

FINANCIAL SECTOR REFORMS AND PRIVATE INVESTMENT IN SUB-SAHARAN AFRICAN COUNTRIES

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Financial sector reforms have been undertaken by many countries in Sub-Saharan Africa and one of the key targets of these reforms has been investment. This study conducts an empirical investigation of the effect of financial sector reforms on private investment in selected Sub-Saharan African countries. An index is developed which tracks the gradual progress made with implementation of the phases of the reforms. The results of econometric estimations show that financial sector reforms (measured by the index) have had a positive effect on private investment in the selected countries, thus offering support to the financial liberalization hypothesis.

Keywords: Private Investment, Financial Sector Reforms, Sub-Saharan Africa
JEL classification: C23, E22, E44, O55

1. INTRODUCTION

Many countries in Sub-Saharan Africa (SSA) embarked upon series of financial sector reforms from the mid 1980s into the 1990s. The reforms were supposed to reduce government intervention in financial markets and reverse the ill-effects of the repressive policies embarked upon by SSA governments upon attaining political independence. The financial systems were characterized by heavy government intervention, including government's acquisition of existing banks or setting up new ones. There was also an active policy of keeping interest rates low, and directed credit allocation to priority sectors. These measures by the governments resulted in stifling of savings and granting of credit not based on commercial criteria, while the financial systems were generally hampered from developing, thereby preventing them from efficiently matching savers' funds with the most efficient users. The financial systems in SSA were also characterised by high intermediation costs, weak resource mobilisation, low and often negative real interest rates, and excessive government borrowing. They also had a large

* All errors are the responsibility of the author.

portfolio of unpaid loans. SSA countries experienced lower financial depth when compared with other regions.

It was in a bid to address these deficiencies in their financial systems that the governments initiated financial sector reforms. These reforms focused on abolishing of directed credit allocation, interest rate liberalization, bank restructuring and privatization, and strengthening of prudential regulation and supervision. These were expected to stimulate and accelerate economic growth, with investment acting as one of the main transmission mechanisms. It is expected that with the reforms, liberalized interest rates will encourage savings, and increased bank deposits will make more credit available for investment. Consequently, investment will increase and as financial intermediaries allocate resources to the most efficient investments economic growth will rise. Evidence of a strong positive relationship between economic growth and investment reported by studies on SSA tends to justify this optimism. These studies include Seck and El Nil (1993), Oshikoya (1994), Matsheka (1998), Calamitsis *et al.* (1999), Gyimah-Brempong and Traynor (1999), Asante (2000), Ndikumana (2000), and Hoeffler (2002). A major drawback of these studies is that none measured the gradual institutional changes involved with financial sector reforms. Rather, they focused on indicators such as the real interest rate thus neglecting other reform measures. Any analysis of financial sector reforms that does not take full account of this plethora of policies will not provide useful insight into how financial reforms have affected investment, and will suffer from omitted variable bias (Gibson and Tsakalatos, 1994, p. 596; Demetriades and Luintel, 1996, p. 366).

This paper is concerned with conducting an empirical analysis of the effects of financial sector reforms on private investment in SSA countries. The paper is important for a number of reasons. First, it improves upon previous empirical research by using a broad and more comprehensive data set on financial sector reforms. This is done by developing an index of the reforms, which takes into account the initial conditions at commencement of the reforms, and characterizes the sequencing of various reform measures. This index is then included in private investment equations to determine the effect of financial reforms on private investment and because we make use of this index of financial reforms, our results will provide a more robust analysis of the impact of financial reforms on private investment than earlier studies have done. Second, this study utilizes data for a broad set of SSA countries and thus tests for the robustness of earlier studies. While studies such as Hermes and Lensink (2005) have utilized such a liberalization index for a group of emerging market economies, it would be particularly insightful to separate SSA countries to see if the conclusions from such broad studies hold. This is because authors such as Jalilian and Kirkpatrick (2005) found that when countries are separated according to their regions, the effect of financial liberalization on macroeconomic variables weakens substantially. Third, many studies on investment have been criticized because of endogeneity of the regressors. We have taken account of such endogeneity concerns by using the system GMM estimator of Blundell and Bond (1998).

2. LITERATURE REVIEW

The theory of financial liberalization advocates the freeing up of financial markets to reverse the detrimental effects of financial repression. Financial repression is a regime consisting of the imposition of interest-rate ceilings, directed credit allocation policies, high reserve requirements, foreign exchange regulations, and heavy taxation of the financial sector. Financial repression keeps interest rates artificially low and investable funds are rationed based on non-market criteria such as political clout, friendship, loan size, and benefits accruable to bank officials. Such criteria result in low investment, and an inefficient allocation of funds between investment projects. Such financial repression was manifested in several countries in the form of ceilings on interest rates, directed credit to priority sectors, and a small number of banks which were mainly government owned and very inefficient.

Broadly speaking, financial liberalization encompasses those policies aimed at freeing financially “repressed” economies from the effects of such growth-retarding financial policies as noted above. Liberalization tends to reverse such policies, through interest rate deregulation, directed credit abolishment, bank restructuring and privatization, enhanced prudential regulation, and deepened supervision. With financial liberalization, it is expected that savings will become more attractive and increase, thereby making more credit available, and this will promote greater investment. It is also expected that reducing reserve requirements makes more loanable funds available to banks, and consequently, rate and level of investment can increase. Furthermore, the granting of more banking licences and the subsequent increase in competition will encourage banks to be more predisposed to providing better services, and this will attract more customers and investors. The removal of credit restrictions under financial liberalization policies will also increase the lending capabilities of banks.

Criticisms of the financial liberalization theory include the neostructuralists (van Wijnbergen, 1983; Taylor, 1983) who noted that financial liberalization can cause a decline in investment efficiency if it causes a shifting of resources from the formal to the informal financial sector. Informal financial markets are more efficient in allocating credit because they, unlike formal intermediaries, are not subject to reserve requirements which reduce the amount of credit provided by banks. This may mean they (informal intermediaries) can allocate credit more efficiently. Lensink (1996) notes that in SSA countries informal financial intermediaries do virtually all financing of investment projects and so liberalizing the formal financial markets will not really enhance credit allocation. On the contrary, it could cause a shifting of resources from the informal to formal markets and result in a fall in both the quantity and quality of investment.

We provide a brief overview of empirical studies of the relationship between investment and financial liberalization in SSA below.

Oshikoya (1992) investigated how interest rate deregulation has affected investment in Kenya over the period 1970-1989. The dependent variable is the private investment ratio, while explanatory variables are: the real economic growth rate, real deposit rate of

interest, changes in terms of trade, public investment ratio, inflation rate, and the lagged debt service ratio. The author found that the real rate of interest is significantly positively related to the private investment rate thus offering support to the financial liberalization hypothesis. The other variables – inflation rate, terms of trade, and external debt service payments have negative and significant coefficients. The coefficient on the public investment ratio is positive and significant, thus implying that public investment is complementary to private investment.

Dailami and Walton (1992) examined the behavior of private investment in Zimbabwe over the period 1970 to 1987. The dependent variable is private investment and the explanatory variables are: GNP growth, relative price of capital goods, the real interest rate, the real effective exchange rate, real wage, the lagged dependent variable, and the real UK government bond yield. The results showed that private investment is positively related to GNP growth, real interest rate, real effective exchange rate, and the lagged dependent variable, and negatively related to the government bond yield, relative price of capital goods, and real wage. These results support the financial liberalization hypothesis.

Seck and El Nil (1993) examined how financial liberalization has affected investment in Africa using data for twenty one countries over the period 1974 to 1989. The dependent variable is the ratio of gross investment to GDP. Explanatory variables are real deposit rate of interest, nominal deposit rate, inflation rate, current account ratio, and growth in the M2 ratio. The effect of the real rate of interest and growth in the M2 ratio are positive and significant thus implying that financial liberalization has improved investment in these African countries.

Oshikoya (1994) examined the determinants of private investment in eight African countries for the period 1970-1988. The results show that the growth rate of real GDP, the public investment ratio, and the availability of credit all have a positive impact on private investment. The debt service ratio has a negative effect on private investment.

Matsheka (1998) estimated an investment function for Botswana for the period 1976-1995. The dependent variable is the real level of domestic investment. Explanatory variables are the real deposit interest rate, real private sector credit, the lagged accelerator (past level of demand), a dummy variable for 1987/88 that captures the effect of the decline in investment. The results showed a positive and significant coefficient for private sector credit and the lagged accelerator, while other variables are insignificant.

Using a two-step Engle-Granger method, Jenkins (1998) estimated a model of private investment flows for Zimbabwe using annual data over the 1969-1990 period. The results show that in the long-run, gross profits have positive effects, while foreign capital inflows and the external debt-to-GDP ratio negatively affect private investment. In the short run, the availability of foreign exchange and the relative price of industrial output have positive effects, while the change in the relative cost of capital is negatively related to the cost of capital.

Moshi and Kilindo (1999) conducted an empirical study on the role of government policy on private investment in Tanzania using data over the period 1970-1992. The results of regression estimates showed a positive and significant relationship between

private investment and GDP growth, private sector credit, and public investment. The authors used another specification where public investment was split into central government investment and parastatal sector investment. The estimated results showed that all the variables were positive and statistically significant with the exception of central government investment which was significantly negative, thus providing evidence of crowding-out.

Ndikumana (2000) examined the financial determinants of domestic investment in Sub-Saharan Africa. The study employs panel data for thirty countries over the period 1970-1995. The results indicate a positive relationship between both total and private investment and 3 indicators of financial development, while credit to the public sector is negative and significantly related to investment. When control variables are included in the regressions, the results show that investment is negatively related to the debt service, debt stock, the black market premium, and inflation. Investment is positively related to per capita GDP growth and international trade flows. The author concludes that financial factors are important in determining domestic investment in Sub-Saharan Africa, and that strong financial development leads to high future investment levels, with private investment reacting more strongly than total investment.

Akpokodje's (2000) sought to explore the association between export earnings fluctuations and capital formation in Nigeria over the period 1960-1995. The explanatory variables were savings, output, and the rate of interest. The authors found a significant positive relationship between capital stock and savings and output. The interest rate was negative and statistically insignificant.

Asante's (2000) study sought to examine the determinants of private investment in Ghana over the period 1970-1992. The results showed that the variables that had a significant positive relationship with investment are: lagged investment, public investment, private sector credit, real interest rate, and real exchange rate. Trade, political instability, macroeconomic instability, and the growth rate of real GDP have had a negative relationship with private investment.

While these studies have attempted to empirically model the effects of financial liberalization on investment in African countries, they have a major drawback which is that none measured the gradual institutional changes involved with financial sector reforms. Rather, they focused on indicators such as the real interest rate thus neglecting other reform measures. Any analysis of financial sector reforms that does not take full account of this plethora of policies will not provide useful insight into how financial reforms have affected investment, and will suffer from omitted variable bias (Gibson and Tsakalatos, 1994, p. 596; Demetriades and Luintel, 1996, p. 366). This study improves on these previous studies by using a broad and more comprehensive data set on financial sector reforms. This is done by developing an index of the reforms, which takes into account the initial conditions at commencement of the reforms, and characterizes the sequencing of various reform measures. Thus, our results will provide a more robust analysis of the impact of financial reforms on private investment than earlier studies have done.

3. CONSTRUCTION OF FINANCIAL REFORMS INDEX

Increasing emphasis is being placed on the fact that variables such as the real interest rate or credit provided by banks to the private sector cannot adequately measure the variety of financial reforms embarked upon by different countries since the mid-1980s. Consequently, different studies have adopted a variety of measures in developing indexes that track the different reforms and the varying start dates of different reform measures (Bandiera *et al.*, 2000; Laeven, 2000; Bekaert *et al.*, 2001; Arestis *et al.*, 2002; Abiad and Mody, 2005; Abiad *et al.*, 2008; Fowowe, 2008). In this study we follow Abiad and Mody (2005) in developing an index of financial reforms which measures the progression made with different financial reforms. Abiad and Mody (2005) identified six different dimensions of financial reforms and each dimension has a scale which ranges from 0 to 3. The liberalization measure will have a value of 0 for years in which the financial sector is fully repressed, this will increase to 1 if the sector is partially liberalized, 2 if the sector is largely liberalized, and 3 if the sector is fully liberalized. Thus each liberalization measure can take on values between 0 and 3.¹ This grading is adopted for our financial reform index.²

We have identified five financial reform measures which are: bank de-nationalisation and restructuring, interest rate deregulation, abolishing of direct allocation of credit, removal of entry restrictions into banking, and strengthening prudential regulation and supervision. We then allocate to each of these measures a value of 0 before the specific reform measure is embarked upon. Each measure then takes on higher values ranging from 1 which corresponds to partial reforms, to 2 for a largely liberalized sector, and finally 3 for a fully liberalized financial sector. This produces a matrix of 5 variables corresponding to each financial reform measure with each reform measure having a value ranging from 0 to 3 depending on the progress made with reforms.

Different methods can be used to obtain a summary index of financial reforms and these range from adding up all reform measures in any given year with the resulting sum giving an index of financial reforms (Laeven, 2000). Other measures include using principal components analysis to obtain a summary measure of financial reform (Bandiera *et al.*, 2000) and some authors vary the use of principal components by multiplying the eigenvectors of the first component with each reform measure (Shrestha and Chowdury, 2006).

This study makes use of the method of Laeven (2000) where we sum all reform

¹ Shrestha and Chowdury (2006) used a different scale from 0 for full repression, 0.33 for partly liberalized, 0.66 for largely liberalized and 1 for fully liberalized. We explored this method as well and the index obtained was similar to the index presented here.

² We also identified the cases of policy reversals and these involved a movement to a lower score depending on the severity of the reversal.

measures in any given year to obtain an index of financial reforms (FINDEX1).³ The indexes obtained for the different countries are shown in Figures 1 to 3 and we can observe some interesting features of financial reforms in these SSA countries.⁴ Firstly, it is seen that the countries proceeded with reforms at different speeds with some countries such as Ghana, Gambia, Senegal and Madagascar progressing rapidly with most reforms while some countries such as Mauritius, Cameroon, Kenya and Zimbabwe adopted a gradual approach to reform of their financial sector. The sequencing of reforms has been a hot topic for debate in the aftermath of financial sector reforms with many authors arguing for a gradual sequencing of reforms of the financial sector. It can also be seen from these figures that some countries such as Ghana, Mauritius, Senegal and South Africa embarked on full liberalization of the reform measures, while some others such as Cameroon and Malawi only partially liberalized their financial sectors. This brings into focus a key feature of financial reforms carried out in many SSA countries which is the varying degrees of commitment and willingness of the authorities, coupled with different levels of initial success with reforms which to a large extent influenced progress made with financial reforms.

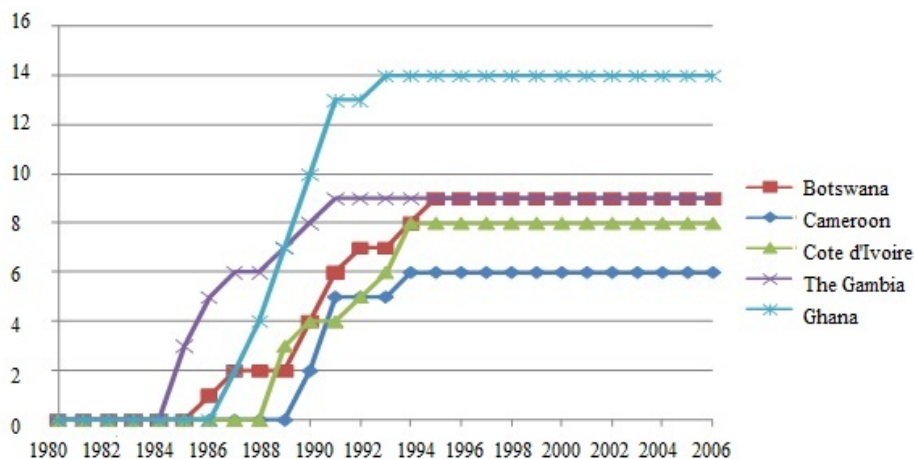


Figure 1. Financial Reform Index in Botswana, Cameroon, Cote d'Ivoire, Gambia, Ghana

³ We also used the other two techniques of Bandiera *et al.* (2000) and Shrestha and Chowdury (2006) for computing different indexes and the results do not change much from those obtained using the method of Laeven (2000), as shown in section 5.3

⁴ The study makes use of data for 14 countries which have been selected based on availability of data on financial sector reforms and they are: Botswana, Cameroon, Cote d'Ivoire, The Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Senegal, South Africa, Uganda, and Zimbabwe.

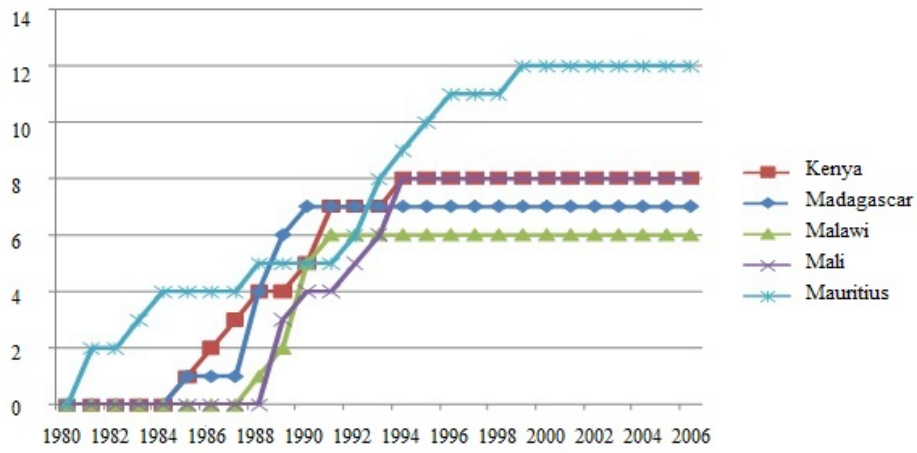


Figure 2. Financial Reform Index in Kenya, Madagascar, Malawi, Mali, Mauritius

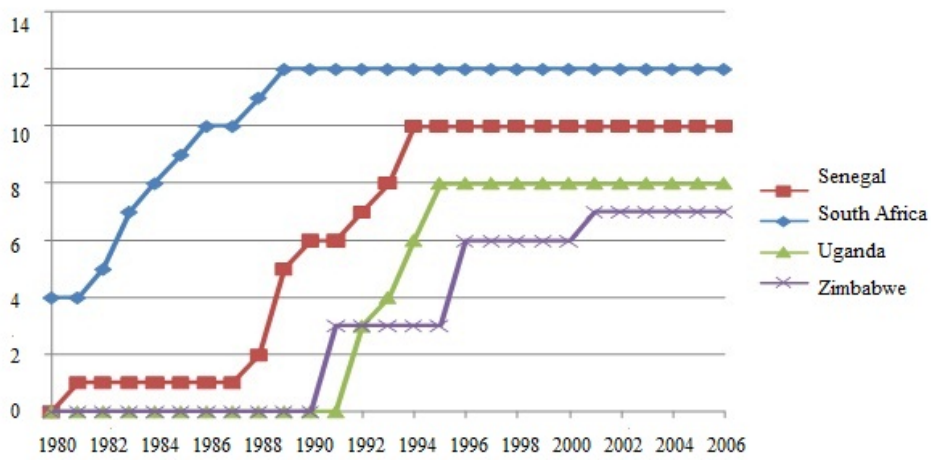


Figure 3. Financial Reform Index in Senegal, South Africa, Uganda, Zimbabwe

4. DATA AND METHODOLOGY

4.1. Model Specification

The primary aim of this study is to examine the effect of financial reforms on private investment in selected SSA countries. Consequently, the primary variable of interest is the index which is developed to measure different financial reforms. Similar to other studies (Asante, 2000) we include other variables in the private investment equation based on the accelerator theory and uncertainty variables.

Financial reforms are measured using the index of financial reforms (FINDEX1) developed in the previous section. The inclusion of this variable in a model of investment is premised on the financial liberalization hypothesis which postulates that liberalization reverses the ill effects of financial repression and stimulates savings and investment. The theory therefore predicts a positive effect of financial sector reforms on investment. If financial reforms have succeeded in improving private investment, this index (FINDEX1) should have a positive coefficient.

Output growth has been the most consistent and significant determinant of investment found by other studies. The accelerator theory makes investment a function of changes in output. In this theory, planned investment is seen as brought about by changes in demand, and so changes in aggregate demand for consumer goods will cause changes in demand for capital goods. The flexible accelerator theory is based on the assumption that there is a fixed relationship between the level of output and the desired capital stock in the economy. Then investment is a linear function of changes in output. Thus, if national income is growing, investment will also grow; and a fall in national income will also cause a fall in investment. We measure output growth by the growth in real GDP.

Public investment is included in our model and it highlights the importance of the government providing a conducive environment for investment to take place. The relationship between private and public investment is theoretically ambiguous. An increase in public investment can have either a positive or negative effect on private investment. On the one hand, public investment can raise private investment in a situation where resources are not fully employed. In such a case, income would increase following an increase in public investment and this increased income would send positive signals to private investors that they can increase their profit margins by investing more. On the other hand, however, public investment will be a substitute for private investment if it is financed through inflation or debt issues. Public investment can also be detrimental to private investment if the goods produced by the public sector compete directly with private sector produced goods. Thus, this crowding out of private investment by public investment makes them substitutes. The exact relationship between private and public investment can only be ascertained empirically.

The irreversible nature of investment and its relationship with macroeconomic uncertainty has attracted considerable attention in the literature in recent years

(Aizenmann and Marion, 1993; Serven, 1997, 1998). Because investment is irreversible, investors watch out for signs of uncertainty in the macroeconomic environment and if they perceive that the economy is too volatile or dangerous for investment, they will desist from investment. Inflation volatility is included to take account of macroeconomic uncertainty. High rates of inflation send out a signal that the government is unable to manage the economy properly and is a sign of instability. There is also the possibility that the actions of the government in attempting to control inflation through contractionary policies might depress demand and this would result in a fall in investment. High and unpredictable inflation rates can be portrayed by investors as a sign that the government is losing control of the economy and thus discourage investor confidence. We measure the volatility of inflation in each year with a 3-year rolling standard deviation of the inflation rate (Serven, 1997; Bo, 2006; Veiga and Aisen, 2006).

Following from the above discussion we arrive at a model of the quantity of private investment given below:

$$\begin{aligned} PRIVATE_t = & \alpha_0 + \alpha_1 FINDEX1_{it} + \alpha_2 GDPGROW_t \\ & + \alpha_3 PUBLIC_t + \alpha_4 VOLINFL_t + \varepsilon, \end{aligned} \quad (1)$$

where PRIVATE=ratio of gross private investment to GDP, FINDEX1=index of financial reforms, GDPGROW=growth rate of GDP, PUBLIC=ratio of gross public investment to GDP, VOLINFL=volatility of inflation.

4.2. Estimation Procedure and Data

In order to exploit the time series and cross section dimension of our data set, panel data has been used to estimate Equation (1). Panel data have been proposed as a better econometric technique for use in cross-country regressions because it allows for the inclusion of country-specific and because it exploits the time series dimension of the data thereby giving greater degrees of freedom. We will make use of the fixed effects estimator which allows us to model the unobserved country specific effects as fixed parameters to be estimated. To control for potential endogeneity bias we will make use of the system GMM estimator as proposed by Blundell and Bond (1998). Endogeneity can arise due to the propositions of the crises-reform hypothesis where adverse economic conditions bring about reforms (Drazen and Easterly, 2001). It would then be useful to control for reverse causation in this investment model which might run from adverse investment performance to induce financial reforms.

We have an unbalanced panel data ranging from 1980 to 2006. The sample period has been selected based on data availability and data sources are African Development Indicators CD-ROM 2008/09, World Development Indicators CD-ROM 2008, and International Financial Statistics CD-ROM 2007.

5. DISCUSSION OF RESULTS

5.1. Baseline Specification

We have first presented average values of private investment before and after financial liberalization in Table 1. It is seen from this table that investment increased after liberalization in most of the countries under study. Specifically, investment increased in 10 countries which are: Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Senegal, Uganda and Zimbabwe; while it fell in 4 countries: Botswana, Cameroon, Cote d'Ivoire and South Africa. This suggests that broadly speaking, financial liberalization has improved private investment in SSA countries. The rate of change of investment after liberalization varied in different countries. In some countries such as Cameroon, Kenya, Malawi and Zimbabwe, investment changed by less than a percentage point while the rate of change was higher in some other countries such as Botswana, Gambia and Ghana where investment changed by over 5 percentage points after liberalization. The table also shows that most of the countries in which investment changed by a higher percentage actually witnessed an increase in investment, thus supporting the earlier observation that the cursory examination of the data suggests that financial liberalization has improved private investment in the countries under study.

Table 1. Average Investment Ratios Before and After Liberalization

Country	Average Private Investment Pre-Liberalization (%)	Average Private Investment Post-Liberalization (%)
Botswana	19.15	14.10
Cameroon	14.17	13.36
Cote d'Ivoire	9.04	6.72
Gambia	6.79	12.36
Ghana	3.92	10.05
Kenya	10.74	11.70
Madagascar	4.05	8.74
Malawi	7.04	7.07
Mali	9.39	13.78
Mauritius	15.10	18.38
Senegal	13.79	16.19
South Africa	19.52	14.76
Uganda	5.31	11.58
Zimbabwe	13.96	14.75

The results of estimating the private investment equations are presented in Table 2 and it can be seen that the coefficient on the financial reform index (FINDEX1) is significant positive. The implication of this is that the financial sector reforms have had

a positive effect on private investment. The fixed effects estimates show that financial reforms have increased private investment by 0.2 percentage points. The dynamic GMM result, with a coefficient of 0.52, indicates a slightly higher effect of financial reforms on private investment. These findings are similar to results obtained by other studies who found that financial reforms have contributed to improving private investment. Hermes and Lensink (2005) obtained a significantly positive coefficient of 0.3 for their index of financial liberalization using data for 25 emerging economies. Ang (2009) found that financial repressive policies such as directed credit programmes and high reserve and liquidity requirements had a negative effect on private investment in India, thus implying that financial liberalization would help in reversing these effects and help to stimulate investment. These results find theoretical support from the financial liberalization hypothesis where the implementation of various financial reforms such as interest rate deregulation and strengthening of prudential regulation leads to increased savings, thereby making more credit available, and this will consequently lead to an increase in investment. Furthermore, financial reforms also include reduction or elimination of directed credit requirements and this makes more loanable funds available to banks and consequently, investment can increase after liberalization. In addition to this, Nagano (2005) found that investment from external sources is low in the developing economies of East Asia. This is attributed to relatively low development of financial markets in these countries and our results show that if financial markets are liberalised, this enhances the development of financial markets and consequently, private investment increases.

The results in Table 2 show that private and public investments have had a negative relationship in these SSA countries. The GMM coefficient of public investment implies that a percentage point increase in public investment is associated with a reduction in private investment of 0.26 percentage points. This result would suggest that private and public investment, rather than being complements are substitutes. This confirms the findings of Looney and Frederiken (1997) who found that in Pakistan, public investment crowds out private investment in non-manufacturing and small-scale manufacturing activities. For large-scale manufacturing activities, public investment on rural works, post offices and rail-roads had a marginal effect in promoting private investment while it was only public investment in energy that significantly stimulated private investment. Our results have important implications for these SSA countries because it shows that the public investments of various governments have not provided a suitable environment for private investment. This calls for a re-thinking and redirection of future public investment if these countries are to achieve faster growth rates since evidence suggests that private investment has improved economic growth more than public investment (Khan and Reinhart, 1990; Khan and Kumar, 1997; Calamitsis *et al.*, 1999).

Table 2. Panel Estimates of Private Investment Equation

Variable	Fixed Effects	SYS-GMM
Constant	10.93 (14.32)***	10.79 (5.55)***
Findex1	0.21 (3.86)***	0.52 (2.14)**
Ygrow	0.17 (3.45)***	0.14 (1.81)*
Public	-0.06 (-0.72)	-0.26 (-2.03)*
Volinfl	-0.03 (-2.06)**	-0.02 (-1.26)
Diagnostic Tests		
Sargan Test		[0.514]
Second Order Serial Correlation Test		[0.231]
Number of Countries	14	14
Number of Observations	360	360

Notes: Dependent variable is the ratio of private investment to GDP. Figures in parentheses are t-ratios and figures in square brackets are p-values. All coefficients have been rounded to two decimal places. * indicates that a coefficient is significant at the 10% level, ** significant at the 5% level, and *** significant at the 1% level. T-ratios are from Windmeijer corrected standard errors.

The negative effects of macroeconomic uncertainty on private investment are supported in Table 2 where we find an inverse relationship between private investment and inflation volatility. This is similar to the results of other studies such as Greene and Villanueva (1991), Bleaney and Greenaway (1993) who found that inflation has a negative effect on investment and this highlights the importance of a stable macroeconomic environment to attract investment. In the fixed effects estimation the coefficient of output growth is significantly positive, and this supports the accelerator theory. Our results agree with most other studies in which output growth has been the most consistent and significant determinant of investment. The coefficient on growth in the fixed effects estimation is 0.17 and this implies that an increase in output growth by 10 percentage points will lead to an increase in investment of 1.7 percentage points. This implies that holding other factors constant, output would have to grow by a very large proportion before sufficient investment can be attracted. Specifically, an average economy in SSA would have to grow from say, 5% to 15% to stimulate an increase in investment from say, 2% to 3.7%.

5.2. Robustness Checks with Alternative Estimators

We have conducted a number of alternative estimations to test the robustness of our results. Firstly, we estimated Equation (1) using a least squares and random effects

estimator and the results are presented in Table 3. The results from Table 3 are consistent with those from Table 2 and we find that financial reforms, irrespective of the estimation technique employed have had a positive effect on private investment. Both the least squares and random effects coefficient on the financial reform index are 0.21, which is the same as the one obtained with the fixed effects estimator. These results further corroborate the conclusions from Table 2 that financial reforms in these SSA countries have improved private investment. The results for the other coefficients in Table 3 agree with those from Table 2. We still have a positive relationship between investment and output growth, thus supporting the accelerator theory. Also, both public investment and inflation volatility have negative coefficients, thus corroborating the findings obtained from Table 2.

Table 3. Alternative Estimates of Private Investment Equation

Variable	OLS	Random Effects
Constant	12.55 (17.55)***	11.08 (10.9)***
Findex1	0.21 (3.41)***	0.21 (3.81)***
Ygrow	0.29 (5.00)***	0.18 (3.57)***
Public	-0.35 (-4.75)***	-0.09 (-1.19)
Volinfl	-0.04 (-2.28)**	-0.03 (-2.11)**
Number of Countries	14	14
Number of Observations	360	360

Notes: Dependent variable is the ratio of private investment to GDP. Figures in parentheses are t-ratios and figures in square brackets are p-values. All coefficients have been rounded to two decimal places. * indicates that a coefficient is significant at the 10% level, ** significant at the 5% level, and *** significant at the 1% level. T-ratios are from Windmeijer corrected standard errors.

5.3. Robustness Checks with Alternative Indexes of Financial Reforms

As was mentioned previously there are different methods of deriving a summary index of financial reforms and our analysis above has relied on one of such methods in arriving at the index of financial reform (FINDEX1). In this section we derive 2 other indexes of financial reforms using different methods and include these indexes in investment equations. To derive the first alternative index we follow Bandiera *et al.* (2000) in using principal components analysis and the index of financial reforms is the value of the first principal component which is denoted by (FINDEX2). For all countries the first principal component explains over 75 percent of the variation. The second

alternative index is also derived using principal components analysis but in this case we follow Shrestha and Chowdury (2006) in multiplying the first eigenvector by each financial reform measure and adding for all reforms. The index computed using this method is denoted by FINDEX3. When these indexes are separately included in investment equations the results are presented in Table 4.

Table 4. Alternative Estimates of Private Investment Equation

Variable	Fixed Effects	SYS-GMM	Fixed Effects	SYS-GMM
Constant	11.96 (18.18)***	12.98 (8.62)***	10.98 (14.4)***	10.89 (5.73)***
Findex2	0.36 (3.27)***	1.28 (2.54)**		
Findex3			0.43 (3.76)***	1.08 (2.11)**
Ygrow	0.17 (3.4)***	0.15 (1.97)*	0.17 (3.43)***	0.14 (1.82)*
Public	-0.05 (-0.59)	-0.25 (-1.98)*	-0.06 (-0.72)	-0.27 (-2.08)*
Volinfl	-0.03 (-2.29)**	-0.04 (-2.36)**	-0.03 (-2.04)	-0.02 (-1.23)
Diagnostic Tests				
Second Order Serial Correlation Test		[0.252]		[0.502]
Number of Countries	14	14	14	14
Number of Observations	360	360	360	360

Notes: Dependent variable is the ratio of private investment to GDP. Figures in parentheses are t-ratios and figures in square brackets are p-values. All coefficients have been rounded to two decimal places. * indicates that a coefficient is significant at the 10% level, ** significant at the 5% level, and *** significant at the 1% level. T-ratios are from Windmeijer corrected standard errors.

It can be seen from Table 4 that the results from Table 2 are robust with respect to alternative financial reform indexes. The coefficients of the 2 alternative reform indexes (FINDEX2 and FINDEX3) are still significantly positive and the conclusion that financial reforms have led to improved private investment can still be upheld despite the use of different indexes of financial reforms. For the second index (FINDEX2), the fixed effects estimate is 0.36 while the system GMM coefficient is 1.28 while corresponding estimates for the third index are 0.43 and 1.08. It is evident from the foregoing that financial sector reforms have had the desired effect on private investment, that is, they have had a positive effect on private investment.

For the other variables in the model the results are still similar to those obtained from Table 2 where output growth is positively related to private investment and both public

investment and inflation volatility have had a negative effect with private investment.

6. CONCLUSION

Many countries in Sub-Saharan Africa (SSA) embarked upon series of financial sector reforms from the mid 1980s into the 1990s. These reforms focused on abolishing of directed credit allocation, interest rate liberalization, bank restructuring and privatization, and strengthening of prudential regulation and supervision. It is expected that with the reforms, liberalized interest rates will encourage savings, and increased bank deposits will make more credit available for investment. This study improved upon previous empirical research by developing a broad and more comprehensive data set on financial sector reforms which was then included in private investment equations to determine the effect of financial reforms on private investment.

The results of econometric estimations showed that private investment has had a positive relationship with financial sector reforms in SSA. This finding was robust to different estimation techniques and alternative indexes of financial sector reforms. These results confirm the financial liberalization hypothesis which advocates financial reforms to stimulate investment. The results also showed that private and public investment, rather than being complements are substitutes in the selected SSA countries. The accelerator theory is supported with the finding of a positive coefficient for output growth and also, the negative effects of macroeconomic uncertainty on private investment are supported as we find an inverse relationship between private investment and inflation volatility.

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Received April 28, 2011, Revised August 24, 2011, Accepted September 8, 2011.