth, reduces poverty and inculcates a savings culture in rural areas. Therefore, financial regulators, governments and the banking industry around the world have intensified efforts to increase access to financial services. For example, the banking industry has introduced products such as "no-frills" accounts and "General Credit Cards" for low deposits and credits, and launched low cost bank accounts to promote financial inclusion. In addition, micro-finance institutions and "Self-Help Groups" have also been promoted in some countries such as India to take care of the excluded groups (Sarma & Pais, 2011). These efforts aim at ensuring access and affordable financial services to the poor to allow them to plan for routine expenses, cope with external shocks and better cover unanticipated expenses. In addition, they contribute to increased access to more stable and productive activities (Gwalani & Parkhi, 2014). This, not only enhances economic growth and reduces poverty, but also promotes social inclusion[23].

In developing countries particularly in Africa, the issue of financial inclusion still remains a challenge as most countries are severely constrained by limited infrastructure and other difficulties of accessing financial services, which leave large proportions of the population, especially in remote areas, with low access to affordable financial services or completely excluded from financial services (see Kempson, 2006 and Oji, 2015).

The literature identifies both demand and supply side constraints to financial inclusion. For example, on the demand side, people may choose not to use formal financial services because they do not need such services due to religious and cultural reasons, and/or lack of trust in formal financial institutions. Lack of trust may be a result of, among others, fear of bank failure or fraud. In addition, people who wish to use formal financial services may face several barriers. First, inaccessibility due to difficulty in reaching service points or absence of such services in the vicinity.

[22]Of course, there other types of informal sources of finance that are part of or enhance finance.

[23] Social inclusion is defined as the degree to which people are and feel integrated in the different relationships, organizations, sub-systems and structures that constitute everyday life. As a process, it refers both to integration into social, economic and civic life and the pursuit of active citizenship as well as a means to counter poverty understood in the sense of capability deprivation (see Cardo, 2014).

Second, unaffordability as formal financial services are often too costly for low income persons. Third, inappropriate product design, which results in products that do not meet the needs of excluded customers. Fourth, inability to meet eligibility criteria, for example not having sufficient assets to meet conditions for the extension of a loan or being unable to provide documentation evidencing identity. In addition, other demand side constraints include cumbersome documentation and procedures that customers have to undergo when opening a bank account, limited literacy and numeracy skills, information asymmetry due to lack of awareness, branch operating hours, which may be inflexible for some sections of the population (see De Koker & Jentzsch, 2013; Gwalani & Parkhi,2014 and Kempson,2006).

On the supply side, high costs, lack of trust or faith in the banking system, bad credit records, inappropriate product design, complex procedures for availing financial services, stringent regulatory requirements deter customers from participating in the formal financial system (De Koker & Jentzsch, 2013). Consequently, the vast majority of populations in many developing countries remain either unbanked[24] or completely financial excluded.

4.2 THE ROLE OF TELECOMMUNICATION TECHNOLOGIES IN IMPROVING FINANCIAL INCLUSION

The conventional banking system has not been able to provide financial services to a large number of low-income and poor people, especially in remote areas, due to high costs of physical infrastructure, operational costs and unprofitability arising from serving these class of consumers (see Boston Consulting Group, 2011; Goss, Mas, Radcliffe & Stark, 2011). However, the diffusion of information and communication technologies (ICT) and mobile telephony have the potential to significantly reduce barriers to financial inclusion and therefore allow millions of people who were otherwise excluded from the formal financial system to perform financial transactions relatively cheaply, securely, and reliably through their mobile phones. Mobile money is one of many possibilities arising from advancement in technology (Dube at. al, 2014; Donner and Tellez, 2008; Kasseeah & Tandrayen-Ragoobur, 2012; Jenkins, 2008).

Mobile phones have a great potential for delivering financial services to a broader base of customers due to their ease of access and enormous uptake by large number of the unbanked and the poor in developing countries. Moreover, mobile phone systems can be placed anywhere as long as there is wireless phone connection. In this regard, they overcome the problem of distance and lack of bank branches in remote areas by enabling the possibility of ubiquitous access to financial services.

[24]According to Gross et al (2012) and Breitbach & Walstad (2014/2015) the unbanked are individuals or households without checking or savings accounts and operate largely outside the banking system when making financial transactions. On the other hand, the underbanked are individuals or households that have a bank account(checking, savings or money market account), but supplement the account with alternatives to traditional banking services such as non-bank money orders, non-bank check-cashing services, payday loans, rent-to-own agreements, payday loan, payroll card or pawnshops. It is important to understand that lack of access to banking services does not necessarily imply financial exclusion in a context where non-bank financial institutions are available.

Furthermore, mobile money financial services are commonly set up with existing infrastructure provided by mobile money operators and a network of "cash merchants" (or "agents"), who are located in most parts of the country, as well as a host of other supporting businesses such as banks, agent aggregators and liquidity management firms (Donovan, 2012; Ramada-Sarasola, 2012). Therefore, not only do these enable new entrants to the financial system but also offer such services at lower costs because they do not incur the costs of physical roll-out and faces lower costs of handling low-value transactions(Flores-Roux & Mariscal, 2010).

Mobile money also increases the large scale financial connectedness among distant households and individuals. For this reason, it serves as a remittance channel for sending and receiving money to/from people in distant locations, both domestically and/or internationally. In this regard, it increases circulation of money in the economy, which spurs economic activity and consequently contribute towards improving the economic well-being of the poor in remote areas (Donovan, 2012; Hinson, 2011; Morawczynski & Pickens, 2009; Alleman & Rappoport, 2010; Morawczynski, 2010, Jack, & Suri, 2011). In addition, it formalizes flow of remittances that used to go through informal channels and thereby improves remittance statistics compilation.

It serves as a form of an alternative savings account for people without formal bank accounts and improves access to financial services. These accounts have the potential of connecting users to the formal financial services grid, which offers a wide range of other sophisticated financial services products like insurance and credit and/or micro-loans from banks and microfinance institutions. It can also be commercially viable by generating substantial revenue for service providers and agents, the success of which may lead to high labor demand and employment generation. Some governments use mobile money for revenue collection and disbursements. This enhances the ability of such governments to monitor financial flows, reduce leakages and thereby arrest illicit corruption and fraud (Donovan, 2012).

In light of the many benefits, mobile money services are being deployed rapidly across many countries over the world, including in Africa, as a tool to further the goal of financial inclusion in their jurisdictions. Table 1 demonstrates the experiences of some African countries including the three East African Community (EAC) countries namely Kenya, Tanzania and Uganda where these services drastically decreased the scale of financial exclusion.

Table 1: Mobile Money Deployments in Selected African Countries

Country	Product	Launch Date	Coverage Details	Source
Kenya	M-pesa	2007	14 months after its launch, M-pesa had signed up 2.7 million users and registered 3,000 agents in Kenya. Within 5 years of its launch, M-pesa had 15 million customers (37.5% of the country's population) and more than 18,000 agents and processing $10 billion per year.	Di Castri & Gidvani(2014); Lal & Sachdev(2015)
Tanzania	M-pesa	April 2008	14 months after its launch, M-pesa had accumulated 280,000 users who were transferring US$5.5 million per month at about 930 agent locations. In February 2014, over half (53%) of households in Tanzania reported that they use M-Pesa exclusively at roughly 17,000 M-Pesa agents.	Rasmussen(2009); Di Castri & Gidvani(2014);
Uganda	MTN Money	March 2009	In collaboration with other smaller MNOs, MTN had registered over 9 million users, processed 242 million mobile money transactions worth US$4.5 billion in December 2012. With market share of over 15,000 agents in 2012, MTN money remains the largest and successful mobile money deployments in East Africa.	Munyegera & Matsumoto(2014); Oritin et.al.(2013)
Zimbabwe	Eco-cash	September 2011	This service reached 4,000 agents, 2.3 million customers(31% of country's adult population), 1 million of whom were active just 18 months after its launch and processed transactions volume valued at 22% of the country's gross domestic product(GDP).	Lal & Sachdev(2015)
Lesotho	Eco-cash M-pesa	October 2012 July 2013	Since its launch until December 2015, Eco-cash has 318,786 registered customers and 1,480 agents cumulatively. On the other hand, M-pesa signed up to 745,242 customers with 1999 agents countrywide during the same period.	Central Bank of Lesotho(CBL)

Despite having several unique attributes that make it attractive, mobile money is exposed to several risks just like any other payment system. The risks include money laundering, terrorism financing, privacy and security threats, fraud, and liquidity risks. In addition, it exposes users to other risks associated with lost payments through faulty transmissions or criminality on part of mobile operators, agents or other payment service providers. Furthermore, any relationship difficulty among MNOs, banks, agent network managers and agents who form a consortia working together to deliver the services could result in service unavailability to the users. Not only could this cause inconvenience to the users, but could also lead to inability to conduct transactions to the detriment of business in the country as a whole (Lake, 2013).

4.3 METHODOLOGY

4.3.1 Data Type and Sources

Financial inclusion and mobile money cannot be directly measured; therefore, they need to be measured by means of proxies. Table 2 below gives the description and measurement of variables. This data are available at the Central Bank of Lesotho (CBL) and covers the period 2013m7 through 2015m12. This sample period was chosen as comprehensive data on mobile money started to be collected in 2013.

Table 2: Description of Variables

Variable	Measurement	Description	Source
FI_t	Total credit per 1000 adults*(tc)*	Total credit extended by commercial banks divided by 1000 adult population.	CBL
MM_t	Mobile money transaction (values) divided by 1000 adults	These include values of the following transactions; airtime purchases *(ap)*, and customers' deposits ()*cd* and float *(flt)*(each divided by 1000 adults).	CBL
	Trust account balance per 1000 adults*(tab)*	This is the current cumulative balance in the mobile money trust accounts held by commercial banks in the name of mobile money agents and customers divided by 1000 adults.	CBL
	The number of registered mobile money customers*(mc)*	The total number of customers(users) who have registered for both M-pesa and Ecocash	CBL
$M2$	Broad money	Broad money (M2) consists of M1 and quasi money in Lesotho.	CBL

4.3.2 Model Specification

This study adopts the approach followed by Andrianaivo and Kpodar (2011, 2012) and Lundqvist and Erlandsson (2014) who examined the relationship between financial inclusion and mobile money using the following bivariate econometric model:

$$FI_t = \alpha_0 + \alpha_1 MM_t + \varepsilon_t \quad (1)$$

Where FI_t denotes natural logarithms of financial inclusion measured by total credit per 1000 adults *(tc)*, MM_t represents natural logarithms of indicators of mobile money and ε_t denotes the random error term. Indicators of mobile money are value of airtime purchases per 1000 adults*(ap)*, (value of customers deposits per 1000 adults *(cd)*, (value of float[25] per 1000 adults *(flt)* (and trust account balances per 1000 adults *(tab)* as well as the number of registered mobile money customers *(mc)*.

[25]Float is the sum of customer withdrawals and deposits

4.3.3 Estimation Strategy: Autoregressive Distributed Lag (ARDL) Bounds Testing Procedure and Granger Causality

4.3.3.1 Primary Model-Bivariate Model

In examining the relationship between financial inclusion and mobile money, the study estimates equation (1). This is done in three steps. First, the paper determines the order of integration of the variables using the Augmented Dickey Fuller (ADF) and Phillips and Perron (1988) tests. The latter test is also used in addition to the former as it caters for serial correlation, endogeneity of regressors and allows for the possibility of heteroskedastic disturbance terms (Hamilton, 1994). While acknowledging the fact that the autoregressive distributed lag (ARDL) bounds testing allows for the presence of *I*(0), *I*(1) or mixed integrated variables in the estimation, pre-testing of the order of integration of the variables ensures the absence of *I*(2), whose presence would nullify the procedure. Second, after establishing the integration properties of variables, the study employs ARDL bounds testing approach to cointegration developed by Pesaran and Shin (1999) and advanced by Pesaran et al (2001) to study the existence long-run relationship between mobile money and financial inclusion. This procedure is preferred to other cointegration techniques due to the several advantages. For example, ARDL bounds testing is applicable irrespective of whether the underlying regressors are *I*(0), *I*(1) or mutually cointegrated. In addition, this procedure still remains robust for cointegration analysis in empirical macroeconomic studies where small samples size is a common phenomenon. Furthermore, it also has finite-sample critical values as opposed to other cointegration approaches for which the distribution of the test statistics may be unknown in finite-samples. In particular, Narayan (2005) develops a set of sample-specific critical value bounds for the sample sizes ranging from 30 to 80 using the same approach and GAUSS code used by Pesaran et al (2001) in generating the asymptotic values. Furthermore, this technique generally provides unbiased estimates of the long-run model and valid -statistics even in the presence of endogenous regressors.

The paper transforms the financial inclusion model (equation 1) into an ARDL framework as follows:

$$\Delta FI_t = \beta_0 + \sum_{t=1}^{p} \beta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \beta_{2t} \Delta MM_{t-i} + \beta_3 FI_{t-1} + \beta_4 MM_{t-1} + \mu_t \quad (2)$$

Where all variables are as previously defined, Δ is the first difference operator, is the lag length, 's are parameters to be estimated, and is a white-noise error term. Similarly, the other variable in equation (2) is a dependent variable, the other equation can also be estimated.

According to the ARDL bounds testing procedure, the cointegration test between variables is conducted using the Wald test (F-statistic). The test imposes restrictions on the estimated long-run coefficients of one period lagged level of the variables to be equal to zero. The two sets of critical F- values (lower and upper bound values) for a given level of significance are reported by Pesaran et al (2001) for large sample sizes and Narayan (2005) for small sample data. The lower bound values assume

that all variables in the ARDL model are integrated of order zero, or I(0), while the upper bound values assume that the variables are integrated of order one, or I(1). Therefore, if the computed F-statistic is below the lower bound value, I(0), the null hypothesis of no cointegration cannot be rejected. Conversely, if the computed F-statistic exceeds the upper bound value, I(1), the null hypothesis is rejected and it is concluded that the variables are cointegrated. Nevertheless, the result becomes inconclusive if the F-statistic falls between the two bounds. Once cointegration has been established between the variables using ARDL bounds testing procedure, then the next step is to estimate the long-run and short-run error correction models from the established cointegration regression. The long-run model and the associated error correction model are given by:

$$FI_t = \delta_0 + \sum_{t=1}^{m} \delta_{1t} FI_{t-i} + \sum_{t=0}^{m} \delta_{2t} MM_{t-i} + \mu_t \qquad (3)$$

$$\Delta FI_t = \theta_0 + \sum_{t=1}^{p} \theta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \theta_{2t} \Delta MM_{t-i} + \theta_3 ECT_{t-1} + \mu_t \qquad (4)$$

Where all variables are as previously defined, δ's and θ's are the parameters to be estimated, *p* and *m* are the lag lengths and θ_3 is the coefficient of the error correction term, which measures the speed of adjustment to the long-run equilibrium following a shock to the system.

According to Granger (1969 and 1988) cointegration among the variables may imply the existence of causality between the variables at least in one direction. However, it does not indicate the direction of causality between the variables. Therefore, once cointegration has been established between mobile money and financial inclusion using ARDL bounds testing procedure, then the third step is to employ a dynamic Granger causality test to determine the short-run and long-run causal effects between mobile money and financial inclusion. For this purpose, the error correction model (equation 4) is used to examine Granger causality from mobile money to financial inclusion. In this test, the short-run causality is implied by the significance of the statistic (or Wald statistic) on the first differences of lagged independent variables. On the other hand, the long-run causality is captured by the significance of the *t*-statistic on the coefficient of the lagged error correction term. Nevertheless, if there is no cointegration between the variables only short-run causality can be determined.

4.3.3.2 Robustness Checks - Trivariate Model

In addition to estimating the bivariate relationship between financial inclusion and mobile money, the study also estimates this relationship in the context of a trivariate model where broad money (M2) is used as a control variable. This is done to avoid omission of variable bias inherent in a bivariate model, which may lead to unreliable results (Lütkepohl, 1982). The use of broad money (M2) is motivated by its high correlation with GDP because data for the latter is only available annually in Lesotho[26]. In order to accommodate the addition of M2, cointegration between

[26]The correlation between M2 and GDP is approximately 99%.

financial inclusion, mobile money and M2 is established by using the following ARDL model:

$$\Delta FI_t = \varphi_0 + \sum_{t=1}^{p} \varphi_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \varphi_{2t} \Delta MM_{t-i} + \sum_{t=0}^{p} \varphi_{3t} \Delta M2_{t-i} + \varphi_4 FI_{t-1} + \varphi_5 MM_{t-1} + \varphi_6 M2_{t-1} + \mu_t \quad (5)$$

Where denotes natural logarithms of broad money (M2), Δ is the first difference operator, is the lag length, 's are parameters to be estimated, and is a white-noise error term. This test is conducted using the steps discussed earlier. Once this is done, the following long-run and short-run models are estimated.

$$FI_t = \gamma_0 + \sum_{t=1}^{m} \gamma_{1t} FI_{t-i} + \sum_{t=0}^{m} \gamma_{2t} MM_{t-i} + \sum_{t=0}^{m} \gamma_3 M2_{t-i} + \mu_t \quad (6)$$

$$\Delta FI_t = \vartheta_0 + \sum_{t=1}^{p} \vartheta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \vartheta_{2t} \Delta MM_{t-i} + \sum_{t=0}^{p} \vartheta_{3t} \Delta M2_{t-i} + \vartheta_4 ECT_{t-1} + \mu_t \quad (7)$$

Where all variables are as previously defined, γ's and ϑ's are parameters to be estimated, and ϑ_4 is the speed of adjustment to the long-run equilibrium following a shock to the system. The estimated trivariate error correction model (equation 7) is also used to examine the short-run and long-run Granger causality from mobile money to financial inclusion.

4.3.4 Analysis Of Empirical Results

4.3.4.1 Unit Root Test Results

As a standard practice in time series analysis, the unit root properties of each series are studied. The test results are presented in Appendix 4. The results show that all the variables used in the study are integrated of order one, that is *I*(1), except the logarithms of the number of mobile money customers, logarithms of trust account balances per 1000 adults and logarithms of airtime purchases per 1000 adults, which are *I*(0). Therefore, the case of a mixed order of integration of the variables, *I*(1) and *I*(0), has been established.

4.3.4.2 The Relationship between Financial Inclusion and Mobile Money

4.3.4.2.1 The Long-run Relationship – Cointegration Results

Appendix 5 presents the results of ARDL bounds testing between financial inclusion and mobile money tested in the context of a bivariate model. The results indicate that the calculated *F*-statistic is greater than the upper bound critical value at 1% level of significance when financial inclusion is a dependent variable in each model. Hence, the null hypothesis of no cointegration is rejected in all models. Similarly, the

existence of long-run relationship is also obtained even in the case of the trivariate models (see appendix 6)[27]. Therefore, there is a strong evidence of long-run steady state relationship between financial inclusion and mobile money in Lesotho both in the bivariate and trivariate setting.

The results of the long-run estimates of the bivariate and trivariate models are presented in Table 3 and Appendix 7, respectively. The results show that the long-run coefficients are not only positive but also statistically significant at either 1% or 5% levels of significance in all models and they are consistent with a priori expectations. Thus, this finding suggests that all explanatory variables representing mobile money determine financial inclusion in the long-run in Lesotho. For instance, mobile money increases the pool of loanable funds held by the banking industry through trust account balances. This is more so given that credit to households in Lesotho constitutes more than 60 per cent of total bank credit. In addition, by increasing the pool of loanable funds in the banking industry, mobile money service also changes the structure of commercial banks' balance sheet as banks would more likely allocate more funds for credit extension to both households and businesses instead of investing in securities and placements in call accounts. This is due to limited availability of the stock of government securities and higher returns associated with credit extension. Therefore, the larger the number of mobile money users in the country, the larger the number people with access to financial services.

Information asymmetry hampers the efficiency of screening of good from bad consumers. The proliferation of mobile money provides a conduit for information sharing, which enables banks to be more informed about prospective consumers and reduces information asymmetry. Furthermore, for wealthier users, mobile money account serves as additional account that complements the bank account, on the one hand. On the other hand, it is the first account for poorer users and has a potential to integrate them further into the formal financial services ecosystem by providing them with access to other accounts that offer a wide range of financial services. In this regard, the integration of mobile money operators systems with commercial banks information technology systems has facilitated the development and provision of services such as transfers from the bank accounts into mobile wallets. This and other potential innovations enable mobile money customers to transact directly with commercial banks and this increases access to financial services.

[27] However, other trivariate models where other proxies of mobile money were used did not produce robust results, therefore they are not reported in the paper. In the same manner, the trivariate models where logarithms of total deposit and number of ATMs are dependent variables are not reported by the paper because they did not produce robust results.

Table 3: Total Credit Models (bivariate case)

Relation Horizon	Explanatory Variable	Dependent Variable, Log of total Credit				
Short-run	*ECM(-1)*	-0.3387* (0.0010)	-0.2881** (0.0105)	-0.2993* (0.0018)	-0.2819* (0.0004)	-0.3659* (0.0011)
	d(ltab)	0.0243*** (0.0913)				
	d(lmc)		0.1151* (0.0026)			
	d(lap)			0.0172** (0.0200)		
	d(ltc(-1))			0.0404 (0.7738)		
	d(lcd)				0.0131** (0.0215)	
	d(lflt)					0.0129* (0.0042)
	D2014M2	-0.0309* (0.0000)	-0.0293* (0.0000)	-0.0312* (0.0000)	-0.0299* (0.0000)	-0.0283* (0.0000)
	D2014M5	-0.0232* (0.0000)	-0.0212* (0.0000)	-0.0249* (0.0000)	-0.0239* (0.0000)	-0.0229* (0.0000)
Long-run	*ltab*	0.0764* (0.0000)				
	lmc		0.1976* (0.0000)			
	lap			0.0788* (0.0000)		
	lcd				0.0594* (0.0000)	
	lflt					0.0316* (0.0000)
	D2014M2	-0.0743* (0.0000)	-0.0653* (0.0034)	-0.0862* (0.0001)	-0.0751* (0.0021)	-0.0579* (0.0005)
	D2014M5	-0.0564* (0.0000)	-0.0489* (0.0062)	-0.0728* (0.0000)	-0.0611* (0.0002)	-0.0488* (0.0000)
	c	6.3061* (0.0000)	5.4774* (0.0000)	6.3609* (0.0000)	6.3739* (0.0000)	6.3591* (0.0000)
Diagnostics	JB	0.3807 (0.8267)	0.4087 (0.8152)	0.3588 (0.8358)	0.5760 (0.7498)	0.8277 (0.6611)
	BG-LM test	1.7161 (0.4240)	7.7595 (0.1008)	0.8073 (0.6679)	1.2754 (0.5285)	3.2395 (0.1979)
	RESET test(F-statistic	0.2733 (0.6061)	0.3278 (0.5725)	0.8073 (0.6679)	0.2162 (0.6465)	0.0596 (0.8093)

Note: *, ** and ***denote the level of statistical significance at 1%, 5% and 10%, respectively. The variables *ltab* = logarithms of trust account balances per 1000 adults, *lmc* = logarithm of mobile money customers, *lap* = logarithms of airtime purchases per 1000 adults, *lcd* = logarithms of customer deposits per 1000 adults,

lflt = logarithms of amount of float per 1000 adults. D2014M2 and D2014M5 are dummy variables representing decline in total credit owing to stringent requirements by some commercial banks in response to regulatory directive by the Central Bank of Lesotho. The values in parentheses are the probability values.

4.3.4.3 Diagnostic Tests Results

Following the establishment of long-run estimates in each model, the next step involves the estimation of the error correction model (ECM). The results of short-term elasticities estimated within the ARDL framework together with their associated diagnostic tests also are presented in Tables 3 and Appendix 7. The diagnostic tests were applied to the estimated ECMs to ensure the reliability of the estimated parameters. The results show that all estimated ECMs pass all specification tests. For example, the findings show normality of residuals, absence of serial correlation, and no heterokesdasticity[28]. In addition, Ramsey's RESET test for the stability of the models together with CUSUM and CUSUMQ tests (though not presented here) suggest that the models are stable over the sample period.

4.3.4.4 The Short-run Relationship

Consistent with the long-run dynamics, the estimated short-run elasticities show that mobile money influences financial inclusion in Lesotho. This is supported by the positive and statistically significant coefficients of the explanatory variables in all bivariate and trivariate ECMs. This finding provides evidence that in addition to influencing the dynamics of financial inclusion in the long-run, mobile money also has significant impact on the dynamics of financial inclusion in the short-run. The findings also show that the coefficient of the lagged error correction term in all models is negative and statistically significant at either 1% or 5% level of significance. This suggests that in the bivariate setting, on overage, 28% to 37% (depending on proxy that are used) of the disequilibrium of financial inclusion is corrected in the current month following a shock in the previous month on the one hand. On the other hand, the speed of adjustment in the trivariate ECMs implies that, on average, 35% to 50% of the disequilibrium from the previous month is corrected in the current month. In addition, the fact that the coefficient of the lagged error correction term is statistically significant and bears a correct sign (i.e. negative) in all models implies that the series are non-explosive and that long-run equilibrium is attainable. Therefore, this is consistent with the cointegration relationship established between the variables in each model.

4.3.4.5 Granger Causality between Financial Inclusion and Mobile Money

The existence of a cointegrating relationship between the variables may suggest that there must be Granger causality in at least one direction, but does not show the direction of temporal causality between the variables (see Granger, 1969 & 1988). Therefore, the paper employs the estimated ECMs to also examine both short-run and long-run Granger causality between financial inclusion and mobile money. The short-run causality can be determined by the significance of the Wald *F*-test (or *t*-statistic) on the first differences of the explanatory variables on the one hand. On

28 These models were estimated using White's heteroskedasticity standard errors, which ensure constant variance.

the other hand, the long-run causality can be examined by the significance of the t-statistics on the coefficient of the lagged error correction term. Granger causality can be unidirectional in either directions or bidirectional. However, this paper specifically focuses on establishing unidirectional Granger causality from mobile money to financial inclusion, which answers the research question in this study.

On the basis of the estimated ECMs presented in Tables 3 and Appendix 7, the coefficients of all the first differences of explanatory variables in each bivariate and trivariate model appear with an expected positive signs and are also statistically significant at either 1% or 5% levels of significance. This result provides evidence of short-run Granger causality from mobile money to financial inclusion. Similarly, the negative and statistically significant coefficient of the lagged error correction term in the same models supports long-run Granger causality from mobile money to financial inclusion. Thus, in general the findings imply that mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho.

4.3.5 Conclusion and Policy Recommendations

The objective of this paper is to study the relationship between mobile money and financial inclusion in Lesotho, with a specific focus on how mobile money can expand financial inclusion in the country. For this purpose, the paper employs ARDL bounds testing approach to cointegration and Granger causality test based on the estimated ECM. The findings suggest a strong evidence of long-run steady state relationship between financial inclusion and mobile money in Lesotho with positive and statistically significant long-run coefficients, which are consistent with *a priori* expectations. In addition, the estimated ECM models provide evidence that mobile money also has significant impact on the dynamics of financial inclusion in the short-run in Lesotho. Furthermore, the findings show that mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho.

The findings of this paper underscore the importance of mobile phone diffusion and hence mobile money in extending financial services in Lesotho. Therefore, policy makers and all stakeholders in mobile money sphere should collaborate to build business ecosystem for mobile money to prosper. In particular, financial inclusion policies should be directed to leveling the playing ground for mobile money to prosper to create a more financially inclusive society in Lesotho. In this regard, the legal and regulatory framework should be friendly and accommodative to enable more innovation in mobile money and other digital financial services. This would contribute drastically to financial development and consequently faster economic growth.

MNOs should work hard to scale up the use of mobile money in remote areas of the country, where the majority of people still do not have access to financial services. This could be achieved through more customer education, improving network coverage in rural areas of the country and growing agent network in rural areas by negotiating with Chinese businesses, which have more reach in rural communities, to become agents and hence act as cash-in and cash-out points. More importantly, the MNOs should endeavor to promote the use of mobile money in its electronic form

in carrying out transactions. These would help resolve many of the hurdles related to liquidity management by the MNOs. Lastly, MNOs should work towards forming partnerships with all commercial banks and other financial institutions in Lesotho to ensure interoperability between MNOs and commercial banks[29]. This would lead to more access to banking services and allow innovation of more services.

This study has examined the linkage between mobile money and financial inclusion in Lesotho without concentrating specifically on how individual aspects of mobile money affect financial inclusion. It has laid a foundation for further research in this area. Further studies could analyze the impact of various aspects of mobile money such as mobile payments, remittances and mobile banking on financial inclusion. As mentioned earlier, this study has used total bank credit to measure financial inclusion because of unavailability of data on activities of microfinance institutions (MFIs) and other non-bank financial institutions at the time. Therefore, other studies could combine data on total bank credit to households with that from MFIs and other non-bank financial institutions to test the robustness of the results of this study. In addition, other studies could also actually use survey data to study the effect of mobile money on financial inclusion.

[29] Of course, there are already interesting developments on the ground with Ecocash customers having access to their bank accounts with SLB.

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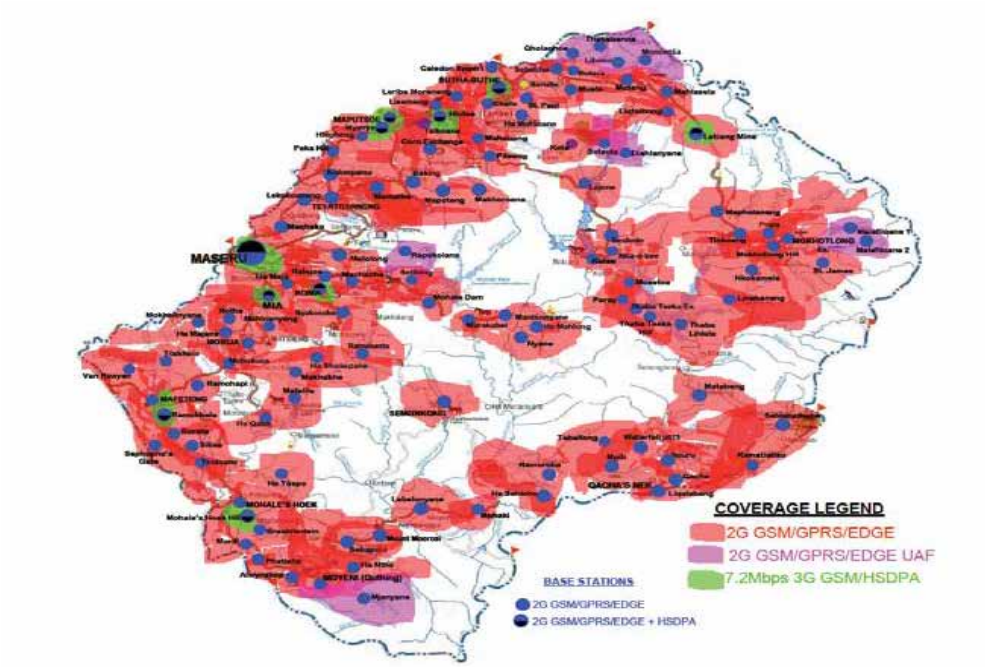
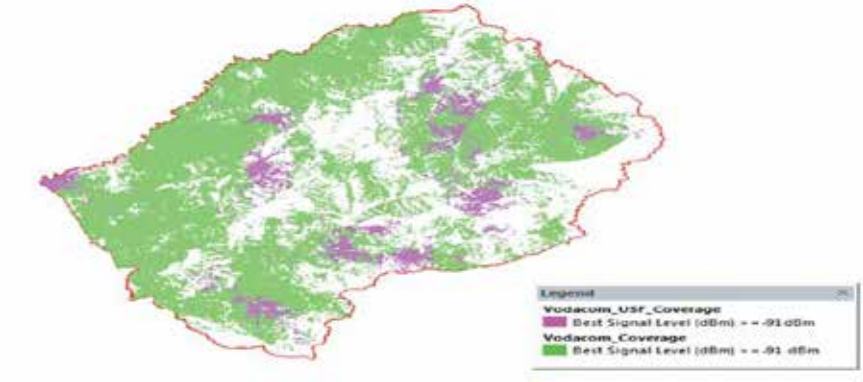
APPENDICES

Appendix 1: Econet Telecom Lesotho (ETL) Coverage Map as at 31st March 2014



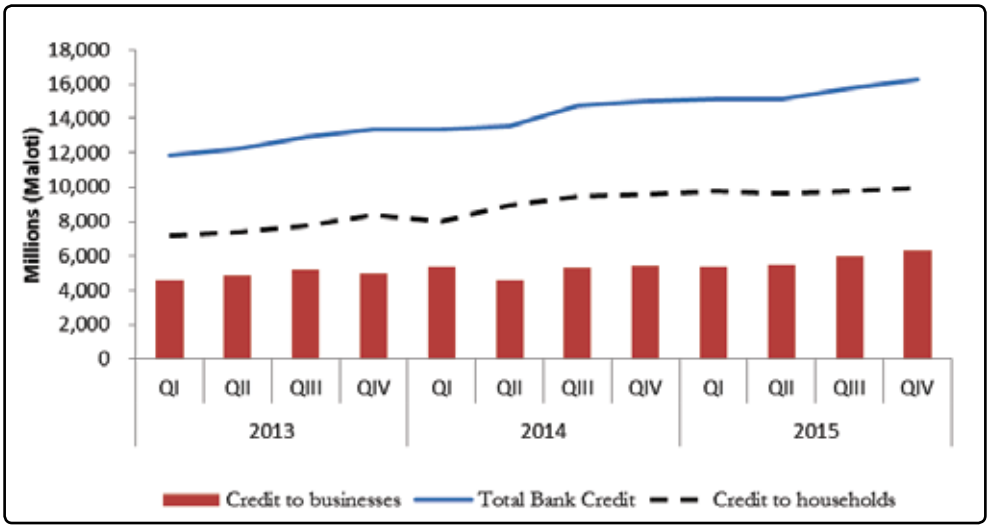
Source: Lesotho Communications Authority Annual Report, 2013-2014

Appendix 2: Vodacom Lesotho (VCL) Coverage Map as at the 31st March 2014



Source: Lesotho Communications Authority Annual Report, 2013-2014

Appendix 3: The Comparison of Total Bank Credit, Total Credit to Households and Credit to Business Enterprises



Source: Central Bank of Lesotho

Appendix 4: ADF and PP Unit Root Test Results

Variable	Variable in levels		Variable at first differences		Conclusion on order of integration
	ADF statistic	PP statistic	ADF statistic	PP statistic	
ltab	-2.2781 (0.1853)	-3.2690** (0.0260)			I(0)
lmc	-4.4050* (0.0017)	-4.3937* (0.0017)			I(0)
lap	-3.7548* (0.0083)	-4.1114* (0.0035)			I(0)
lcd	-1.9792 (0.2936)	-1.9792 (0.2936)	-7.6065* (0.0000)	-8.9371* (0.0000)	I(1)
lflt	-1.6307 (0.4537)	-1.6307 (0.4537)	-6.3914* (0.0000)	-7.0360* (0.0000)	I(1)
lm2	-2.0451 (0.2689)	-7.4735 (0.0000)	-1.9559 (0.3035)	-11.3808 (0.0000)	I(1)
ltc	-1.1503 (0.6817)	-1.1247 (0.6922)	-6.6015* (0.0000)	-6.8463* (0.0000)	I(1)

Note: Values in parentheses are probability values. * and ** denote the level of statistical significance at 1 and 5%, respectively. The variables *ltc* = logarithms of total credit per 1000 adults, *ltab* = logarithms of trust account balances per 1000 adults, *lmc* logarithm of mobile money customers, *lap* = logarithms of airtime purchases per 1000 adults, *lcd* = logarithms of customer deposits per 1000 adults, *lflt* = logarithms of amount of float per 1000 adults. In addition, *lm2* denotes the logarithms of M2.

Appendix 5: ARDL Bounds Testing to Cointegration Results (bivariate Case)

Total Credit Models								
Model	**F-statistic**	**Critical value bounds of the F-statistic**						**Evidence of Cointegration?**
		99%		**95%**		**90%**		
k=1		*I*(0)	*I*(1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)	
F_{ltc}(ltc\ltab)	17.57*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
F_{ltc}(ltc\lmc)	14.67*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
F_{ltc}(ltc\lap)	16.20*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
F_{ltc}(ltc\lcd)	12.26*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
F_{ltc}(ltc\lflt)	14.78*	6.027	6.760	4.090	4.663	3.303	3.797	Yes

Note: 1) is the number of regressors and 2) * and ** denote the level of statistical significance at 1% and 5%, respectively.

Appendix 6: ARDL Bounds Testing to Cointegration Results (trivariate Case)

Total Credit Models								
Model	**F-statistic**	**Critical value bounds of the F-statistic**						**Evidence of Cointegration?**
		99%		**95%**		**90%**		
k=2 F_{ltc}(ltc\ltab, lm2)	15.35*	*I*(0) 5.155	*I*(1) 6.265	*I*(0) 3.538	*I*(1) 4.428	*I*(0) 2.915	*I*(1) 3.695	Yes
F_{ltc}(ltc\lmc, lm2)	10.73*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
F_{ltc}(ltc\lap, lm2)	11.46*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
F_{ltc}(ltc\lcd, lm2)	9.65*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
F_{ltc}(ltc\lflt, lm2)	11.07*	5.155	6.265	3.538	4.428	2.915	3.695	Yes

Note: 1) is the number of regressors and 2) * and ** denote the level of statistical significance at 1% and 5%, respectively.

Appendix 7: Total Credit Models (trivariate Case)

Relation Horizon	Explanatory Variable	Dependent Variable, Log of total credit				
Short-run	*ECM*(-1)	-0.4745 * (0.0013)	-0.3489* (0.0048)	-0.4959* (0.0001)	-0.3831* (0.0004)	-0.4406* (0.0009)
	d(ltab)	0.0036** (0.0256)				
	d(lmc)		0.1122* (0.0061)			
	d(lap)			0.0158** (0.0281)		
	d(lcd)				0.0118** (0.0316)	
	d(lflt)					0.0115* (0.0088)
	d(lm2)	0.1793** (0.0272)	0.0412** (0.0685)	0.1566** (0.0248)	0.1722** (0.0162)	0.1429** (0.0346)
	d(lm2(-1))	-0.1793*** (0.0714)		-0.1478*** (0.0652)		
	D2014M2	-0.0289* (0.0000)	-0.0289* (0.0000)	-0.0288* (0.0000)	-0.0262* (0.0000)	-0.0247* (0.0000)
	D2014M5	-0.0281* (0.0000)	-0.0221* (0.0000)	-0.0285* (0.0000)	-0.0243* (0.0000)	-0.0235* (0.0000)
Long-run	*ltab*	0.0136* (0.0073)				
	lmc		0.1542* (0.0005)			
	lap			0.0364** (0.0387)		
	lcd				0.0386* (0.0015)	
	lflt					0.0244* (0.0001)
	lm2	0.9446* (0.0000)	0.2718*** (0.0894)	0.6598* (0.0084)	0.4584** (0.0153)	0.2949** (0.0102)
	D2014M2	-0.0583* (0.0000)	-0.0573* (0.0001)	-0.0598* (0.0014)	-0.0583** (0.0101)	-0.0477* (0.0000)
	D2014M5	-0.0583* (0.0000)	-0.0461* (0.0000)	-0.0578* (0.0003)	-0.0521** (0.0051)	-0.0436* (0.0000)
	c	1.8324*** (0.0745)	3.8384* (0.0037)	1.9126 (0.2223)	3.2710** (0.0108)	4.3659* (0.0013)
Diagnostics	JB	1.7269 (0.4217)	0.6649 (0.7171)	0.3364 (0.8452)	0.0250 (0.9876)	0.3387 (0.8442)
	BG-LM Test	0.9609 (0.9430)	3.1935 (0.2026)	0.7029 (0.7037)	0.0889 (0.9565)	1.6178 (0.4453)
	RESET Test	0.6448 (0.4314)	0.4036 (0.5318)	1.82E-05 (0.9966)	0.0924 (0.7640)	0.2120 (0.6497)

Note: *, ** and *** denote the level of statistical significance at 1%, 5%, and 10%, respectively. The values in parentheses are probability values.

5.0 SECTORAL EFFECTS OF MONETARY POLICY IN UGANDA: A DSGE ANALYSIS

By Dorothy Nampewo[30]

Abstract

The paper investigates the sectoral effects of monetary policy in Uganda. While focusing on the agricultural and industrial sectors, we examine the effect of a positive interest rate shock, while taking care of the effect of exogenous exchange rate shocks on real output. The analysis is based on a Dynamic Stochastic General Equilibrium (DSGE) model. The empirical findings suggest that the agricultural and industrial sectors are negatively affected by positive interest rate shocks. A similar effect is realized with a positive exogenous exchange rate shock. Since the Bank of Uganda (BoU) is pursuing an Inflation Targeting policy framework, raising interest rates to fight inflation would invariably hurt sectoral growth, as demonstrated by the findings of the analysis. To minimize the negative impact on growth, monetary policy requires a broader view of policy objectives, with greater priority accorded to output growth, alongside the control of inflation. This can be done by ensuring that authorities put in place alternative financing options, targeted at priority sectors. Further, authorities should ensure policies geared towards increasing the supply of foreign exchange, so as to reduce the negative impact associated with exchange rate risks on domestic production, and create long-term capacity to boost production.

Keywords: Monetary Policy; sectoral growth; DSGE; Uganda

5.1 INTRODUCTION

Over the past two decades, Uganda's economy recorded impressive growth rates averaging 7 percent per annum. This sustained growth trajectory however changed during the post global financial crisis period. Specifically, average growth has decelerated to about 4.7 percent during the past five years, hitting lows of 3.4 percent in 2011/12. The impressive pre-crisis growth was achieved in a large part due to a robust macroeconomic management strategy that focused on price stability as the anchor for real sector peformance. However, recent developments, including inflation spikes in 2011, have led to pursuance of a more restrictive monetary policy which could have implications on private investment and growth through high interest rates.

Evidence suggests that a restrictive monetary policy mitigates aggregate demand which has negative implications for private investment and growth (Prasand and Zhang, 2015). Indeed, there is emerging evidence linking Uganda's recent weak domestic growth to the restrictive monetary policy regime (MFPED, 2015 and BOU, 2015). Consequently, the extent of the impact of monetary policy on growth

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is of concern among policy makers. Particularly, the channels through which the monetary policy impulse is transmitted to the productive sectors of the economy has been a subject of intense debate (Prasand and Zhang, 2015).

The literature shows that, monetary policy may have adverse effects on sectoral growth and consequently on the entire economy and that; different sectors of the economy react differently to monetary policy shocks (Serju, 2003 and Nampewo, 2013). For the case of Uganda, as is clearly stated in the National Development Plan, emphasis is put on developing agriculture and industry as the primary growth sectors that will steer the economic transformation of Uganda's economy (NDP-2 2015).

The agricultural sector provides the most employment opportunities and takes-up the largest share of the consumption basket in Uganda. About 67 percent of Uganda's population is employed in the agricultural sector. In terms of the consumption basket, about 45 percent of the entire consumption expenditure is related to agricultural products. Besides, about 50 percent of Uganda's exports are agricultural in nature (BOU, 2015). The industrial sector although it remains realtvely underdeveloped, it is critical for value addition of Uganda's agricultural exports and hence is important for boosting Uganda's tradable sector. The services sector on the otherhand, is majorly non-tradable with minimal potential to boost Uganda's exports. Also, the services sector employs a small number of skilled workers and thus, is not necessarily employment intensive.

The primary objective of monetary policy is ensuring price stability. However, it is also concerned about growth, especially for the primary growth sectors of the economy. Thus, empirical evidence on how these sectors react to monetary policy shocks is relevant for policy direction. Against this background, this study examines the sectoral effects of monetary policy in Uganda. In particular, the study focuses on the two productive sectors; namely: agriculture and industry. The anaylsis uses the Dynamic Stochatic General Equilbirum (DSGE) modelling framework to test the differentiated impacts of monetary policy on sectoral growth. The study also accounts for the effect of a positive exogenous exchage rate shock on the sectors. Results suggest that a positive interest rate shock results into a decline in output for agriculture and industry sectors. A similar effect is realized with a positive exogenous exchange rate shock.

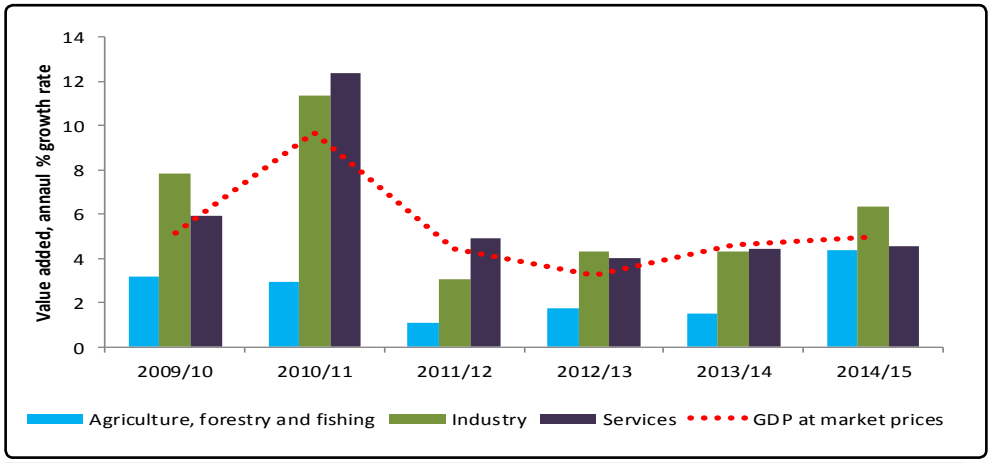
The rest of the paper is organised as follows: section 2 examines the structure of Uganda's economy and monetary policy; section 3 reviews the related literature, section 4 explores the model, section 5 reveals the results, while conclusions and policy considerations are presented in sections 6.

5.2. STRUCTURE OF UGANDA'S ECONOMY AND MONETARY POLICY

5.2.1 Structure of Uganda's Economy

Uganda's economic growth has mainly been driven by the services sector over the past decades. The sector contributes about 50 percent of Uganda's GDP. The expansion of the services sector has been majorly driven by innovation and technology, mainly due to developments in the banking, telecommunication, and transport sub sectors (UBOS 2015). The downside is that most of the activities within the sector and, in particular, telecommunications, finance and real estate are not employment intensive and instead rely on a relatively small number of skilled workers. Besides, the sector is majorly non-tradable with minimal potential to boost Uganda's exports. Figure 1 summaries the structure of Uganda's economy.

Figure 1: The performance of Uganda's economic sectors



Source: Uganda Bureau of Statistics, statistical abstract, 2015

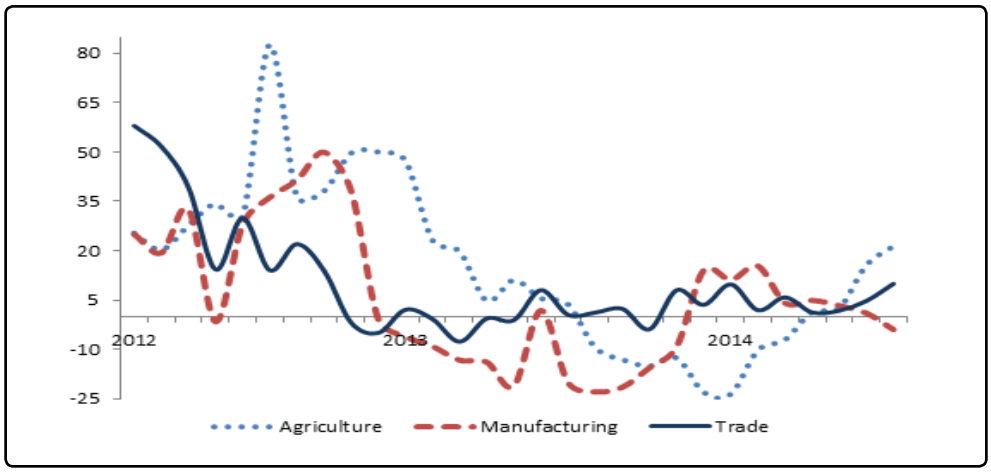
The agricultural sector includes the production of both cash and food crops, livestock, forestry agriculture-related services, and fishing. The sector contributes about 24 percent of Uganda's GDP. Whereas its contribution to GDP has been declining over time due to challenges associated with poor technological advances, the sector remains the main employer of Uganda's population. In the past decade, the sector has employed over 80 percent of Uganda's population. This has however declined to about 67 percent in recent times due to structural challenges in the sector associated with small scale farming, land fragmentation, natural calamities and other related risks. These have led to low turnover in the sector and have forced most of the active labour force to seek for opportunities elsewhere. Besides, the sector remains critical in driving Uganda's export base. About 50 percent of Uganda's export originate from the agricultural sector. In terms of the consumption basket, about 45 percent of the entire consumption expenditure is related to agricultural products. This keeps the sector at the forefront of accelerating Uganda's economy to attain the middle income status. This notwithstanding, the sector is still contrained with several factors of which high cost of credit emerges as the most binding constraint (NDP-2,2015).

The industry sector includes, mining, manufacturing, electricity, water and construction. The sector remains relatively small and is dominated by subsidiaries of multi-national corporations, and heavy investment by foreign companies in sectors such as textiles, steel mills, tannery, bottling and brewing and cement factories. Small- and medium-scale enterprises in the sector account for over 90 per cent of enterprises (NDP-2,2015). The most important sectors are the processing of agricultural products (such as coffee), the manufacture of light consumer goods, and the production of beverages, electricity, and cement which largely depend on domestic sources of financing of which credit from the financial sector is important. The sector contributes about 19 percent to Uganda's GDP (UBOS 2015). Although the sector employs only 9 percent of Uganda's population, it remains at the centre of transforming Uganda's agricultural primary exports by ensuring value addition and hence boosting Uganda's tradable sector.

Monetary policy and growth

Uganda is currently implementing an inflation targeting framework, while maintaining a floating exchange rate regime, where BOU's involvement in the foreign exchange market is limited to occasional interventions to dampen excessive exchange rate volatility. This monetary policy framework has been successful in ensuring price stability as evidenced in the declining trend of inflation from highs of 30 percent in 2011 to the 5 percent BOU's medium term target (BOU, 2015 and MFPED, 2015. However, this has been achieved at a cost of high interest rates which have constrained credit growth across most sectors, including agriculture and manufacturing (figure 2).

Figure 2: Annual Growth Rates of Credit Aggregates



Source: Bank of Uganda, monetary survey, 2015

In addition, the floating exchange rate system has, nonetheless, presented certain difficulties for the country including, the heightened risk of exchange rate volatility which is disruptive to investment and economic activity (Aghion et al., 2009). For instance, in the 2013/14 and 2014/15 fiscal years, Uganda experienced a positive shock in the exchange rate which saw the Ugandan Shilling depreciating by 22 and 27

percent, respectively, against the US dollar. This was the biggest shock on Uganda's economy since the global financial crisis. This shock could be associated with the decelerated growth rates during this period.

5.3. REVIEW OF RELATED LITERATURE

5.3.1 Empirical literature

A large body of empirical work has employed fundamentals-based models in modeling the transmission mechanism of monetary policy on real growth (Kashyap and Stein, 2000; Angeloni et al, 2003; Monacelli, 2003; Ireland, 2005; Mugume, 2011). Most of these studies document that indeed monetary policy affects real growth. Notwithstanding this evidence, most studies tend to focus only on the effects of monetary policy at the aggregate level without necessarily analysing the sectoral effects of monetary policy, particularly in developing countries. A few studies that focused on the sectoral effects of monetary policy confirm that monetary policy has effects on sectoral growth.

Sahinoz and Cosar (2009) investigated the response of output in the Turkish manufacturing sector to a contractionary monetary policy shock. Their findings showed that the manufacturing sector responds to a restrictive monetary policy with a decrease in overall output of the sector. Similarly, Mehdi and Reza (2011) used the auto regressive distributed lag (ARDL) model to establish the effect of monetary policy on Iran's industrial sector. Their results also indicated that monetary policy affects Iran's industrial sector. Nampewo et al, (2013) analysed the sectoral effects of monetary policy in Uganda using a structural vector autoregressive model. Their findings indicate that a restrictive monetary policy affects growth of the agriculture, manufacturing and services sectors. Ifeakachukwu and Olufemi (2012) arrived at a similar conclusion. The shortcoming with VARs as noted by Boivin, (2010) is that they do not account for microfoundations and structures of the different economies. Thus, Boivin, (2010) recomneds micrfounded models to clearly capture the transmission mechanism of monetary policy shocks.

A large body of empirical literature has assessed the impact of external shocks on the monetary policy transmission mechanism. The literature focusing on the impact of exchange rate shocks on the transmission mechanism and on growth indicates that the exchange rate risk is detrimental to growth (Mirdala, 2012; Arratibel, et al., 2011; Chipili, 2010). For instance, Bergin, (2004) and Obstfeld and Rogoff, (1998) argue that risks associated with exchange rate fluctuations introduce uncertainty which in turn generates negative economic welfare effects. Further, fluctuations in the exchange rate affect consumer goods prices which in turn affect demand and consequently consumption. They add that monetary policy is affected by currency fluctuations especially where domestic growth is underpinned by exports as authorities attempt to support the external sector through exchange rate stabilization at the expense of inflation stabilization (Crosby, 2000).

In the recent decades, analysis of monetary policy transmission mechanism has shifted from the econometric models to dynamic stochastic general equilibrium models

(DSGE). Boivin, (2010), notes that DSGE models tend to incorporate relatively few sources of uncertainty compared to econometric models such as the vector autogressive models and the auto regressive distributed lag models. This implies that DSGE models are structural in nature and that all the model's predictions can be traced back to assumptions about the structure of the economy, agent's preferences, production technology and the stochastic processes driving the shocks in the model. He further, notes that DSGE models are useful in capturing the effects of external shocks in small open economies. Empirical analysis of monetary policy effects at the sector-level using DSGE frameworks remains scarce.

The only study by Cardia and Murcia (2004) that used a DSGE model to analyze the transmission of monetary policy in a multi-sector economy, focused on the US which is a developed country and thus, not comparable to a developing countries like Uganda. Nonetheless, their results reveal a strong sensitivity to monetary policy shocks on sectoral output growth, particularly, construction and manufacturing sectors. The current study assesses the sectoral effects of monetary policy in Uganda based on a DSGE framework

5.3.2 Theoretical literature

The theory of the monetary policy transmission mechanism stipulates the channels through which monetary policy shocks are transmitted to the decisions of firms, households, financial intermediaries, prices and economic growth (Mishkin 2004). The literature highlights four transmission channels of monetary policy. These include the exchange rate channel, the credit channel, the asset prices or wealth channels and the interest rate channel.

For the asset price channel, a tight monetary policy results into a rise in asset prices leading to an increase in the market value of firms and in the investment expenditure. A similar effect is realised with the wealth channel as an increase in asset prices leads to a rise in the financial wealth of consumers. This results into an increase in the life time resources of consumers which in turn increase the consumption expenditures of households (Mishkin, 1996). The asset price and wealth channels are irrelevant in most developing countries including Uganda due to small or underdeveloped stock markets (Mishra, Montiel, and Spilimbergo, 2014).

The credit channel comprises two channels: the bank-lending channel and the balance-sheet channel. The bank-lending channel is based on the assumption that a contractionary monetary policy reduces bank reserves and bank deposits and thus constrains the quantity of bank loans available to borrowers. This ultimately reduces private investment and output (Taylor, 1999). The balance-sheet channel is related to the effects monetary policy can exert on the net worth of businesses and households. A monetary contraction decreases the net worth of a firm through its cash flows and the value of its collateral, thus leading to a higher external finance premium associated with more severe moral hazard problems. This in turn would reduce the level of lending, investment, and output (Bernanke and Gertler, 1995).

In small, open economies like Uganda, the effects of monetary policy on the exchange rate are pronounced through the exchange rate channel. The theory of uncovered interest rate parity suggests that the expected shifts in the nominal exchange rate are related to the interest rate differential between the domestic and foreign interest rate. During a monetary policy tightening, domestic interest rates increase relative to the foreign interest rates. This results into a currency appreciation which causes a rise in net imports and a fall in output. The reverse is true for an expansionary monetary policy. However, as highlighted by Kasekende and Brownbridge, (2011), economies which are predominantly driven by imports may be negatively affected by unanticipated positive shocks in the exchange rate. This argument is supported by Obstfeld and Rogoff, (1998) who note that exchange rate risks affect consumer goods prices which in turn affect demand and consequently consumption.

Regarding the interest rate channel, the monetary authorities directly influence the official interest rates, which in turn alters; the money market rates, aggregate spending by increasing or decreasing investment and consumption expenditures, and thus affect output growth. Given some degree of price stickiness, a policy induced increase in the short-term nominal interest rates initially increases the longer-term nominal interest rates, in line with the expectations hypothesis of the term structure. This, in turn, translates into an increase in the real interest rate as prices are slow to adjust. Because firms face increased real cost of borrowing, they cut back on their investment expenditures. Similarly, households scale-back on their expenditures and consequently aggregate demand and inflation falls. For countries like Uganda which are implementing monetary policy in the context of an inflation-targeting framework, the interest rate channel is relevant since they use short-term money market interest rates to influence the level of retail deposit and lending interest rates and eventually growth.

5.3.3 Set-up of the DSGE model

Our model setup follows that developed by Cardia and Murcia (2004) and, Prasad and Zhang (2015), and comprises of the following sectors; 1) the household, 2) the firm 3) the central bank which is in charge of monetary policy and 4) the external sector. We assume that the economy is populated by households and by firms. The households supply labour to the firms and earn a wage, a portion of which is either consumed or saved for future consumption. The household aims to maximise its utility subject to a budget constraint which depends on the household's income and expenditure patterns. The firms, on the other hand, specialise in either agriculture or industry sectors and are assumed to use the labour supplied by the household. The firms face adjustment costs related to output loss associated with changes in the prices.

We include a monetary policy Taylor rule which reflects the actions of the monetary authority to adjust policy rates in relation to inflation, exchange rates and output movements of the sectors and thus influencing the firms and the household's consumption and expenditure patterns. A positive shock to the short-term interest rate (the central bank rate) is expected to lead to a rise in the domestic real interest rates. This, in turn, may increase the cost of borrowing hence forcing households

to cut back on their consumption and other expenditures including investment leading to positive inflationary pressures and negative output growth. Similiarly, a policy induced interest rate influences the exchange rate movements whereby an expansionary monetary policy causes domestic interest rates to decrease relative to the foreign interest rates, leading to a currency deppreciation which causes a rise in net exports and a rise in output.

It is however, imperative to note that Uganda is a small open economy and so is vulnerable to external shocks. Although the exchange rate channel of monetary policy transmission shows a positive response of output to an exchange rate depreciation through increased export competitiveness, this rather may happen in the long-run given that most developing countries including Uganda depend on imported inputs for production. Thus, risks associated with exchange rate shocks may be detrimental to growth in the short-run. Unlike in the econometric models that consider the exchange rate as an endogenous variable, in our DSGE model, we introduce an exchange rate shock as a purely exogenous variable that hits the economy from the external sector as opposed to a policy induced exchange rate reaction to a monetary policy shock. The layout of our DSGE model is as follows.

5.3.4 Household

The economy is populated by infinitely lived households who supply labour to firms in two sectors: the agricultural sector and the industry sector. We assume that the household's labour supply is immobile across the sectors. The representative household, denoted by the superscript, is indexed by (agricultural sector) and (the industry sector). The household maximises the discounted stream of utility as follows:

$$maxE_0 \sum_{t=0}^{\infty} \beta^t \left[U\left(C_t^i, L_t^i\right)\right] \tag{1}$$

Where β^t is a constant discount factor; C_t^i is the composite consumption index and L_t^i is the leisure time by household. The household's utility function is defined as follows:

$$U\left(C_t^i, L_t^i\right) = \frac{{C_t^i}^{1-\sigma}}{1-\sigma} - \eta_t \frac{{L_t^i}^{1+\gamma}}{1+\gamma} \; ; \tag{2}$$

Where; i$\in \{A, I\}$

σ is the inverse of elasticity of intertemporal substitution; η_t is the preference shock and γ is the inverse of Frisch elasticity of labour supply. The consumption index is defined as follows:

$$C_t^i = \prod_{j=1}^{j} \left(\xi^j\right)^{\frac{1}{\xi}} \left(C_t^j\right)^{\xi} \tag{3}$$

Where C_t^{1j} represents the households consumption of goods produced in sector j where j = *(A and I)* and $\xi \in (0, 1)$ is the sectoral weights in the consumption index and $\sum_{j=1}^{j} \xi^j = 1$

We assume that firms in both sectors produce differentiated products, which implies that

$$C_t^j = \left(\int_0^1 \left(C_t^{lj}\right)^{\frac{\varphi-1}{\varphi}} dl\right)^{\frac{\varphi}{\varphi-1}} \tag{4}$$

Where C_t^{lj} the household's consumption of the good produced by a firm li in sector j and $\varphi > 1$ is the elasticity of substitution between differentiated goods within a sector. The household's labour supply L_t^i; is aggregate hours supplied to each firm in each sector and is defined in equation 5. $\phi > 0$ is the elasticity of substitution between sectoral hours. L_j^i , is the number of hours worked in sector j. Equation 5 depicts limited labor mobility across sectors and thus, implies that wages and hours are assumed to be different in the two sectors. For instance, the agricultural sector is assumed to be more labour intensive but also is a less paying sector than the industry sector. Thus, the agricultural sector is expected to absorb more man hours and less wages compared to the industrial sector. Further, the summation sign or the aggregator in equation 5 thus, allows for heterogeneity across the sectors.

$$L_t^i = \left(\sum_{j=1}^{j} \left(L_t^j\right)^{\frac{\phi-1}{\phi}}\right)^{\frac{\phi}{\phi-1}} \tag{5}$$

It then follows from equation 5 that the total number of hours worked in firm l in sector j is, L_t^{lj} , defined as follows:

$$L_t^{lj} = \int_0^1 l_t^{lj} dl \tag{6}$$

The integral sign (the aggregation) in equation 6 implies that the number of hours worked in different firms within the same sector are perfect substitutes and labor is perfectly mobile within sectors but not across sectors. As a result, wages and hours will be the same for all firms in the same sector but not, across sectors.

5.3.4.1 The household budget constraint

We assume that the household has accumulated savings (b_{t-1}) from the previous period and that the household also earns a wage W_t from labour supplied to the firm. The household uses this income to finance its consumption and saving for the future in the form of bonds. The household aims to maximise its utility subject to a budget constraint which depends on the household's income and expenditure patterns as shown below:

$$\sum_{j=1}^{j} \int_0^1 \left(\frac{p_t^{lj} C_t^{lj}}{p_t^i}\right) dl + b_t = \sum_{j=1}^{j} \int_0^1 \left(\frac{L_t^{lj} W_t^{lj}}{p_t^i}\right) dl + \frac{r_{t-1} b_t}{\pi_t} \tag{7}$$

Where;

$p_t^i = \prod_{j=1}^{j} (\zeta^j)^{\frac{1}{\zeta}} (p_t^j)^{\frac{\zeta-1}{\zeta}}$; is the aggregate price of all firms; and

$p_t^j = \left(\int_0^1 \left(p_t^{lj}\right)^{\frac{\varphi-1}{\varphi}} dl\right)^{\frac{\varphi}{\varphi-1}}$ is the aggregate price of the sectors, j in firm l , r_{t-1} is the interest earned on savings and is the general price level.

5.3.5 Firm

We assume that the firms in each sector (agriculture and industry) face a linear Cobb-Douglas technology function in labour as follows:

$$Y_t^{lj} = A_t^{lj\omega^j} L_t^{lj\alpha^j} \tag{8}$$

Where Y_t^{lj} is the firm's output for each sector; A_t^{lj} is sector specific productivity shock; and L_t^{lj} is the sector specific labour supply; ω^j, $\alpha^j \in (0,1)$, and $\omega^j + \alpha^j = 1$.

We assume that a firm in each sector produces a homogenous intermediate good using labour supplied by the household. The intermediate-goods firm faces adjustment costs related to output loss associated with changes in the price of the intermediate good. The firms in each sector face different adjustment costs. For instance, adjsutment costs are assumed to be faster in the industry sector than in the agricultural sector. Thus, introducing nominal price rigidities, we assume that the firms in each sector face a cost when changing prices. The cost is represented by a quadratic form following the Calvo (1983) pricing theory as follows:

$$\theta_p \left(\frac{P_t^{lj}}{P_{t-1}^{lj}}\right)^{\varepsilon} D_{p,t-1} + (1-\theta_p)\left(\frac{P_t^{lj*}}{P_{t-1}^{lj}}\right)^{-\varepsilon} \tag{9}$$

Where $\theta_p \in (0,1)$ is the proportion of firms that do not adjust prices in each period, *P* is the general price level. The other proportion of firms chooses the optimal price that maximizes their discounted future profits:

$$maxE_0 \sum_{t=r}^{\infty} \beta\theta^r \left(\frac{C_t^{i^{-\sigma}}}{P_{t+r}}\right)\left[P_t^{lj} - MC_{t+r}^{lj}\right]Y_{t+r}^{lj} \tag{10}$$

Where MC denotes the marginal cost of production in nominal terms

5.3.6 Monetary policy rule

We introduce a monetary policy Taylor rule based on a simple inflation targeting rule as follows:

$$r_t = \vartheta r_{t-1}^{\gamma}\left(s_t^{\rho}\pi_t^{\tau}Y_t^{\psi}\right)^{1-\gamma}\epsilon^{\vartheta t} \tag{11}$$

Where s, π and Y are the steady state values of the exchange rate, inflation and the output gap, respectively. ϑ represents the central banker's preference for interest rate smoothing. ϕ_s, ϕ_π and ϕ_y are the weights assigned by the central banker to react to the deviations of the exchange rate, inflation and output from their steady state levels and to shocks. To capture the effect of the recent positive shock in the exchange rate on Uganda's economy, we include an exchange rate equation based on the uncovered interest rate parity from which we generate the shock as follows:

$$s_t = \Gamma(r_t - r_t^*) + \Theta s_{t+1} + \varepsilon_s \tag{12}$$

where is the real exchange rate; is the domestic real interest rate; is the foreign interest rate.

5.3.7 Exogenous shock process

We assume that the monetary policy shock (z) and the exchange rate shock (s) are exogenous shocks that follows an AR (1) process with its innovations drawn from normal distributions as defined in the equation. The monetary policy shock is defined as an interest rate shock arising from changes in the policy rate, the central bank rate, which is managed by the central bank. The exchange rate shock is defined as changes in the real exchange rate. A positive shock in the exchange rate is a depreciation while a negative shock is an appreciation.

Monetary policy shock $z_t = \rho_z(z_{t-1}) + \varepsilon_{zt} \quad \varepsilon_z = N(0, \delta_z^2)$ (13)

Exchange rate shock $s_t = \rho_s(zs_{t-1}) + \varepsilon_{st} \quad \varepsilon_s = N(0, \delta_s^2)$ (14)

5.3.8 Calibration

Selection of calibration parameters for DSGE models is a challenging task (Clarida, Gali, and Gertler, 1998) as there appears to be no clear consensus on the values of some parameters and those used in the literature are mostly based on micro data from advanced countries. Thus the selection of our calibration parameters has closely followed the parameters used by Adam and Walker (2015) and Prasad and Zhang (2015) who have developed DSGE models for East Africa and developing countries. We have also referred to Ugandan data to generate other parameters especially on sectoral shares to overall output and on labour. The parameters used in our model are presented in appendix 1.

We choose $\beta^t = 0.99$ which amounts to a real interest rate of 4 percent per annum. We set the inverse of elasticity of intertemporal substitution to 2 i.e, $\sigma = 2$, following Prasad and Zhang, (2015). We assume that 45 percent of total expenditure by households is accounted for by the agricultural related consumption and about 24 percent is for industry, based on estimates on Ugandan data (UBOS, 2015). Thus, for the agricultural sector, $\xi_A = 0.45$ and $\xi_1 = 0.24$ for industry. We set $\varphi = 10$ the elasticity of substitution for the differentiated good within a firms in each sector. The inverse of the Frisch elasticity of labour supply (γ) is set to 10, implying an inelastic labour supply across sectors and this is consistent with the estimates of Adam and Walker (2015) for East African countries. We set the number of households working in the agricultural sector, α^A - 0.67 and $\alpha^1 = 0.09$ for the industry sector, so as better to reflect the structure of Uganda's economy which is majorly agricultural based. We follow the Calvo pricing theory to account for price rigidities in the sectors and using Balke and Nash (2003) estimates, we assume, $\theta_p^{iA} = 0.6$ corresponding to the agricultural sector and $\theta_p^{iI} = 0.7$ for the industry sector, as a probability of not changing prices in each sector.

For monetary policy and exchange rate parameters, we follow (Adam and Walker, 2015; Clarida, Gali, and Gertler, 1998; Prasad and Zhang, 2015), and set $\vartheta = 0.75$, $\phi_\pi = 1.5$ $\phi_y = 0.125$ and $\phi_s = 0.5$. These parameters are consisitent with estimates

on Uganda based on the Taylor rule. We set the persistence of the monetary policy shock to 0.8 implying a fairly persistent shock. We recalibrate the model for different parameters of consumption time preference, intertemporal substitutability, and labour supply elasticity to the respective values of 0.97, 2.5 and 20. This was done as robustness check for the calibrated parameters.

5.3.9 Simulations

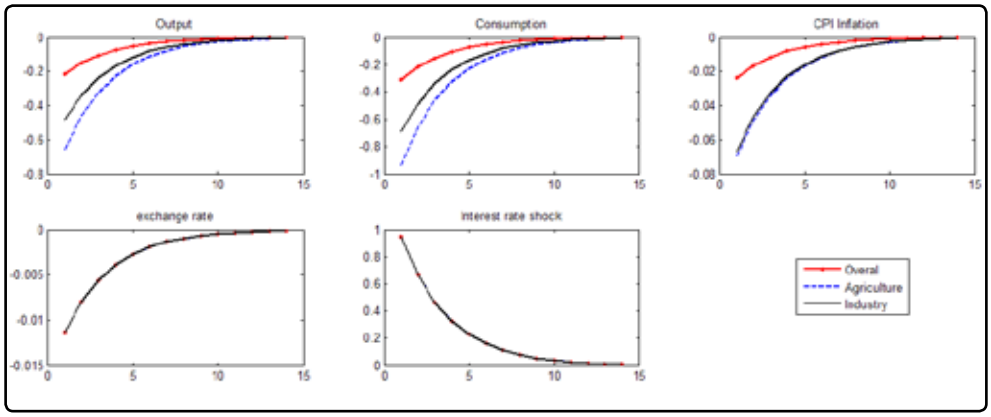
Using parameters calibrated to reflect the key features of Uganda's economy, we simulate the calibrated model over 15 quarters to assess the impact of a tight monetary policy on sectoral and overall growth. We conduct positive interest rate (tight monetary policy) and exogenous exchange rate shocks and compare the impact of the shock on agriculture, industry and on overall growth.

5.4. IMPULSE RESPONSE FUNCTIONS

Effect of a tight monetary policy (positive interest rate shock)

In this section we consider the effect of a monetary policy tightening where the Bank of Uganda raises its short-term policy rate. The solid red line gives the response of overall output growth. The solid black line shows the response of the agricultural sector, while, the blue dotted line shows the response of the industry sector. The results seem to indicate that all sectors react as expected to a positive monetary policy shock. The increase in the policy rate leads to an appreciation of the exchange rate and a fall in inflation. At the same time, the nominal interest rates increase which results into a decrease in the consumption expenditure and aggregate demand for both the agriculture and industry sectors. Consequently, an overall decline in sectoral and output is realised (Figure 3). The results are consistent with the findings based on the econometric models including the structural VAR model that was used by Nampewo et al 2013 and the autogressive model that was used by Mehdi and Reza (2011).

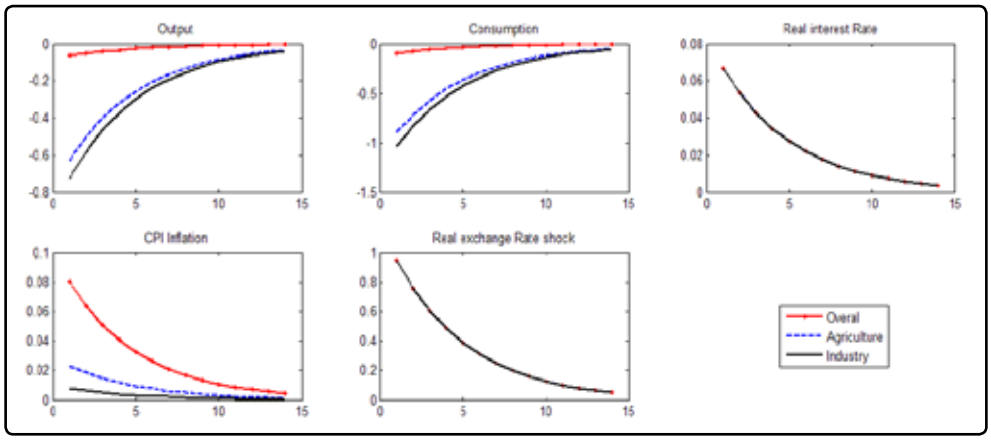
Figure 3: Effect of a positive interest rate shock



Effect of a positive exogenous exchange rate shock

The effect of an exogenous positive exchange rate shock presented in figure 4 differs from the conventional exchange rate channel. In this case, an exogenous positive exchange rate shock results in increases in inflation which pushes monetary authorities to react by increasing interest rates. The rise in interest rates reduces aggregate demand, leading to a fall in sectoral and overall output.

Figure 4: Effect of a positive exchange rate shock



The results in figure 4 seem to indicate that positive shocks in the exchange rate hurt the economy in the short-run. The agricultural sector which contributes over 50 percent of Uganda's exports still faces structural issues that have negatively contributed to the growth of its exports which would have benefited from an immediate shock in the exchange rate leading to a depreciation. Besides, the sector also relies on imported inputs for production which is adversely affected by an exchange rate depreciation due the implied increased cost of doing business. Regarding the effects on the industrial sector, the Bank of Uganda indicates that manufacturing firms are among the largest users of foreign exchange in Uganda thus, a depreciation will make inputs into manufacturing more expensive (Tumusiime-Mutebile, 2015) hence affecting sectoral output which eventually feeds into overall output.

5.5 CONCLUSION AND POLICY IMPLICATIONS

5.5.1 Conclusion

The paper investigates the sectoral effects of monetary policy in Uganda. While focusing on the agricultural and industrial sectors, we investigate the effect of a tight monetary policy, while taking care of exogenous exchange rate shocks on real output. The analysis based on a dynamic stochastic general equilibrium (DSGE) framework reveals that a tight monetary policy (positive interest rate shock) negatively affects sectoral output growth for agriculture and industry sectors. A similar effect is realized with a positive exogenous exchange rate shock.

5.5.2 Policy implications

The empirical findings suggest that the agricultural and industrial sectors are negatively affected by high-interest rates and positive exogenous shocks to the exchange rate. Since the Bank of Uganda (BoU) is pursuing an Inflation Targeting policy framework, raising interest rates to fight inflation would invariably hurt sectoral growth, as demonstrated by the findings of the analysis. To minimize the negative impact on growth, monetary policy requires a broader view of policy objectives, with greater priority accorded to output growth and development objectives such as employment, alongside the control of inflation. This can be done by ensuring that authorities put in place alternative financing options, targeted at the priority sectors. However, the authorities should be mindful of the unintended consequences of these financing options on inflation and other economic variables in the short term.

In addition, authorities should ensure policies geared towards reducing the risks associated with exogenous (external) exchange rate shocks on domestic production. This includes increasing production for export, increase in foreign market access, and promoting increased local demand for substitutes of imported consumer and investment goods and services.

5.5.3 Suggestions for Further Research

Most developing countries, including Uganda are in the process of changing their monetary policy frameworks from monetary targeting to inflation targeting frameworks. This warranties a comprehensive re-examination of the monetary transmission mechanism for all the relevant channels.

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APPENDICES

Appendix 1: Calibration parameter values

β	Discount factor	0.99
σ	Inverse of elasticity of intertemporal substitution	2
ξ_A	Weight of agriculture in consumption index	0.45
ξ_I	Weight of Industry in consumption index	0.24
φ	Elasticity of substitution for differentiated good within a sector	10
γ	Inverse of the Frisch elasticity of labour supply	10
α^A	Share of households working in the Agricultural sector	0.67
α^I	Share of households working in the Industry sector	0.09
θ^A	Calvo sticky-price parameter for agriculture	0.6
θ^I	Calvo sticky-price parameter for industry	0.7
ε	Elasticity of substitution between different varieties	11
ϑ	Degree of interest rate smoothing	0.75
Θ_π	Degree of response to inflation	1.5
Θ_s	Degree of response to short term exchange rate movements	0.5
Θ_y	Degree of response to the output gap	0.125
Θ	Degree of response to the expected exchange rates	0.65
Γ	Degree of response to the interest rate differential	0.35
ρ_z,	Monetary policy shocks: persistence, std. dev.	0.8, 0.95
ρ_s,	Exchange rate shocks: persistence, std. dev.	0.8, 0.95

Appendix 2: Equilibrium Conditions of the DSGE Model

The household

The household budget constraint

$$\sum_{j=1}^{j}\int_0^1\left(\frac{p_t^{ij}c_t^{ij}}{p_t^i}\right)dl + b_t = \sum_{j=1}^{j}\int_0^1\left(\frac{L_t^{ij}w_t^{ij}}{p_t^i}\right)dl + \frac{r_{t-1}b_t}{\pi_t} \qquad (14)$$

Households' intertemporal Euler equation

$$C_t^{ij-\sigma} = \beta E_t\left(\frac{r_t}{\pi_{t+1}}C_{t+1}^{ij-\sigma}\right) \qquad (15)$$

Household's optimal labour supply decision

$$\omega_{j,t} = \emptyset_j C_t^{ij\sigma} L_t^{ij\psi} \qquad (16)$$

The firm

Cost minimisation for the firms in both sectors

$$\omega_{j,t} = x_{H,t} A_{H,t} \tag{17}$$

Output in the sectors

$$Y_{H,t} = \varrho A_{H,j} L_t^j \tag{18}$$

Optimal price-setting in the sticky price sector

$$\left(\frac{1-\theta_j^{\varepsilon-1}}{1-\theta}\right)^{\frac{1}{1-\varepsilon}} = \frac{\Gamma}{E} \tag{19}$$

Recursive formulation of Γ

$$\Gamma_t = \frac{\varepsilon}{\varepsilon-1} C_t^{\,j-\sigma} Y_{j,t} \frac{\omega_{j,t}}{A_{j,t}} + \beta\theta E_t \pi_{j,t+1}^{\varepsilon} \Gamma_{t+1} \tag{20}$$

Recursive formulation of E

$$E_t = x_{j,t} C_t^{\,j-\sigma} Y_{j,t} + \beta\theta E_t \pi_{j,t+1}^{\varepsilon-1} E_{t+1} \tag{21}$$

Aggregation for the economy

Aggregate consumption

$$C_t = \lambda C_t^{\,A} + (1-\lambda) C_t^{\,I} \tag{22}$$

Aggregate output

$$Y_t = x_{A,t} Y_t^{\,A} + x_{I,t} Y_t^{\,I} \tag{23}$$

Aggregate price index for each sector

$$p_t^j = \left(\int_0^1 \left(p_t^{lj}\right)^{\frac{\varphi-1}{\varphi}} dl\right)^{\frac{\varphi}{\varphi-1}} \tag{24}$$

Aggregate price for all firms

$$p_t^i = \prod_{j=1}^{j} (\zeta^j)^{\frac{1}{\zeta}} (p_t^j)^{\frac{\zeta-1}{\zeta}} \tag{25}$$

The definition of the real exchange rate:

$$rexrt = \frac{s_t}{s_{t-1}\pi_t} \tag{26}$$

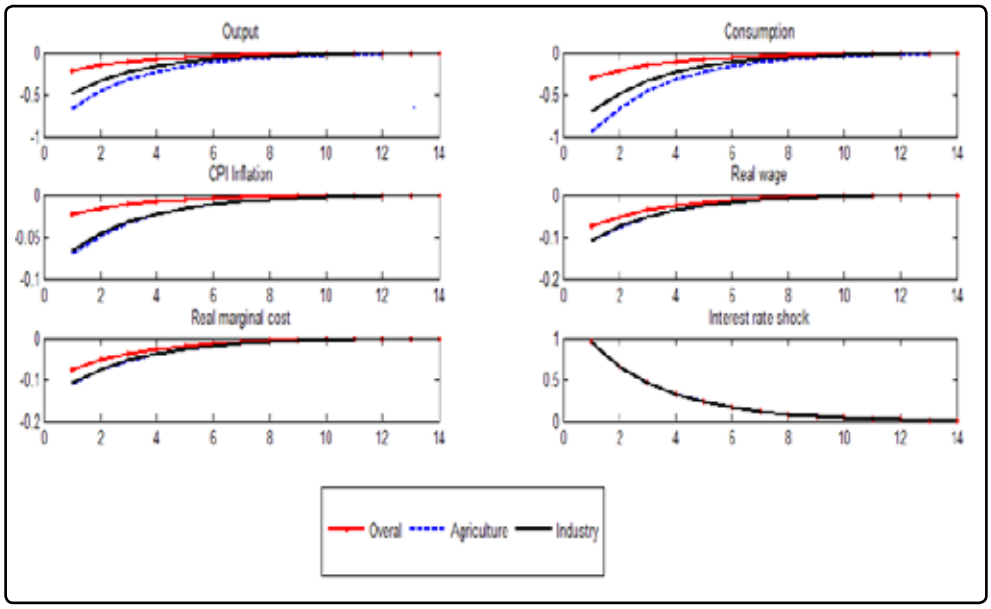
Monetary policy rule

$$log\left(\frac{r_t}{R^*}\right) = \log\left(\frac{r_{t-1}}{R^*}\right) + (1-\gamma)\left[\phi_\pi log\frac{\pi_t}{\pi^*} + \phi_s log\frac{s_t}{s^*} + \phi_y log\frac{y_t}{y^*}\right] \tag{27}$$

The uncovered parity condition

$$s_t = \Gamma(r_t - r_t^*) + \Theta s_{t+1} + \varepsilon_s \tag{28}$$

Appendix 3: Effect of a monetary policy tightening



6.0 TOWARDS A SUPPORTIVE REGULATORY ENVIRONMENT FOR DIGITAL FINANCIAL SERVICES IN MEFMI COUNTRIES

By Angella Lapukeni[31] **-** Reserve Bank Of Malawi/Yokohama National University

Abstract

In Africa, financial inclusion is embraced as a potent strategy for poverty alleviation and human development. Sub-Saharan Africa has embraced financial technology more than any other region in the world. Driven by rapid developments in ICT, digital financial services (DFS) have broadened the scope for competition in, and dramatically increased access to the financial services market. Optimal exploitation of the DFS innovation will significantly depend on the financial sector regulatory environment. This paper explores the opportunity space in MEFMI countries for a financial regulatory environment that is conducive to rapid growth in DFS while at the same time ensuring basic stability of the financial system. The study mainly relied on descriptive research methodology and two country case studies. The aim was to cast light on the challenges and developments in the regulatory environment for DFS to safely flourish at the pace dictated by rapid technological developments. The paper found a general recognition in MEFMI countries of the strategic role of DFS in financial inclusion. Recent developments in the regulatory environments appear responsive and supportive to DFS and are consistent with the basic tenets of a stable financial system. The policy thrust is for the regulatory environment not to stifle innovation. Some recommendations drawn from the paper include: a) bi-annual comprehensive reviews of the legal and regulatory frameworks to promote timely amendments that can respond to market developments; b) Coordination arrangements should be institutionalised to promote effectiveness of regulatory interventions; c) Inclusion of DFS indicators in indices used for measuring financial sector competition; d) there is a need for an increase in consumer education.

6.1 INTRODUCTION

6.1.1 Background

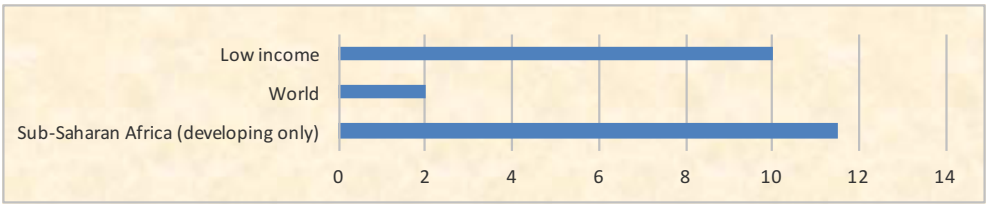
The rapid improvements in information and communications technology (ICT) continue to be the major driver of financial innovations today. Many banks globally and in Africa have moved from manual banking systems and invested in digital services, including online banking and electronic transaction systems. Some banks are coordinating with telecommunication companies to pioneer mobile banking systems that bring financial services to the previously unserved clients (Nyantakyi & Sy, 2015). This has allowed banks to reach more customers, compete with large foreign competitors, and improve banks' margins by reducing operational costs.

[31]At the time of submission to MEFMI, Angella Faith Lapukeni was an employee of the Reserve Bank of Malawi but at the time of publication was a PhD student at Yokohama National University in Japan

Digital financial services (DFS) refers to the technologies available to deliver financial services from a broad range of providers to a wide range of recipients using digital remote means, including e-money, mobile money, card payments, and electronic funds transfers (Asian Development Bank, 2016). DFS has two key models: Bank-led and non-bank led models. The Bank-led model is where a bank account is necessary and only banks and financial institutions offer mobile banking services, while a non-bank or Mobile Network Operator (MNO) led model is where the client holds the account with the MNO and have interaction only with the MNO and its agents (Beck, 2016).

DFS is rapidly gaining ground. In 2015, there were more mobile money accounts than bank accounts in 19 markets of the world and more registered agents than bank branches in 37 markets of the world (GSMA, 2015). In Africa, the MNO-led model seems to be outperforming the Bank-led model. Sub-Saharan Africa (SSA) more than any other region in the world, has embraced financial technology in the form of mobile money which is a type of electronic money (E-Money) that is transferred electronically using mobile networks and SIM-enabled devices, primarily mobile phones (Alliance for Financial Inclusion (AFI), 2016). As of 2014, SSA accounted for 53% of live mobile money services[32] globally (GSMA, 2014), although the proportion has been decreasing in the past few years (58%, 56% and 52% in 2011, 2012 and 2013 respectively) as other regions gain ground. Chart 1 below shows that SSA was above both global and low-income countries' averages in using a mobile phone to pay bills, send or receive money, receiving wages, government transfers, or payments for agricultural products in 2014.

Chart 1: Mobile account (% age 15+) 2014



Source: World Bank Global Findex Database

Mobile telephone subscriptions allow expansion of financial services as they reduce the costs of running a physical bank for the supplier and reduces costs of distance and time for the user. The increasing use of mobile phones in developing countries has contributed to the emergence of branchless banking services, thereby improving financial inclusion. The African region however has been slower in adapting other forms of DFS such as internet banking and debit/credit card usage. Half of mobile money account owners in SSA region do not have an account at a formal financial institution. This shows that DFS is an important and sometimes the only means of 'formal finance' for many adults in Africa (Chart 2).

[32]Mobile money uses the mobile phone to transfer money and make payments to the underserved (GSMA, 2014)

Chart 2: Account at a financial institution (% age 15+)

Source: World Bank Global Findex Database

This reflects the relatively more complex challenges faced by people in accessing financial services from the regular banking facilities.

In addition to improving basic access to financial services, the digital financial services offer other advantages such as cost effectiveness in public and private sector administration, safety and transparency. Mexico saved $1.3 billion annually by simply shifting to electronic payments system. India has recognized the value of digital payments in reducing "leakage"- the payments that fail to reach the intended recipients. Moreover, digital transfers are relatively more transparent, and thus reduce risk of money laundering, terrorist financing, drug smuggling and other illicit payments and activities (Villasenor et.al 2015).

As Africa tries to ride on DFS for financial inclusion as a strategy for broad based development, significant challenges can arise from the regulatory environment. Opening the commercial arena for easy entry should be balanced with an appropriate level of regulation that keeps the financial system stable and minimises systemic risk (Ncube, 2016). Since DFS involve other sectors besides financial services, a comprehensive regulatory regime should go beyond financial regulations to also cover ICT and Telecommunication regulations. While regulations are often associated with stifling innovation, it is generally accepted that a regulatory vacuum or weaknesses in the financial regulatory environment can undermine innovation and integrity of the financial system.

The case for effective financial regulatory systems has become universally strong in the light of the 2008 financial crisis in the United States of America (USA) that led to a global economic meltdown. The financial crisis had its roots in the mismanagement of a major financial innovation i.e. securitization which, like DFS was driven by rapid improvements in information and communication technology. There was thus a serious problem of moral hazard on the part of commercial banks that stood to make substantial profits from these new products without carrying any risk for credit default (Mishkin, 2009). It is now generally recognised that if securitisation had flourished under a strong regulatory umbrella, it would not have ended in the 2008 disaster, and the positive benefits of this innovation would have been preserved. Following the crisis, there have been debates about the acceptable balance between financial innovation and financial stability. The Stiglitz Commission (2010) was the United Nations' first international response to the challenges of domestic regulations

and possible international approach to the regulations of financial systems to prevent similar future global financial crises. A major lesson observed by Stiglitz (2010) from the 2008 financial crisis was that weaknesses in the regulatory system of one country can create financial and economic instability well beyond the boundaries of that country and threaten the global financial system. Hence the inevitable emphasis on a global approach.

This paper recognises the significant development opportunities arising from DFS which is driven by rapid developments in ICT as well as the need for financial regulation to be responsive to the needs of DFS and a stable financial system. The objective of this paper is to examine the opportunity for MEFMI countries to develop financial regulatory regimes that can sustain financial system stability while being fully responsive and supportive to the rapid and steady growth of DFS and the competition which DFS brings to the financial sector. It recognises the tremendous potential development dividends that can come from DFS if allowed to grow at the pace of innovations in ICT. The challenge is for regulations to be sensitive and fully responsive to the needs of DFS while at the same time protecting the financial system stability which in turn also provides a protective umbrella for DFS. With the help of case studies, the paper highlights challenges of the regulatory regimes to respond to the rapid developments of DFS, and provides recommendations.

6.1.2 Problem Statement

The rapid increase in DFS is likely to pose new challenges to existing financial regulatory systems. High rates of innovations in ICT, which underlie the application of DFS, imply that new applications in the DFS area continue to be churned out at a rate that is bound to challenge regulatory systems that are more static. Since financial services always come with serious risks, it is important that as DFS expand, the regulatory framework should also increase its capacity to ensure adequate support to DFS needs while at the same time ensuring the integrity and stability of the financial system. Regulations should not however, stifle competition that may be generated by the rapid growth of DFS as competition can help promote healthy growth of the financial sector. Low barriers to entry and exit, level playing fields and high levels of customer engagement are a description of highly competitive markets. The responsibility is now more complicated than ever before, and adequate attention needs to be paid to this. Regulators are now faced with the necessity to respond at the pace of financial technology's speedy advancement in their job to create a conducive environment for financial service providers to enter and compete fairly.

6.1.3 Justification of Study

The main contribution is the review of existing levels of DFS, financial inclusion and competition in financial services in MEFMI countries. The paper assesses existing vis-à-vis recommended regulations that can foster digital financial inclusion and draw some possible recommendations. The basic thrust of the paper is that the financial innovation stimulus of ICT and subsequent competition should not be unduly frustrated by regulations, but that all innovations should evolve under a clear

regulatory umbrella. This study is a discussion on the opportunities for rapid growth of DFS based on the rapid growth of ICT, and the opportunity space for dynamic growth in the regulatory frameworks that will ensure not only the safety and integrity of the financial system, but also the sustainable growth of DFS. The paper looks at challenges and opportunities faced by financial system regulators in Africa and MEFMI member countries in particular, in responding to the rapid growth in DFS. A few specific experiences in MEFMI member countries have been highlighted to demonstrate the challenges and the regulatory measures that have been embarked on to accommodate DFS in the regulatory regimes of these countries.

6.1.4 Research Methodology

This study mainly relied on secondary data to generate trends that facilitated descriptive analysis of developments in DFS; mobile technology; and competition. The study further used detailed case studies of Malawi and Zambia on developments and practices in the regulatory environment. The choice of Malawi and Zambia was mainly a practical and cost-effective decision as the authors are based in these countries. Although MEFMI member countries are not homogeneous, it was anticipated that challenges, opportunities, and progress in the regulatory environments of these two countries would reflect the situation of the typical MEFMI member country. This was premised on the regional collaborative arrangements among central banks through such forums as SADC Committee of central bank governors and MEFMI Forum of central bank governors which promote common regional standards in critical areas. In recognition of Kenya's leadership role in DFS and financial inclusion, some developments and good practices in Kenya's regulatory environment have also been highlighted in order to articulate the practical challenges and opportunities with DFS.

6.1.5 Structure of the paper

The rest of this paper is as structured as follows: Section 2 discusses the role of competition in fostering financial development. This is in recognition of the impact of DFS on the competitive environment of the financial sector, and the possible role of regulation in promoting a competitive regime for the DFS. Section 3 focuses on the inter play between technology and DFS in fostering growth of the financial sector. Section 4 is a review of the challenges of financial regulation in anchoring a stable environment for the DFS under conditions of rapid technological developments. This section also shows developments in the regulatory environments of Malawi and Zambia. Section 5 covers concluding observations with policy options and recommendations.

6. 2. THE ROLE OF COMPETITION IN FINANCIAL DEVELOPMENT

6.2.1 Competition in Financial Services

In any market driven economy, competition is essential to ensure high quality of services and affordable prices. A market open to fair competition often leads to a greater variety of products and services, increased efficiencies and lower costs, which ultimately improves access to better services by the consumers including those currently on the side lines. In small economies, the limited number of service providers especially in the banking and financial services can easily promote collusion in the pricing of services. Indeed, weak competitive structures tend to undermine quality service delivery. In Zambia for instance, Sandi (2009) has shown that the high concentration (or dominance of the banking sector by a few banks) is a major contributor to the unrealistically low deposit interest rates paid to the customers and other poor services of the banking industry. Sandi's findings are consistent with other studies such as Besrtein (2003) and Hanaan, (1998).

As in any other business sector, competition increases efficiency and development of the financial sector. Too few players in any market can tilt the level playing field necessary for markets to allocate resources efficiently and give consumers choices. In the financial sector, they can additionally limit the reach of financial services and thus financial development of an economy. For instance, Leon (2015) shows that in countries where banking markets are more competitive, financing limitations are lessened. From a monetary authority perspective, some generally argue that competition in the banking sector is necessary if changes in the policy rates are to have an impact on market rates. Some theories attest that increased competition enhances stability in the financial sector (Boyd, et al., 2006)

In general, competition is good for more efficient functioning of financial intermediaries and markets, improved access to financial services and thirdly, for stability of the financial system (Leon, 2015). Love & Martinez Peria (2015) for instance find that the probability of access to credit for firms is reduced in countries where market power is higher (measured by Lerner index and Boone indicator). A less competitive environment is likely to limit financial inclusion and therefore development (Petersen & Rajan, 1995; Boyd, et al., 2006 as cited by Leon, 2015). Studies such as Eschenbach & Joseph (2002) have found a strong positive relationship between financial sector competition and financial sector openness and growth. Some studies, however do not find a positive relationship with industrial growth in low income countries (i.e. Deidda & Fattouh, 2005).

From the mid to late 1980s, many African countries implemented financial sector reforms as part of the International Monetary Fund (IMF) and World Bank structural adjustment policies (SAP). The reforms were accompanied by supplementary policies that made entry and exit easier, lessened interest and capital controls, as well as the overhaul of supervisory and regulatory frameworks in the banking sector (Nyantakyi & Sy, 2015). Savings/capital mobilization, were the stimulant of the financial liberalization and reform programs. However, there was undue emphasis on

the development of the banking sector. With an African environment characterised by high risk and uncertainty, imperfect information and agency problems, risk allocation and sharing are also vital functions of financial markets. Sub-Saharan African countries still remain among the least financially developed in the world. The financial development gap of African countries is reflected through poor access to financial services for both individuals and businesses. This notwithstanding, passing enabling regulation does not guarantee increased access if the users don't understand the product and services.

Financial products differ from ordinary goods and services, mainly because they represent claims on uncertain future streams of income (Maes & Kiljanski, 2009). Greater competition can also induce excessive risk-taking behaviour by banks, and pose systemic risk in the financial system. In the USA where competition is most protected for many sectors, there have been regulatory restrictions on competition in the financial sector mainly to prevent suicidal competition and mitigate systemic risk (Mishkin, 2009).

6.2.2 DFS Driven Competition

Traditional banks are now under pressure to respond to emerging non-bank competitors, and win the challenge posed by technology. Players in e-payments have evolved from different industrial sectors, including the payments service sector itself (e.g. credit cards companies and payment service providers), the banking sector, the telecommunications sectors, technology sectors e.g. software and hardware companies. In addition, there are the new entrants such as Paypal, Google, Payhound and retail shops. The current e-payments industries are a hyper competitive market place with substantial scope for both competition and business alliances.

Non-bank competition forces the banks to be more efficient and responsive to customers' needs. There are many web-based, data-based financial products and services, and multi-sectoral services that customers cannot obtain from either their bank or a similar provider (Dapp, 2014). There is growing demand and change in consumption behaviour of clients when it comes to financial services. The rewarding opportunities attract new players who in turn exert more competitive pressure on the established players. Therefore, on the supply side, traditional banks are now competing with what were thought to be technology companies, forcing banks to sometimes take significantly costly measures in investing in new technologies, to adapt to consumer tastes. Consequently, banks have been creating alliances with among themselves, technology companies and telecommunication companies. M-Shuari in Kenya is an example of successful collaboration between a commercial bank and a mobile network provider.

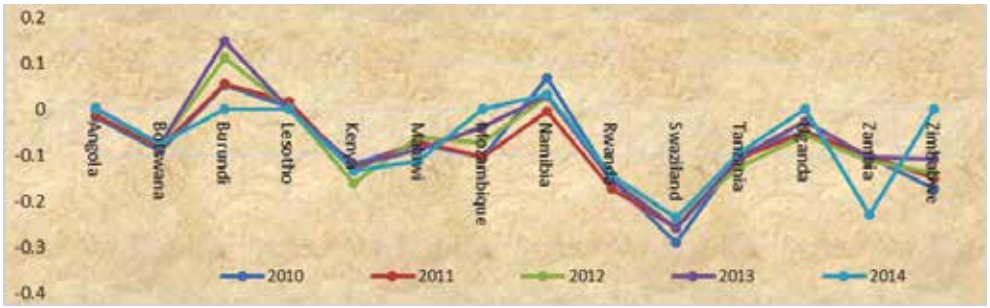
These developments contribute to potential instability for the traditional financial sector players and sets the scene for systemic change. They also encourage creativity, variation and competition, specifically incorporating supermarkets, retailers and other entities, and to encourage low value or micro payment mechanisms (Adams & Mouatt, 2016). Regulators can control and refuse entry of inefficient service

providers (*ex-ante* regulation) or intervene following an establishment of a market failure (*ex-post* regulation) (Bourreau & Valletti, 2015). Imposing too inflexible entry conditions could slow down the development process of the sector as it may involve high compliance costs that raise barriers to entry, and thus to competition, just as too flexible conditions may expose the financial sector to systemic risks. Prudential regulation of digital finance reduces this risk, but may involve high compliance costs that raise barriers to entry, and thus to competition.

Within the African region, a major limiting factor on competition can be collusive tendencies among the few players in the market. For instance, despite Kenya's leading position in financial inclusion and DFS, the Central Bank of Kenya has "expressed concerns about insufficient market competition in mobile financial services" (Villasenor, et al., 2015). Under these circumstances the regulatory regime, needs to be particularly proactive in promoting and protecting high service levels.

Chart 3 below illustrates the level of bank competition in MEFMI countries using Boone Indicator, from 2010 to 2014, one of the most used indices for competition in the literature. This is calculated as the elasticity of profits to marginal costs. The rationale is that higher profits are achieved by more-efficient banks. Hence, the more negative the Boone indicator, the higher the degree of competition is because the effect of reallocation is stronger. The indicator assumes that competition increases the performance of efficient banks and erodes the performance of inefficient counterparts. The chart shows Swaziland as having the highest level of competition in 2014, followed by Zambia. Angola, Lesotho and Mozambique are among the lowest.

Chart 3: Boone indicator in MEFMI Countries



Source: World Bank Global Financial Development Data

Since DFS involves ICT companies that are regulated by specialised ICT regulators and financial service providers who are regulated by the central banks, there is need for some collaboration among these public authorities. In Malawi, the collaboration of regulatory authorities has been institutionalised through their joint membership of the National Payments Council (NPC) which has some regulatory powers over financial services (See Malawi case study). It is significant that membership of the NPC is not confined to the regulators of the financial services and ICT services, but extended to the competition regulatory authority and other public regulators.

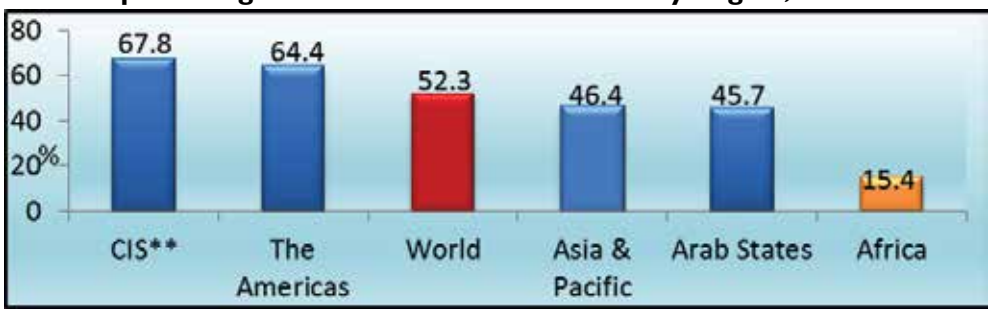
The competition challenge in DFS is further complicated by the structural dependence of some DFS providers on ICT service providers who are competitors in DFS. In Zambia, Airtel, one of the major mobile service providers, sought to protect its DFS subsidiary by limiting airtime in which other DFS providers can transact on their mobile network. The allotted time turned out to be too short for many customers to transact effectively. This led to extremely unsatisfactory services for non-Airtel DFS providers. When Airtel was confronted with the public queries, its position was that allowing more time to these other DFS providers would take away airtime from the Airtel Money customers. The Bank of Zambia and ZICTA, the regulator of Airtel, leaned on Airtel to give equal access of airtime to all DFS providers, and not give Airtel's DFS, Airtel Money special advantages. This is one example where the regulator of DFS worked with the regulator of ICT services to promote a level playing field in the ICT area for DFS providers to compete. A key limitation is that financial sector competition indicators do not yet incorporate non-bank players such as MNO's.

6.3 TECHNOLOGY, DFS AND FINANCIAL INCLUSION

6.3.1 Global and Regional trends in technology and DFS

DFS in the form of mobile money services has been on the increase in recent years. There were 271 live mobile money services globally and SSA accounted for over half of the services in 2015. SSA has had over half the global share since 2008 when there were only 16 such services. Hence the growth in SSA has been proportionate to global increase. Seven billion people (95% of the global population) live in an area that is covered by a mobile-cellular network. As for internet usage, just over half the households globally have a computer, whilst less than half use the internet (International Telecommunication Union (ITU), 2016). African households are the most deprived of internet services (see **Chart 4**).

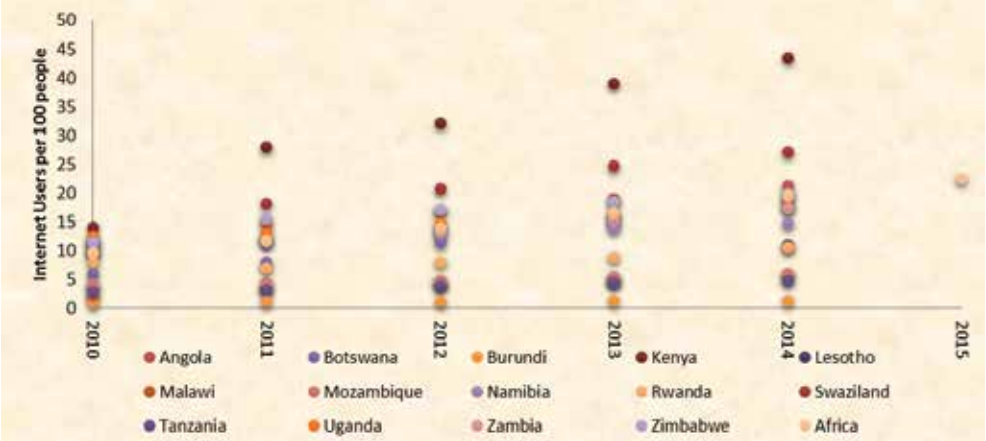
Chart 4: percentage of Households with Internet by Region, 2016*



Source: ITU World Telecommunication/ICT Indicators database

Although Africa has the lowest access to internet facilities, this may indicate substantial potential for rapid development in technology. Specific to the region, Chart 5 shows internet users within MEFMI region and reveals that within the MEFMI region, Kenya has been the leader with regard to internet banking with 43.4 % of adults using the internet in 2014, over twice the number of the African average of 20%.

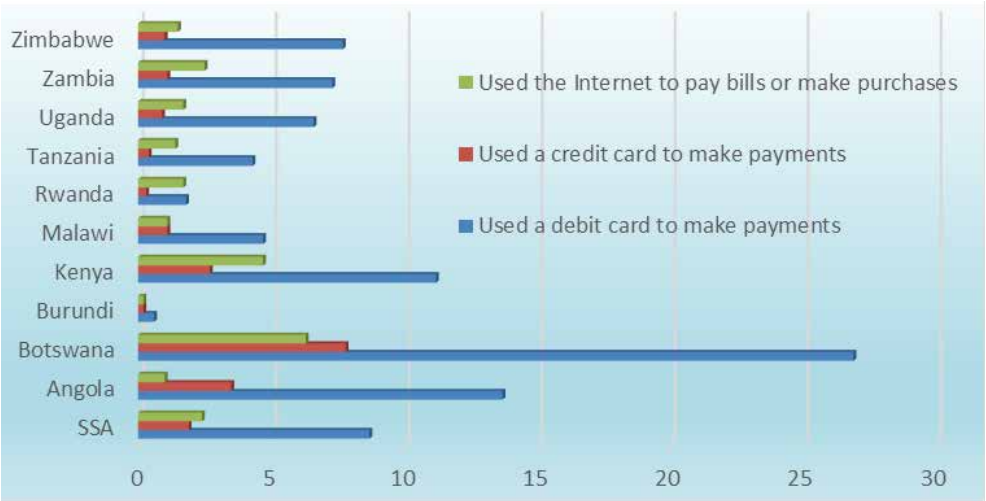
Chart 5: Internet Users in MEFMI Region



Source: World Bank Development Indicators

Chart 6 shows that debit card usage is by far the most popular bank-led DFS. Although Kenya's had the highest usage of internet facilities, Botswana was leader in internet banking in 2014. This shows the importance of consumer education to generate demand and clearly indicates that access does not necessarily translate into usage. Therefore, efforts to create a platform for thriving DFS must be pursued simultaneously with consumer education.

Chart 6: Bank-Led DFS usage in MEFMI countries 2014

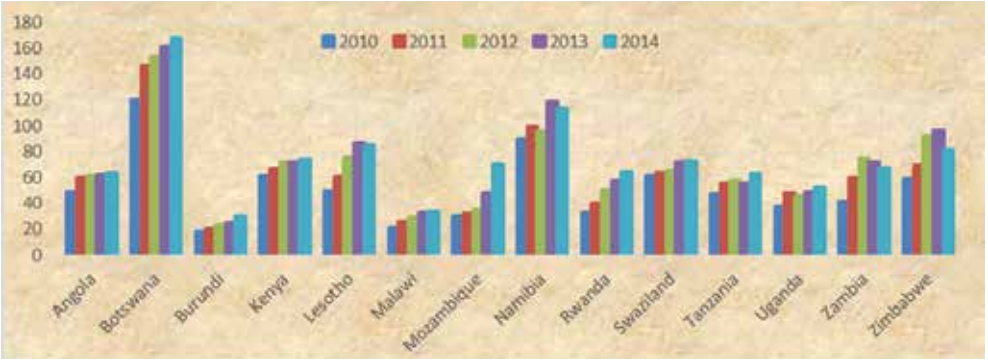


Source: World Bank Group: The Little Databook on Financial Inclusion 2015

In high-income OECD economies, 77% of adults—82% of account holders—reported using at least one of the three payment mechanisms in 2014. Disaggregated, 65% of adults reported using a debit card, 47% a credit card, and 21% a mobile phone to make direct electronic payments in 2014. In contrast, in SSA, only 8.7% of adults used a debit card to make payments; 1.9 % used a credit card and 2.4% used the internet to pay bills or make purchases. Globally the proportions were 23.2%, 15.1% and 16.6% for the payment types respectively (World Bank Group, 2015).

Chart 7 below shows mobile phone subscriptions in MEFMI countries. Though varying, there has been growth in the number of people subscribing to a mobile phone, displaying the potential growth in the use of mobile technology. There were 100 million new mobile money accounts registered globally in 2015 alone (GSMA, 2015). For Sub-Saharan Africa, the number of adults with a mobile money account has increased from 24% in 2011 to 34% in 2014. The registered mobile money agents had a global average active rate of 51.4 %. SSA active agents grew by 4.7 % from 2014 to 2015. Agent activation, especially in Africa is challenging for reasons such as a restrictive regulatory environment, a lack of commercial investment, or a particularly complex market context (GSMA, 2015).

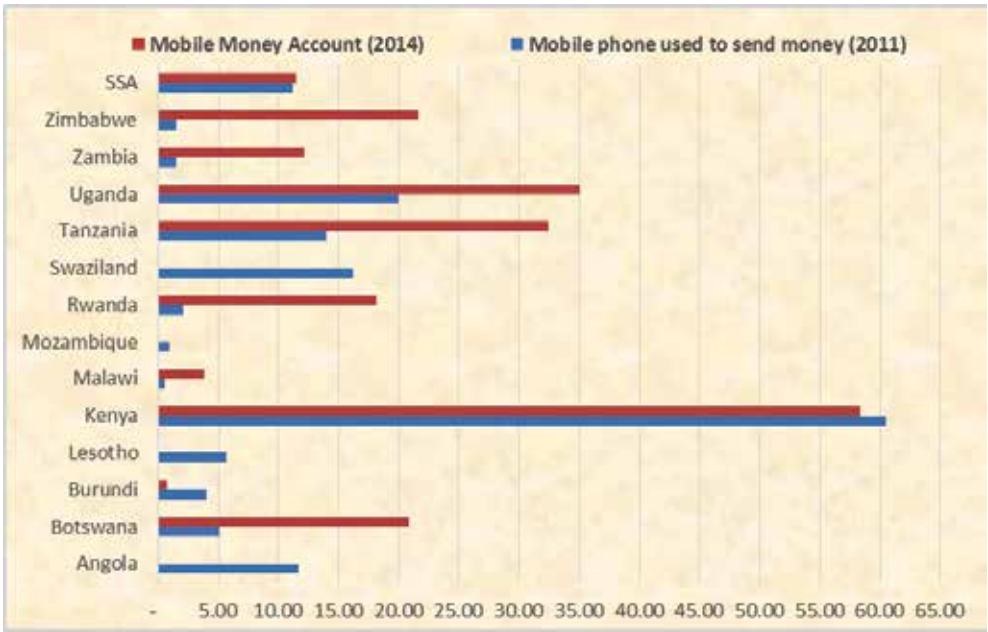
Chart 7: Mobile cellular subscriptions (per 100 people) MEFMI Countries



Source: World Bank Development Indicators

Across SSA, one in three mobile connections was linked to a mobile money account as of December 2015 (GSMA, 2015). In 2011, 60.5% reported to have sent money through a mobile phone. In 2014, Kenya reported 58.4% adults as having a mobile money account (World Bank Group, 2015). Chart 8 shows the penetration of mobile money services in the MEFMI region. Majority of countries in 2014 were above the SSA average of 11.5% of adults owning a mobile account, which translates to 64 million people. Of this population, 50% have mobile money accounts as the only formal financial services available to them. This compares favorably with the global picture of only 2% adults having mobile money accounts (Villasenor et.al 2015). Although the data is on different indicators in 2011 and 2014 surveys, both indicate the growth in mobile money in the region. Kenya's leadership in DFS is not confined to this region, but she was also top in the financial inclusion rating of the 20 countries from Latin America, Africa and Asia and one country from Europe that were surveyed by the 2015 Brookings Project on Financial Inclusion (Villasenor et.al, 2015). Through systematic knowledge sharing, the MEFMI region can benefit from this strong performance of Kenya.

Chart 8: 2014 Mobile Money Account (% 15 Yrs +) in MEFMI Countries[33]



Source: Global Findex Database

6.3.2 Drivers of Financial Inclusion

Many countries recognize that financial inclusion is critical to individual wellbeing and national development. Financial inclusion is generally embraced by developing countries as a potent strategy for poverty alleviation and social development. Thus, many developing countries have committed themselves to financial inclusion enhancing policies. It is significant to note that by May, 2015 many governments in developing countries had signed the Maya Declaration on Financial Inclusion which is an elaborate and comprehensive commitment to financial inclusion (Villasenor et. al, 2015).

According to the 2014 World Bank Global Findex data base, only 62% of adults around the world had access to an account at a formal financial institution or mobile money provider. Of the adults surveyed, 4% of those without accounts indicated that they did not need an account. This implies that over 30% of the global adult population is deprived of access to financial services. In SSA, the barriers to financial services include prohibitive distances from physical financial institutions, limited access to telecommunication facilities, and high poverty levels. DFS offers convenient and less expensive use of formal finance and less need for cash to make payments and transfer funds. These platforms accommodate the very small and unpredictable cash flows of the poor, allowing them to transact affordably whenever they wish.

[33]Denotes the percentage of respondents who report personally using a mobile money service in the past 12 months. Countries included only those whose data were available in Global Findex

The 2015 Brookings Financial and Digital inclusion Project report has given an excellent exposition of the interplay between technology and regulation in fostering financial inclusion. The study covered 21 countries that are diverse not only geographically, but also economically, politically and socially (See Appendix 1). The study identified 33 indicators or drivers of financial inclusion distributed across four "dimensions" that represent the broad categories of factors that drive or impinge on financial inclusion defined in the report as "both access to and usage of appropriate, affordable and accessible financial services." These dimensions are country commitment, mobile capacity, regulatory environment, and adoption, and each is described below.

Country Commitment

Country commitment covers the role of the government as the principal driver of enabling conditions for financial inclusion, including indicators of the involvement of the private sector. The assessments include: commitments to multinational financial inclusion organizations or networks; specific DFS commitments; whether: a comprehensive national financial inclusion strategy exists; the country has established specific quantifiable financial inclusion targets, recent demand-side financial services survey(s) have been conducted or supported by a government entity, and there is a financial inclusion coordination body.

Mobile Capacity

Mobile money services are a potent mechanism for increasing access to financial services, and mobile technology is recognized as a critical driver of the emerging financial services landscape. Indicators that measure mobile infrastructure and adoption include: the extent of 3G mobile network coverage; the degree of unique mobile subscribership; the availability of mobile money-enabled P2P payments, bill payments, and international remittances; the number of active mobile money services within each country.

Regulatory Environment

Regulations and policies surrounding traditional and digital financial services vary widely across countries and are critical factors in determining the success of financial service provisions. Among the specific indicators used were: Agent banking; non-bank led mobile financial service deployments (with a focus on the role of MNOs); e-money regulations, and general legal framework; mobile money platform interoperability; proportionate know-your-customer processes, and cash-in/cash-out capability at agent locations.

Adoption

This fourth dimension of evaluation focuses on adoption of traditional and digital financial services. This captures the penetration of traditional accounts, digital services linked to traditional formal financial institutions (e.g., debit cards), and mobile money accounts. Measurement of adoption focused on: traditional account penetration; the percentage of: adults who borrowed and saved at a financial institution; debit and credit card use; adults utilizing online bill payment and purchases; mobile money

account penetration among the general population, wage earners using a mobile phone to receive salary and wages; and adults who used a mobile phone to make utility payments. All scores for the indicators in the adoption dimension were based on data from the 2014 Global Findex database.

Appendix I provides a comparative picture of the financial inclusion achievements among the surveyed countries. The top performers**,** with their overall ranking in brackets were Kenya (89%); South Africa (80%); Brazil (78%); Rwanda and Uganda (75% each); and Chile, Colombia, and Turkey (74% each). The major distinguishing characteristic of the top performers was their commitment to financial inclusion as reflected in specific financial inclusion objectives. Among significant steps were implementation of changes to laws and regulations that permitted involvement of diverse institutions in the financial market; measures to support mobile and digital networks that enhanced service delivery; development of shared payments infrastructure that helped cut costs for the service providers; and provision of suitable incentives for digital money usage. In terms of practical measures, key factors were mobile capacity and regulatory frameworks. This underscores the critical role of both mobile capacity infrastructure and the regulatory framework. As reported by IBRD/World Bank (2014), digital payments face significant infrastructure challenges in rural areas due to the lack of electricity with which to power mobile phones and cell towers, limitations in mobile network coverage, and poor roads and transport networks.

The Brookings findings appear to be in line with the observations of the 2016 SADC Financial Inclusion Strategy Workshop where financial development was premised on the "combined goals of stability, efficiency, consumer protection, and market competition" (SADC and FinMark Trust, 2016). The report identified three broad categories of barriers to financial inclusion as follows: (i) Supply barriers: lack of incentives, capacity and appropriate delivery channels; (ii) Demand barriers: administrative, systemic and attitudinal challenges which were more pronounced among youth and women; (iii) Policy and regulatory environmental barriers: weaknesses in the policy and regulatory environment that tend to exacerbate the supply and demand barriers.

For purposes of monitoring progress in financial inclusion, the report identified and prescribed the following ten (10) indicators under four broad categories: (i) Overall (SADC region) indicator: Regional access; (ii) Product indicators: Remittances; Mobile money; Savings; Credit; Insurance; (iii) Demographic indicators: Gender; Geographical location; Age; and (iv) Policy indicators: Financial inclusion strategy. In the area of product indicators, remittances and mobile money are key elements of DFS performance that indicate the role attached to DFS in financial inclusion. The demographic indicators reflect the potential performance in overcoming the identified demand barriers, notably the systemic and attitudinal challenges that are more pronounced among women and youth. The choice of financial inclusion strategy as the only indicator of policy performance is consistent with the emphasis placed on the development of a comprehensive financial inclusion strategy in the Brookings report.

Among the concerns identified by the SADC report that require change or significant additions was consumer education and protection. In the MEFMI member countries, consumer education may need to put some emphasis on basic financial literacy which is an area of concern even in the developed world. Although consumer protection may widely be seen as the responsibility of the financial regulators, an informed consumer community makes consumer protection much easier. Thus, while financial literacy should get priority attention in consumer education, public sensitization on issues of consumer rights should not be neglected if the general public is to play an informed role in the evolution of a conducive regulatory environment.

6.4 THE CHALLENGE OF REGULATING DFS UNDER RAPID TECHNOLOGICAL CHANGE

6.4.1 Mitigation of Market and Payments System Risks in the DFS

Given the significance of DFS to the national development agendas of MEFMI countries, there is need to avoid any national, regional or global mismanagement of this important financial innovation. The surest way of promoting sustainable innovation is a credible and conducive regulatory environment. If regulations are insensitive to the needs of market players or commercial opportunities, there is a high risk of regulations stifling innovation. On the other hand, if financial innovations flourish outside a credible regulatory umbrella, there is the risk of destabilizing the entire financial system as was the case in the 2008 global financial crisis. With rapid technological developments driving the pace of growth in DFS, there is increased pressure on the regulatory systems to adapt to the pace of technological changes. Failure to adapt or move at the pace of technological developments can result in regulatory systems that are not relevant or responsive not only to national development policies, but also to the emerging economic and commercial dynamics. Under such circumstances, the economic and commercial stimulus of technological change will be frustrated rather than used to impact positively on national development.

If mismanaged, regulations can hamper innovation in DFS. The 2015 Brookings study found that despite Indonesia's high mobile phone penetration and large volumes of government to person payments, Indonesia's achievements in financial inclusion was among the lowest mainly because of its restrictive regulations (Villasenor et.al 2015). Indonesia only permits big banks to hire informal, unregistered entities as e-money agents. Smaller banks and mobile network operators (MNOs) can only partner with registered legal entities, which restrict them from building dense agent networks in rural areas. As a result, MNOs are struggling to scale up their operations.

On the other hand, the high performance by Kenya in financial inclusion was mainly linked to Kenya's regulations that encouraged market entry of a variety of players in digital financial services (Villasenor et. al 2015).When the agency- driven M-PESA services was launched in Kenya, there were no agency regulations for banks or non

banks. Rather than criminalise or stop the new DFS, the Central Bank of Kenya addressed the legal vacuum by issuing bank agency guidelines. The subsequent e-money regulations were designed with reduced licensing, reporting and other requirements (Lauer, K, 2011). A World Bank study on the effective regulatory frameworks has confirmed that agent banking regulations have a positive coloration with usage of mobile banking (Gutierrez, E and Singh, S, 2013).

The primary responsibility of the financial system regulator is to contain and manage market risks that can threaten stability of the financial system. In the DFS arena, the risk is significantly compounded by the preponderance of agent responsibilities. As observed by Lauer et al (2011), "although a number of countries have issued regulations related to use of bank agents, there has not been any global guidance to supervisors on how to supervise agents". The bottom line is risk management and mitigation. Risk management is always at two levels. The first is the micro level where the banks take internal responsibility. The second level which is the subject of this paper is the macro level where regulations may specify the required policies and procedures and corporate governance procedures, or the supervisor may impose them.

In this section, we look at the major risks that can, and often arise in the digital financial services, and the risk management and mitigation strategies employed in the typical MEFMI country. According to the Bank of Zambia Payment and Settlements Systems reports (2013, 2014), the major risks in the payment and settlement systems include, credit risk, liquidity risk, operational risk and legal risks.

6.4.1.1 Credit Risk Mitigation

This risk mainly applies to credit institutions and is not a pronounced risk for the typical mobile payment players whose activities do not normally include credit. Indeed, where guidelines such as the 2011 Malawi Mobile Payment Systems Guidelines specifically exclude or prohibit acceptance of deposits from the public, the financial intermediation role is firmly discouraged from the mobile platform and the associated risks of financial intermediation are fully mitigated by the basic rules. When DFS becomes a major player in deposits and credit services, appropriate regulations will need to be developed.

6.4.1.2 Liquidity Risk Mitigation

This is a significant risk in mobile money activities. The regulations in Malawi and Zambia have provided stringent rules to ensure that mobile money providers have adequate liquidity to discharge their obligations at all times. Under section 8.7 of the 2011 Malawi Guidelines for mobile payment systems, the mobile payment service provider is required to maintain a trust account with a bank whose usage is restricted to facilitating mobile payment transactions. The balances on the trust account are to be equal to the total outstanding (un-claimed) balance of all holders of the e-money under the service. The 2015 Zambia Payment Systems Directives on Electronic Money issuance has similar restrictions. Under Section 17(3) "the aggregate value of the holding account shall at least equal the total outstanding e-money liabilities at all times." It is further required that the customer funds in the holding account are to

be reconciled to the outstanding e-money liabilities daily by the E-money institution. In enforcing these rules, the Bank of Zambia inspectors examine reports of E-money institutions and compare them with the Holding Account statements of banks.

Despite these efforts, there appear to be practical challenges in the distribution of the available liquidity to all points of service. There have been confirmed cases in Zambia where recipients of mobile money have had to wait as long as two days or more to get cash because their point of service did not have liquidity. To protect the integrity of the payments system and the benefits of DFS, there is need for the regulations on liquidity to address the challenge of liquidity at all points of service.

6.4.1.3 Operational Risk Mitigation

Operational risks arise from any weaknesses or lapses in the operational arena. Major sources of this risk include weaknesses in internal processes, human factor, systems or exogenous and external factors. It is duly recognised that for their own basic survival and profitability, the E-money institutions will internally do their best to mitigate the operational risk. However, the regulator must still recognise its ultimate responsibility for managing operational risks in the system. Since the major challenges for operational risk arise at the various operational levels of the institutions, the primary approach for the regulator is to strengthen the risk management capacity of institutions through regulatory guidelines and effective monitoring. In both Malawi and Zambia, the regulations give very clear and specific guidelines on credible systems and procedures that safeguard the integrity of the payments system for e-money.

The guidelines cover such areas as customer transactions; safeguards of customer funds; records and returns; specific prohibitions and restrictions and money laundering requirements. In the area of technology, the Malawi guidelines provide for modularity of technologies; message format; reliability and security. With regard to people risk, the Bank of Zambia screens and approves candidates for the Board members and key management positions for regulated institutions. The screening process covers technical/ professional capabilities and criminal records. In Zambia, nobody is appointed to key positions in the regulated financial institutions until they are cleared by the Bank of Zambia. These measures have historically helped Zambia to raise professional standards in the management of banks and financial institutions.

6.4.1.4 Legal Risks Mitigation

This includes risk of failing to comply with laws, regulations, and rules. It also includes risk of loss related to new and changed laws, and interpretation of laws (Group, 2014). Legal risks can also arise from weaknesses and gaps in the legal framework. Thus, delays in implementing desirable legal reforms can create legal risks. African countries have been active in monitoring the legal environment to ensure that it is conducive to the rapid DFS developments. Where such developments may not have been fully anticipated in previous legal instruments, African countries need to amend payments systems and develop specific guidelines for mobile payment system. The SADC Committee of central bank governors for instance, provides a forum for knowledge sharing and advocacy for appropriate legal and regulatory reforms.

The main challenge for legal reforms may arise from the slow pace of legal reforms in Africa. The regulatory environment needs to keep pace with the rapid developments in DFS which are driven by the rapid pace of technological change. For optimal response and relevance to the rapidly changing landscape, the regulatory reforms need to be properly informed through regular national surveys of national financial sector.

6.4.3 Coordination of Regulatory interventions

While the primary focus of the regulatory framework is naturally on financial system regulation, it is important to recognise that effective financial regulations cannot be implemented in isolation. Since DFS depend significantly on ICT facilities, developments in DFS need to be harmonised with those in ICT. In many countries, the ICT service providers are regulated by bodies different from the regulator of financial institutions. Effective regulation of financial innovation especially DFS requires effective coordination between the central banks and the ICT/telecommunications regulators. In recognition of this, some countries such as Zambia have been proactive; the Bank of Zambia signed a memorandum of understanding with ZICTA, the ICT regulator. In Malawi, there has been some institutionalisation of coordination through creation of the National Payments Council (NPC) that includes the central bank and other public regulators, notably the ICT regulator and the Competition authority (See details in case studies below).

While regulation is generally recognised as the domain of Government, there is increasing realisation that the process of developing suitable laws and regulations should involve the private sector. The private sector should have the opportunity to provide inputs in developing laws and regulations that affect their operations. In Zambia, the private sector is extensively consulted by the Bank of Zambia, while the partipatory role of the private sector in Malawi is institutionalised through its membership of the NPC. In terms of overall effectiveness of policy management, the Malawi model of institutionalised approach to coordination of regulatory interventions appears more potent than Zambia's ad-hoc arrangements. The Malawi model provides better scope for coordinated planning, implementation and monitoring of developments in the policy and regulatory frameworks.

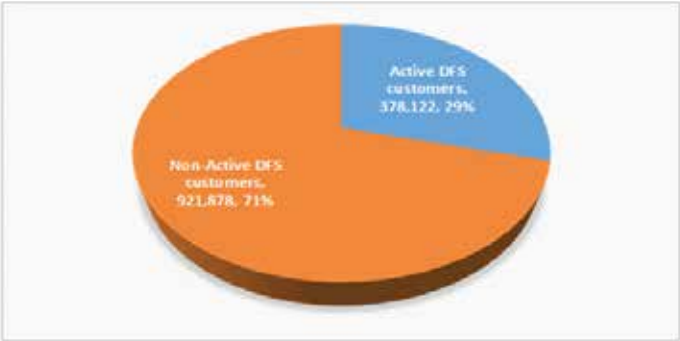
6.4.4 Case Studies: Country Profiles

6.4.4.1 Malawi

In Malawi, 2 MNO's and 3 commercial Banks are the main providers of DFS, with others such as Zoona. The use of DFS in Malawi has been growing over the years. In 2012, less than 1% of the adult population were active users of DFS, with only 1 active agent per 100,000 adults. In 2015, this increased to 8%, and 98 active agents per 100,000 adults. Malawi is being described as moving from Start-up phase which saw the introduction of new technology in the telecommunications and banking sectors into the expansion phase when the technological changes are pushing the frontiers of financial services mainly through DFS (UNCDF, 2015). As of 2015, there

were 1.3 million registered DFS users in Malawi and 29% were active (See **Chart 9**) (Atluri & Cracknell, 2015).

Chart 9: DFS Users Malawi (2015)



Source: (Atluri & Cracknell, 2015)

Although Malawi has no specific legislation to back DFS, the Reserve Bank of Malawi (RBM) is the lead regulator based on its broader mandate to regulate payments and promote the national payment system under the RBM Act. This vacuum in the legal framework is expected to be addressed by National Payment Systems (NPS) bill that has been developed. Other regulators range from telecommunications (Malawi Communications Regulatory Authority (MACRA), competition (Competition and Fair Trading Commission (CFTC), consumer protection as well as anti-money laundering and countering the financing of terrorism (Financial Intelligence Unit, FIU). These are involved in coordinating the oversight approach (Greenacre, et al., 2014). The Ministry of Finance (MOF) is involved in policy development as part of its wider policy on financial inclusion in the country.

Malawi's Banking Act of 1965 was very restrictive to entry and as a result, Malawi implemented financial sector reforms in the late 1980's. Consequently, a more conducive and competitive environment was created and the financial system saw entry of new players. As at end-December 2015, a total number of 12 banks were operating in the market. Recently the financial system has seen the coming in of other players such as the Mobile Network Operators (MNOs). There is only a general provision in the RBM Act relating to 'the promotion of sound payments, clearing and settlement systems', but the provision of the Act has no specific reference to electronic payments.

By virtue of membership to the Eastern and Southern Africa Anti Money Laundering Group (ESAAMLG), the Financial Action Task Force (FATF) was established in 1989. This is an inter-governmental body established by the Ministers of its Member jurisdictions with the objective of setting standards and promoting effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system. In June 2013, FATF issued a guidance note titled Guidance for a Risk-Based Approach: Prepaid Cards, Mobile Payments and Internet-Based Payment Services (Guidance Note).

A National Payments Council (NPC) was established in 1993 as a result of a recommendation by the International Monetary Fund. The council comprises the governor of the Reserve Bank of Malawi (RBM) and the chief executives of all commercial banks and other key non-bank financial institutions. It is designed to encourage cooperation in modernising Malawi's payment systems. The NPC provides a forum for institutions to share ideas (Greenacre, et al., 2014). In 2001, the National Payments Council endorsed the Malawi National Payment Systems Vision and Strategy Framework, in conjunction with the RBM and the Bankers Association of Malawi (BAM).

Mobile Payments Systems Guidelines were issued in 2011, which are restricted to Mobile Financial Services (MFS). These MFS were described in the guidelines as "components that facilitate the delivery of payment to the banked and non-banked population through mobile phones or other similar electronic means". The 2011 Mobile Payment Systems Guidelines apply to non-bank based mobile payments models and were drafted on the basis of the RBM Act of 1989 Section 4 (e) which mandates the bank to promote a sound financial structure in Malawi, including payment systems, clearing systems and adequate financial services in Malawi.[34] These guidelines however, are not laws per say. While interoperability is identified as being required in the Mobile Guidelines this has not been enforced. Legislative and regulatory changes were proposed in Malawi to further develop the mobile money market and to broaden financial inclusion. The proposed legislation is the Payments Systems Bill (Payments Bill) and the proposed regulations are the draft Reserve Bank (E-Money) Regulations, 2014 (E-Money Regulations). These are further discussed below.

In early 2012, the RBM introduced Agent Banking regulations aimed at governing the operations of bank agents which have proved to be a new delivery channel for offering banking services to the rural poor in a commercially viable manner. These apply to agents carrying on agent banking activities and involve further requirements given the increased range of activities they undertake compared to e-money activities. Liquidity and operational risk have been the main threats to the use of agents for mobile money in Malawi. Cash-out constraints are a common issue because agents are required to meet the customer demand for the physical cash, while operational risk is due to agents being unable to perform tasks effectively due to low levels of financial literacy and high staff turn-over (Greenacre, et al., 2014). The draft E-money Regulations dealt with some of these.

The Reserve Bank (E-Money) Regulations were issued in 2014. The *E-Money Regulations* replaced the then existing *Mobile Payment System Guidelines 2011* (*Mobile Guidelines*). The draft E-Money Regulations provide regulatory arrangements for e-money (which encompasses all stored value facilities including mobile money), including the approval and licensing of entities (and their agents) issuing and storing the underlying funds which e-money represents and operating the payment systems involved in the transfer of e-money. The regulations do not prohibit any particular type of institution from providing mobile money services but instead take an activity-

[34] RBM Guidelines For Mobile Payment Systems (2011)

focused approach; any entity providing e-money is captured by the regulations. In this way, the E-Money Regulations will cover all entities providing mobile money, including banks and non-banks. These regulations are however, silent on agent liability. An e-money service provider shall also have in place a trust deed in accordance with these regulations which shall set out the duties and obligations of trustees in relation to the trust fund. The Bank may, if it deems fit prescribe a model trust deed to guide e-money service providers in this regard.

By February 2015, Malawi had finalized a Payment Systems Bill and instituted the Mobile Money Coordination Group (MMCG). The former was passed in parliament in 2016 and awaits the president's signature as of the time this paper was written. The Act identifies the Reserve Bank of Malawi to exercise the oversight role over the systems and instruments. This is a milestone in setting up the correct regulatory environment. The MMCG consists of a variety of regulators, donors, banks, and the two MNOs. Specifically, it is composed of members from the RBM, consumer associations, telecommunications industry, and international nongovernmental organizations such as the United States Agency for International Development (USAID) and the World Bank. MMCG aims to boost the use of mobile money in Malawi by facilitating and incorporating the views of a variety of stakeholders (policy, regulatory, and market) into regulation and policy objectives for mobile money. Aside from focusing on regulatory issues, the MMCG is involved in a variety of areas of mobile money, including: financial literacy education, pilot programs for government to person (G2P) and social cash transfers. MMCG aims to strengthen the use of mobile money in Malawi by facilitating and incorporating the views of a variety of stakeholders (policy, regulatory, and market) into regulation and policy objectives.

The path toward interoperable DFS systems is a challenging one for regulators. However, regulatory involvement is likely to be necessary to provide the drive that market forces alone will not create. Malawi's central bank has also identified interoperability as a goal. This appears consistent with World Bank empirical findings that interoperability is correlated with higher usage of mobile money (Gutierrez, E and Singh, S, 2013). On the infrastructure side, a national switch was commissioned in December 2014 which provides interoperability to DFS supporting networks like ATMs, POS, mobile banking, internet banking and mobile money. Under the Financial Sector Technical Assistance Project, Malawi implemented its National Switch in February 2015. The launched national switch for retail payment systems is to improve interoperability between existing digital payment systems, and to further accelerate digital payment uptake. National switch provides a switching platform for internet banking, remittances, and mobile money transactions. In a speech, the Minister of Finance and Economic Planning and Development said, "we have decided to develop this as a shared payment services arrangement with the Bankers Association of Malawi so as to facilitate interoperability and help ensure the volumes to make the investment viable (EY, 2015). Currently, this is working for ATM's of all registered banks.

The Brookings 2015 Report on financial inclusion cited the following as highlights for the scores awarded to Malawi: The 2011 Mobile Payment Systems Guidelines;

The Government of Malawi committed to the Better Than Cash Alliance in 2013; Implementation of the NatSwitch and the work of the MMCG (Villasenor, et al., 2015). While enabling regulations and policies such as proportionate KYC are important, lack of documentation continues to pose challenges to take-up in many developing countries such as Malawi, whose citizens do not have national IDs.

6.4.4.2 Zambia

The Financial Sector Development Program (FSDP) was drafted as a strategy to "address challenges in the Zambian financial sector." The FSDP was implemented in 2004, after the Financial Sector Assessment Program (FSAP) was conducted in 2002. This involved a collaborative network that included the Ministry of Finance (the coordinator and funder of FSDP's activities and Chair of the FSDP steering committee), the Bank of Zambia (which houses the secretariat for FSDP) and Fin Mark Trust (which provides technical expertise). The FSDP has since 2004 helped to guide policy development to improve financial inclusion. Its activities have been properly supported by regular surveys of the financial landscape which have been undertaken by Fin Mark Trust. The Bank of Zambia (BOZ) draws its regulatory powers from the National Payments Systems Act 2007 as well as the Banking and Financial Services ACT 1996. Under the Payments Systems Act, the BOZ may under section 5 (3) "Give such directives to participants as may be necessary to ensure the integrity, effectiveness, efficiency or security of the payment system".

Under this Act, the National Payments Systems Directives on Electronic Money Issuance was gazetted on 26 June, 2015. It is these directives that govern the operations of e-money in Zambia today. With the help of these directives, the BOZ is regulating digital financial services (DFS) to ensure that major risks are contained and customer funds are safeguarded. For e-money services of a major telecommunications company such as Airtel, the BOZ insists that the E- money component is registered under BOZ guidelines as an autonomous subsidiary of the parent ICT based company. Thus, Airtel Money is an autonomous subsidiary of Airtel, the ICT parent company which is regulated separately by the Zambia Information, Communications Technology Authority (ZICTA). Airtel Money is registered and regulated by BOZ as a DFS company. Under the guidance of BOZ, Airtel Money signs a service agreement with Airtel for accessing the ICT services needed to deliver DFS.

To ensure smooth collaboration among the public regulators of inter-linked services, the BOZ has signed a memorandum of understanding with ZICTA, and this has been helpful in promoting coordinated responses and guidance by the regulators of financial services and ICT services. The legal separation of E-money service companies from their ICT parent companies can be seen as a basic step in promoting sharp focus on the E-money service providers. The solvency risks are thus based on core E-money activities. Traditionally, the level of capitalisation has been the basic assurance against insolvency. Under the minimum capital requirements of the 2015 regulations, an E-money institution shall be required to have an initial capital prescribed BOZ, and must maintain continuing capital that shall be equal to or greater than 2% of:

The current amount of its outstanding e-money liabilities at the end of the prior business day; or

The average outstanding e-money liabilities.

Continuing capital shall not fall below the initial minimum capital. At present, the BOZ has not yet determined figures for initial capital, and is relying entirely on the continuing capital prescriptions. The main advantage of the continuing capital requirements is the inherent automatic adjustment mechanism for capital requirements in accordance with movements in the e-money liabilities. This system of continuing capital can give confidence in the ability of E-money institutions to meet their liabilities with available capital.

For the commercial banks and non-bank financial institutions, the BOZ has fixed initial minimum capital requirements in addition to continuing capital requirements. These are revised from time to time based on commercial dynamics. While the continuing capital prescriptions may give reasonable comfort about the stability of the E-money institutions, the BOZ can strengthen its capitalisation rules with specified amount(s) for initial capital for E-money institutions. It is observed that when BOZ made its last revision of primary/initial capital requirements, there were widespread misgivings about the prescribed quantum for both foreign and local banks. There were fears that the minimum had been pitched too high for both local and foreign banks, and that this rule could discourage emergence of local banks, and discourage entry of foreign ones. As BOZ considers introducing specific figures for minimum initial capital for E-money institutions, it should balance the financial system security concerns with the developmental objective of promoting legitimate growth in the DFS. In particular, the capital requirements should not unduly discourage legitimate investments in DFS.

One of the misgivings about the current capitalisation rules for commercial banks in Zambia is the homogeneous categorisation of local banks for capitalisation rules. There is a single minimum capital requirement for local banks and another for foreign banks. Yet Zambia shows scope for small rural banks which need not have the same capital requirements as a large national or urban based banks. The capitalisation rule tends to promote a homogeneous pattern in commercial bank development, while segregated capitalisation rules could have helped to promote smaller viable banks for specific markets. In the determination of minimum initial capital requirements for E-money institutions, the BOZ will do well to recognize different categories of active players and potential players and set not one initial capital, but consider a regime of segregated initial capital requirements based on the needs of identified categories.

Another major risk in the financial sector is liquidity. The E-money institution should at all times have adequate liquidity to discharge its obligations. This is not just to protect the normal operations of the institutions, but also to safeguard the customer funds. Under Section 14 of the 2015 Rules, an E-money institution shall not issue E-money unless an equal amount of funds has just been deposited into the holding

Account. Under Section 17, the aggregate value of the holding Account shall at least equal the total outstanding e-money liabilities. Under the same section, customer funds in the holding Account shall be reconciled to outstanding e-money liabilities on a daily basis by the E-money institution. In terms of practical monitoring of these rules, the BOZ gets holding Account balances directly from commercial banks to confirm the data and reports from E-money institutions on monthly basis.

While the basic rules and the monitoring system of BOZ appear adequate to safeguard the customer's funds and to promote smooth operations, there are other rules aimed at promoting good practices by E-money institutions. These include compliance with Know Your Customer (KYC) requirements and the establishment of a customer support centre with mechanisms for resolving customer queries timely. While a certain amount of quality of services including pricing can safely be left in the competition arena, the BOZ takes some responsibility in ensuring good service delivery. The BOZ has engaged the E-money institutions and also ZICTA where collaboration with another regulator was considered necessary in ensuring quality services by e-money institutions.

So far the rules do not appear to stifle growth of DFS, while at the same time they appear to promote a safe and secure environment for the growth of DFS. However, there may be need to institutionalize coordination with other public regulators and private sector as the current informal relations are not predictable enough for the serious challenges of regulating financial innovations that are moving at high speed.

While Zambia has been developing its home-grown regulatory system for E-money, the BOZ has worked closely with the SADC Committee of Central Bank Governors. The Payment systems subcommittee of this Committee is already engaged in standardizing rules for E-money institutions for the region. As observed by the Stiglitz Commission (2010), there is greater need after the 2008 Global Financial Crisis for coordinated international approach to financial regulations. This is particularly so for regulations that focus on financial products driven by the rapid growth in Information Communications Technology. The SADC regional approach should be encouraged for regional stability. It should also be encouraged as a step towards further international collaboration.

6.5 CONCLUSION AND RECOMMENDATIONS

6.5.1 Summary of Findings

The aim of this paper was to examine the opportunities for MEFMI countries to develop financial regulatory regimes that can sustain financial system stability while being fully responsive and supportive to the rapid and steady growth of DFS and the competition which it brings to the financial sector. Driven by rapid technological changes, DFS are being adopted at high speed around the world, especially in Africa where DFS is often the only access to formal financial services. Therefore, Africa has particular interest in ensuring that DFS flourish at the pace of technological developments.

Our study shows that regulation is just a tool- a complex one though- that requires expertise and commitment to use effectively. The effectiveness of this tool depends on how it is used and managed. If not adjusted to reflect emerging trends in technologies and innovation, regulation can, indeed, retard progress and have negative consequences on the financial system as a whole; but if competently used it can help promote financial innovation and competition while also anchoring financial system stability. Specifically, this paper has found no evidence of financial regulations stifling DFS or the competition that it generates in the financial system. The Malawi and Zambia case studies brings out cases of the financial regulator working jointly with the ICT regulator to protect and encourage competition in DFS. The prospects of DFS growth are good under the current regulatory attitudes in the MEFMI region. This finding is consistent with the World Bank empirical findings from a cross country analysis of 35 countries' regulatory frameworks.

> *"…regulators can foster the development of mobile banking services through the enactment of supporting regulations…regulatory adequacy…. does not require having a detailed regulation of mobile banking, only a legal framework that does not impose restrictions to the development of mobile banking services…" Gutierrez, E and Singh, S (2013)*

As both regulation and innovation are needed for stable development of financial inclusion, the challenge for MEFMI governments is to ensure that the legal and regulatory environment is at all times conducive to the development of DFS. Regulation should also not suffocate innovation and competition which is seen here as a significant ingredient in well-functioning market economy. Indeed, where market structures tend to constrain competitive behaviour, the regulatory bodies can help promote competitive behaviour. The task of promoting and sustaining a conducive regulatory environment requires suitable institutional arrangements and effective coordination framework. Coordination is needed not only among public policymakers and regulatory bodies, but also with the private sector players. It also requires regular surveys of the financial landscape to promote evidence based strategies and plans related to regulatory reforms. Aided by a regional collaborative approach through forums such as the SADC Committee of Central Bank Governors and the MEFMI Governors Forum that promote regional standards and good

practices in financial regulations, MEFMI countries can respond effectively to the needs of DFS while also ensuring a stable financial system.

Recommendations

While the regulatory environment in the MEFMI countries appears responsive and supportive of DFS, significant challenges will continue to arise. If regulations are to remain responsive to the needs of DFS, the slow pace of legal reforms generally associated with African countries needs to change to the pace of technological developments that drive the pace of DFS. The following futuristic recommendations are thus drawn:

- Financial regulation and competition measures and indicators ought to recognise non-bank players.
- Regulatory reforms should be anchored on sound comprehensive national development strategy that includes a Financial Inclusion Strategy with measurable targets.
- In order to be abreast with the rapid pace of technological developments, there should be bi- annual comprehensive reviews of the legal and regulatory frameworks.
- There should be regular surveys of developments in the entire financial sector to enhance monitoring and planning activities.
- Coordination arrangements between regulators from all sectors should be institutionalised to promote effectiveness of interventions. This should include policy organs, relevant public regulatory organs and private sector players.
- Identified amendments to the legal and regulatory frameworks should be prioritised in implementation processes to support healthy growth in the financial sector
- Regional and international coordinated approach to financial regulation should be encouraged through active participation in international and regional networks like the SADC Committee of Central Bank Governors and the MEFMI Governors Forum.
- There is need for increased financial literacy to increase uptake of DFS and consumer rights.
- Regulations on liquidity should go beyond basic cover of liabilities, and promote availability of adequate liquidity at all points of service.
- No DFS product should be offered outside the financial regulatory framework.
- There is need to incorporate the DFS indicators in measuring financial sector competition.

Limitation of the study

The major limitation of this study is data availability of DFS, the narrow source of information on regulatory practices and developments and competition that allows for econometric analysis. For a study whose concluding observations and recommendations cover the entire MEFMI region, the use of data and information from only two MEFMI countries, Malawi and Zambia may appear too narrow for a

realistic generalization of findings to the entire MEFMI region. However, in the light of the regional collaborative approach to financial regulations we are confident that the developments in Malawi and Zambia give a fair enough picture of developments in the entire MEFMI region and set stage for further research.

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APPENDICES

Appendix 1: Brookings Financial and Digital Inclusion 2015 Scores[35]

Country	Country Commitment	Mobile capacity	Regulatory environment	Adoption	Total Score	Overall ranking
Sub-Saharan Africa						
Kenya	89	94	94	84	89	1
South Africa	89	100	78	69	80	2
Rwanda	100	94	94	49	75	4
Uganda	100	83	83	58	75	4
Nigeria	100	89	83	49	72	9
Tanzania	100	83	100	42	71	12
Zambia	100	89	83	42	69	14
Malawi	89	78	94	33	63	19
Ethiopia	72	61	72	36	54	21
Asia						
India	100	78	89	51	72	9
Indonesia	72	94	100	47	70	13
Philippines	94	89	89	40	68	15
Bangladesh	94	94	78	40	67	16
Pakistan	100	83	89	33	65	18
Afghanistan	56	94	83	33	58	20
Latin America						
Brazil	89	83	94	64	78	3
Chile	89	72	67	61	74	6
Colombia	89	94	89	53	74	6
Mexico	94	83	83	53	72	9
Peru	94	78	89	40	66	17
Europe						
Turkey	89	78	78	64	74	6

Source: (Villasenor, et al., 2015)

[35] Source: https://www.brookings.edu/wp-content/uploads/2016/06/fdip2015.pdf

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