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Savings-investment-financial development trilogy: evidence from SSA

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Abstract

Purpose – The study seeks to examine the role of financial development (FD) in the Feldstein–Horioka (FH) puzzle. The novelty of this study is based on the fact that the measures of FD are expanded to account for the qualitative nature of the financial sector ("better finance").

Design/methodology/approach – The study used annual dataset for 37 countries in sub-Saharan Africa (SSA) for the period 1999 through 2010 and relied on the system generalised method of moments (GMM) technique, which takes accounts of endogeneity-related issues.

Findings – The estimated FH coefficients ranged between 0.419 and 0.720. The qualitative measures of FD have higher FH coefficient relative to the traditional or quantitative measure of FD ("more finance"). Hence, improvement in both the quantity and quality of the financial sector might be helpful in the mobilization, distribution and utilization of savings for investment purposes within these economies. The high FH coefficients obtained suggest that the FH puzzle does not hold in the SSA region.

Practical implications – Policymakers should formulate and design policies that would seek to ensure the development of the financial sector both in terms of quantity and quality. While taking this into consideration, special attention should be devoted to the qualitative measure of finance.

Originality/value – The study extends the work of Adeniyi and Egwaikhide (2013) by providing different and, possibly better proxies for FD to capture the efficiency and the qualitative nature of the financial system. This crux of the study serves as the value addition to the literature, as no other study the authors are aware of, has considered the importance of "better finance" indicators in the saving – investment nexus investigation.

Keywords Banks, Financial markets and the macroeconomy, International finance, Econometric modeling

Paper type Research paper

1. Introduction

The extent of the contagion effect of the global financial crisis of 2008-2009 clearly demonstrated the degree of integration of the global capital and financial markets. The rapidity of global capital mobility was distinctly manifested during this period. There was a widespread tumult and subsequent massive sell-off of stocks, leading to comatose of the global financial markets. In an integrated world, capital is expected to seek financial hubs with relatively higher returns. The industrialized economies are most likely to experience such capital inflows because of the less restrictive regulatory environment. Hence, investment in the industrialized economies should naturally be financed by capital from abroad. In other words, association between savings and investment in the economies should be dampened because of the potentials to attract capital.

JEL classification – C23, D73, F12, H5

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This relationship, between domestic savings and investment, was investigated by Feldstein and Horioka (1980) (FH), using a cross-sectional data of 16 Organization for Economic Cooperation and Development (OECD) countries between 1960 and 1974. FH posited that savings and investment would be perfectly correlated in a closed economy but should not be related in an interconnected global economy, as the savings could look for financial hubs with higher returns. In contrast to this, the FH result suggests that nearly all domestic savings was used to finance domestic investment and, thus, implying low capital mobility. Indeed, the correlation between savings and investment otherwise referred to as "retention coefficient" was closer to unity and, hence, the puzzle. In other words, as the economy could attract capital from abroad, why was investment financed almost entirely by domestic savings?

There have been several attempts by different studies to investigate this puzzle. The attempts can be viewed from three perspectives. First, different econometric approaches have been applied (Adedeji and Thornton, 2006; Bangake and Eggoh, 2010; Charpentier *et al.*, 2015; Henrickson and Herzog, 2015). This is with the goal of ascertaining that methods of analysis could be the cause for the existence of the puzzle. Second, sample splitting (threshold effect) has also been done by several authors (Fouquau *et al.*, 2008). Third, several variables have been included in the investigation. It can be stated that efforts in the first strand led to a general conclusion of affirming the FH's submission, despite using different estimation techniques. Hence, we opine that estimation technique is not a really a good means to solve the puzzle. As for the second strand, little has been done in terms of estimating the threshold effect of the relationship between savings and investment. Even though, there is a valid theoretical justification for the threshold effect, it is puzzling why studies, inclusive of this present effort have not made an attempt to fill this perceived gap. Substantial empirical studies have pursued the investigation in line with the spirit of the third strand. It should be noted that this aspect of the literature has dominated the FH-puzzle discourse. This present study takes a cue from the third tranche of the literature.

Specifically, we seek to enquire the role of financial development (FD) in the savings-investment nexus. The importance of FD in accelerating economic growth and development has been identified based on both theoretical and empirical approaches[1]. As savings and investment have been theoretically argued to be good determinants of growth, it can then be hypothesized that FD would have a gratifying influence on both savings and investment. Among the functions of FD that are related to savings and investment include the production of *ex ante* information about possible investments and capital allocation; monitoring of investments and provision of corporate governance after providing finance; facilitation of trading, diversification and management of risk; mobilization and pool savings; and easing of the exchange of goods and services (Demirgüç-Kunt, 2008; Raheem and Oyinlola, 2015).

FD describes the depth of the financial structure in an economy which is mainly comprised money and capital markets. The commonly used indicators or proxies of the money market are private sector credit; liquidity liabilities (M3); and the credit provided by the banking sector. As for the capital market indicators, stock market capitalization, stock traded value and stock market turnover ratio are the generally used indicators. These indicators are known as the traditional or quantitative measures of FD. As a large literature has confirmed the positive association between FD and growth, the traditional indicators could be termed as "more finance, more growth" or the quantitative measures of FD, a coinage that is attributed to Law *et al.* (2013) and Bettin and Zazzaro (2009).

Until recently, the common practice found in the existing studies was to rely on the traditional indicators. Despite the prominence of these indicators and accolades received

over the years, they can be faulted on two grounds. First, the recent global financial crisis had showcased the possibility that malfunctioning financial systems directly or indirectly waste resources, discourage savings and encourage speculation. This results in decline in investment and misallocation of scarce resources (Law *et al.*, 2013; Law and Singh, 2014). This being the case, the essential functions of the financial system and the financial intermediary would be altered.

Second, there are also arguments on the quality of finance, which distinguishes the size of a financial system from the efficiency of the system. The conventional measure of FD often captures the size of the system without reflecting on the efficiency aspect of the system. Arestis and Demetriades (1996) and Demetriades and Andrianova (2004) expressed the view that varying connections may reflect dissimilarities in the quality of finance, which is determined by the quality of financial regulation and rule of law. This claim has also been backed up by Law *et al.* (2013) and Law and Singh (2014), who argued in their papers that institutional quality matters for the efficiency of the system. In addition, Cooray (2012) had argued that efficiency of the financial sector is a "better" measure than the size of the sector. Bettin and Zazzaro (2009) and Raheem (2015a) also opined that the qualitative measure of FD (efficiency) would be able to capture satisfactorily the microeconomic efficiency of banks, a fundamental characteristic that the quantitative approach lacks. By implication, the relationship between efficiency of a financial sector and the economic growth can, therefore, be described as "better finance, more growth" in the thinking of Law and Singh (2014). In the same spirit, there is a need to understand the role of the quality of finance if the choice of "more finance" or "better finance" measures matters in the investigation of the "mother of all puzzle"[2].

The objective of the study is to examine the role of FD in the FH puzzle investigation. The contribution of this study to the literature is hinged on the introduction of alternative proxies for FD, whose aim would be to satisfy the efficiency and the qualitative nature of the financial system. This crux of the study serves as the value addition to the literature, as no study that we are aware of, has considered the importance of "better finance" indicators in the savings-investment nexus investigation in SSA.

Following the introductory section, the rest of the paper is structured as follows: Section 2 dwells on literature reviewwe present methodology, data-related issues and the empirical results of the estimated models in Sections 3 and 4, respectively, while Section 5 highlights the concluding remarks and policy implication of the study.

2. Brief literature review

Empirical investigations into the savings-investment relationship, otherwiseknown, as the Feldstein–Horioka (FH) puzzle, is enormous. The euphoria the puzzle generated has led to the coinage of "Mother of all Puzzles" by Obstfeld and Rogoff (2000). In this section, an attempt to review existing studies is in threefold. The first could be tagged "old literature". The literature herein, coincidentally, surveyed related articles. We termed the second strata "relatively newer literature". This review focuses on subsequent studies that investigated the puzzle, especially in the new millennium. The last strand dwells on the importance of FD in the savings-investment nexus.

Starting with the first, a number of studies have made efforts to properly document the findings through a detailed literature survey. Lap (1996) and Coakley *et al.* (1998) are good examples in this regard[3]. Lap (1996) provided a selective survey of the literature on the FH paradox. The observed high correlation between national savings and domestic investment emerges as a robust empirical regularity. If this regularity is to be attributed to low-capital mobility (due to government interventions or market imperfections) or other factors (such as

immobility of goods, shocks or inter-temporal budget constraints), then the puzzle cannot be resolved. Similarly, Coakley *et al.* (1998) queried the FH puzzle that a high savings-investment association across OECD countries implied low-capital mobility. This posed an uncomfortable puzzle, as the conventional wisdom in most exchange rate and open-economy macroeconomic models was that capital mobility was high. They submitted that in the face of a variety of replications, the FH result of a high cross-section association between savings and investment rates in OECD countries has remained remarkably robust. The debate over whether savings-investment co-movements are informative about capital mobility is still unresolved, although the sceptics appear to be in the dominance.

Shifting our focal search into the second strand, preponderant of recent studies performed a cross-section estimation of the relationship between domestic savings and investment for different time periods (Tsoukis and Alyousha, 2001; Coakley *et al.*, 2004; Fouquau *et al.*, 2008; Bebczuk and Schmidt-Hebbel, 2010; Petreska and Mojsoska-Blazevski, 2013; Katsimi and Zoega, 2015).

Tsoukis and Alyousha (2001) reviewed the approach to the measurement of the degree of international capital mobility by the size of the savings-investment correlation for a sample of seven industrialized economies using quarterly data at different periods from the post-war, the 1980s and the 1990s. The causality results indicated a unidirection from savings to investment in six countries; however, it runs from investment to savings for Germany. The paper submitted that there was evidence of increased international financial market integration post-1980.

Coakley *et al.* (2004) reconsidered the FH puzzle in a nonstationary panel framework for a finite sample of 12 OECD economies 1980I-2000IV. They used a mean group procedure, which produced a slope coefficient estimate that was insignificantly different from zero. The study supports long-run capital mobility and the globalization of international financial markets despite persistence in the current account.

Fouquau *et al.* (2008) estimated country-specific and time-specific savings retention coefficients for 24 OECD countries and examined the influence of five factors on Feldstein and Horioka outcome of a high savings-investment association over 1960-2000. The panel threshold regression results show that degrees of openness, country sizes and ratios of current account to GDP have the greatest influence on investment and savings relationship.

Bebczuk and Schmidt-Hebbel (2010) worked on a sample of OECD countries spanning the period 1970-2003 by estimating the FH coefficients at the households, corporations and government institutional sector level. They also examined the asymmetry between current account deficits and surpluses while using advanced panel data techniques to deal with endogeneity and to distinguish long- and short-run effects. They concluded that the national FH coefficient is in the vicinity of 0.5, but sectorial coefficients are much lower, a puzzling result possibly explained by endogenous intersectoral savings and investment links. In addition, the FH coefficients are higher in deficit than in surplus years, while the long-run relationship is in all cases below 1, which raises the question as to whether the inter-temporal budget constraint should be interpreted.

Petreska and Mojsoska-Blazevski (2013) used the panel cointegration econometric technique to investigate the existence of the Feldstein and Horioka puzzle in transition countries, which are divided into three groups of countries: South-East Europe (SEE), Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS). The existence of the puzzle was confirmed in the three panels, but the connection between savings and investment was generally lower than the unity. The savings retention coefficient increased for a sub-sample composed of the larger and richer countries.

Katsimi and Zoega (2015) estimated the FH equation for a sample of 30 OECD countries for the period 1960-2012. Structural breaks that coincide with the introduction of the European single market in 1993, the introduction of the euro in 1999 and the financial crisis in 2008 were found. The results suggest that the correlation between investment and savings depends on institutions, exchange rate risk and credit risk. The enquiry further found that the pattern of capital flows within the euro zone reflect differences in output per capita, the rate of growth of output per capita and budget balances.

Fan and Mohtadi (2014) made an attempt to resolve the long standing FH puzzle. The properties of capital mobility were studied dynamically, and the coefficient was re-estimated using a time-varying-parameter model for each of 67 countries from 1970 to 2009. The trend of the FH coefficient is found to be highly consistent with increased global financial integration. They concluded that the FH coefficient contains information not only about capital mobility, but also about the capital market imperfection. Using capital market openness index by Chinn and Ito (2008), the findings showed that financial market imperfections influence the viability of FH coefficient in measuring capital mobility. They submitted that the FH coefficient is more likely to reveal information about international capital mobility only in deregulated financial markets across countries.

An example of a country-specific study was that of Trunin and Zubarev (2013), who tested the hypothesis of capital mobility reduction in the wake of the global financial crisis of 2008-2009 through the estimation of correlation between savings and investment in Russia. An increase in correlation between savings and investment was observed from 2007 to 2011. This suggested that the financing of domestic investments was primarily from internal sources in Russia.

In the study by Payne and Kumazawa (2006), the FH puzzle was examined for a sample of 47 developing countries for the period 1980-2003. A comparison of the FH cross-section estimator results with the outcome obtained from a mean group estimator, allowing for the cross-section dependence and permanent shocks to the current account was made. The mean group estimator results indicate higher capital mobility with a savings coefficient of 0.36, 25 per cent lower than the estimates based on the cross-section estimator, for the whole sample with little variation across sub-regions.

In another paper focusing on developing countries, Adeniyi and Egwaikhide (2013) examined the FH puzzle using a sample of 20 sub-Saharan Africa (SSA) countries. They found that savings retention coefficients are similar in magnitude to those already reported for developing countries, particularly SSA. The importance of sustenance of financial sector reforms for the savings-investment nexus in SSA was, particularly, emphasized in the paper.

Raheem (2017) contributed to the debate on the trilogy of FD, savings and investment. Focusing on 31 SSA countries for the period 1999-2011 and replying on pooled ordinary least squares (OLS), some interesting results were obtained. First, series on the model are not stationary at levels. Second, there is a long-run relationship among the variables. Third, the savings retention coefficients ranged between 0.047 and 0.106. The introduction of proxies for FD increases the coefficients.

A different approach was applied by Charpentier *et al.* (2015) in the analysis of the puzzle. They provided a meta-analysis of 1,651 point estimates of FH savings retention coefficient from the 49 peer-reviewed papers published over three decades. They found a consistent underlying coefficient lying between 0.56 and 0.67 for the studies using the original paper. They also found evidence that the savings retention coefficient is systematically underestimated in the following models: models written in first difference; models using the savings ratio or the current account ratio as the dependent variable instead of the investment

ratio; and models that included indicators of the public deficit or indicators of the country size, as additional explanatory variables.

Henrickson and Herzog (2015) demonstrated that savings-investment regressions are biased toward capital immobility because of the failure to control for the endogeneity of investment rates across countries. They also showed that the savings coefficient is significantly lower and statistically insignificant from zero for small open economies using a spatial autoregressive lag process.

The summary of the narrations from these studies, among numerous others, seems to focus on the savings retention coefficient and its interpretation. The general tone of contributions is largely, but by no means unanimously, negative toward the FH interpretation of low-capital mobility.

3. Data and methodology

The goal of this section is to provide an overview description of the relevant data used in this study. As the key variable of interest is finance related, it is important to describe, in general, the structure of the financial system in developing countries with special reference to SSA. The financial system comprises both the money and capital market. As such, each of these markets has different indicators to quantify the development and efficiency of the system. The differences between development and efficiency of the sector have been identified by recent studies. These differences would be highlighted in the succeeding paragraphs of this section.

3.1 Financial development

From inception, by this, we meant the seminal papers by Shaw (1973) and McKinnon (1973), the focal point of measuring the development of the financial sector have tilted towards using indicators that measures the size and depth of the sector. It is believed that the level of liquidity in the sector would go a long way in explaining the extent of development in the financial system. The liquidity can be measured in different ways, as it depends on the channels of usage. For instance, there is private sector credit, credit provided by the banking sector and liquidity liabilities, stock market capitalization and stock-traded value, among others. There is no gain saying the fact that all these indicators measure the level and values of available capital within the system.

Among the functions of the financial sector is to channel savings from the surplus sector to the deficit sector. It is hypothesized that credit constrain is a fundamental problem, at least in the developing world. So an attempt by the sector to solve this problem is viewed as a great achievement and, hence, seen as a form of development of the sector.

However, these indicators cannot capture some fundamental peculiarities within the economy as explained in the introductory section. This is in addition to the fact that these indicators essentially focus on only one function out of the five as argued by Demirgüç-Kunt (2008). Raheem and Oyinlola (2015) have argued that the ability of the financial sector to simultaneously perform the five functions would determine the efficiency of the sector.

3.2 Efficiency of the financial system

Specifically, three attempts have been made to measure the efficiency of the financial sector. The first dates back to 1999 when the World Bank through Beck, Demirguc-Kunt and Levine provided a database for the financial structure. Two of the developed indicators measure the FDüs efficiency. These are: ratio of the value of banks' net interest margin to total assets and ratio of bank's overhead costs to real total assets. It is expected that increased competition in the financial market will reduce these measures and, hence, improve efficiency and vice versa (Corray, 2012). The second attempt is attributed to Bettin and Zazzaro (2009). They

developed bank inefficiency index by sourcing data from BankScope. The last attempt measures efficiency by arguing that the institutional framework in the financial sector is quintessential to the efficiency of the sector. These set of studies interacted measures of governance/institutions and proxies of FD.

These perceived "better" indicators have also had their shares of criticisms. We start with the indicators of Beck *et al.* (1999). The major limitation is related to the fact that the correlation between efficiency and operational performances is not well explained. For instance, environmental factors, including high-operational cost or cost-of-doing-business might be high, which would thus have an impact on its efficiency. The problem of Bettin and Zazzaro's (2009) index is due to lower data coverage. Even though the BankScope dataset is quite huge, not all the financial institutions in an economy are captured. Also, some countries are not included. Hence, relying on this measure might be counterproductive. The critics of the third strand have opined that institutions and/or governance are a very complex issue to model and develop. This might not be unconnected to the fact that different organizations perceive institutions in different ways. This being the case, the approach in measuring institutions would certainly be different. The inability to identify the measures of governance that is related to the financial sector serves as a disadvantage.

Despite the foregoing, this present study did not refrain from adopting an approach of measuring the efficiency of the FD. Explicitly, we adopted the approach of Beck *et al.* (1999). This is justified on the following grounds. First, adopting the index of Bettin and Zazzaro would considerably reduce the scope of the study as only a handful number of countries in SSA are represented in the dataset of BankScope. Second, we argue that interacting measures of governance and FD is deviating from the aim of capturing efficiency. This approach would have been better if the institution features can be implicitly captured (without interaction). This is in addition to the fact that there exist variants measures of institutions/governance. Hence, as far as we are aware of, Beck *et al.* (1999) offers the most acceptable measure of FD.

3.3 Methodology

3.3.1 Estimation procedure. The starting point of our analysis is to carry out some pre-estimation tests. To avoid spurious regression, we conducted unit root test. Subsequently, we ascertain the existence of a long-run relationship among the variables in the model. To this end, we adopted the cointegration test as propounded by Pedroni (2008). The third step is the actual estimation. The issue of causality between savings and investment is a common norm in the literature. This issue is being investigated by adopting system GMM as the estimation technique of Arellano and Bond (1991) and Arellano and Bover (1995). The superiority of this methodology over the pooled OLS is the features of the former to deal with endogeneity issues that might occur as a result of measurement error, omitted variable bias and reverse causality. The System GMM estimator combines the set of equations in first differences with suitable lagged levels as instruments, with an additional set of equations in levels with suitably lagged first differences as instruments. Blundell and Bond (1998) have evidenced from Monte Carlo simulations that System GMM performs better than first-differenced GMM, the latter being seriously biased in small samples when the instruments are weak.

3.3.2 Model specification. Feldstein and Horioka, using cross-sectional data on 16 countries, specified the model below:

$$\left(\frac{I}{Y}\right)_i = \propto_0 + \theta_1\left(\frac{S}{Y}\right)_i + U_1 \tag{1}$$

where I denotes domestic investment, S measures national savings, Y captures GDP and U_1 is a random disturbance. The coefficient θ referred to as the "savings retention coefficient" measures the "proportion of the incremental savings that is invested domestically". The above equation is modified to account for the inclusion of proxies of FD, which is consistent to the objective of the study. Also, current account balance and return on investment are included in the baseline regression. This inclusion (current account balance) is justified because the turn of twentieth century witnessed a rapid increase in intra FDI flows[4]. This suggests the existence of a relativenew investment-friendly environment and, hence, the inclusion of return on investment. The estimable baseline regression is presented below:

$$\left(\frac{I}{Y}\right)_{it} = \propto_0 + \theta_1\left(\frac{S}{Y}\right)_{it} + \theta_2\left(\frac{FD}{Y}\right)_{it} + \theta_3\left(\frac{CAB}{Y}\right)_{it} + \theta_4 log\left(\frac{1}{GDPPC}\right) + U_{it} \quad (2)$$

where FD serves as the proxies for FD and efficiency. The proxies are credit to the private sector as a ratio of GDP (FIN); ratio of the value of banks' net interest margin to total assets (INTEREST) and ratio of bank's overhead costs to real total assets (OVERHEAD). CAB is current account balance, GDPPC is GDP per capital. The goal of investors is to maximize their expected rate of return. The higher the rate of return, the higher would be the proportion of the portfolio investment. θ_4 is a common proxy in the literature that is used to measure return on investment. i and t are the country and time characteristics, respectively. The rest of the variables are as previously defined.

3.3.3 Data. Based on data availability, the sample size of this present study is limited to the 31 countries in SSA and for a period 1999-2011[5]. Annual data series were obtained from World Development Indicator and International Monetary Fund databanks.

4. Empirical results

This section seeks to present the empirical results of the estimation in a sequential order, as highlighted in the previous section. Table I shows the descriptive statistics characteristics of the variables in the model. Investment, savings and private credit have mean values of 18.63, 8.81 and 20.7 per cent, respectively. The "better finance" indicators have mean values of 8.20 per cent for interest and 6.46 per cent for the overhead. The most volatile series among the FD indicators is private credit.

Results of the stationarity test are presented in Table II. It could be deduced from the results that proxies for "better finance" indicators are stationary at levels. As regards the remaining variables, it was found that their order of integration ranged between 0 and 1. These results are presented in Table II below.

Next, we conducted a co-integration test that was propounded by Pedroni (1999) by using seven test approaches:

Variable	Mean	Minimum	Maximum	SD
CAB	−4.741	−28.191	22.883	8.737
FIN	20.726	0.682	161.980	26.069
GDP^{-1}	0.389	0.269	0.521	0.060
INTEREST	8.204	0.032	45.450	4.845
INVE	18.633	2.000	59.723	7.697
OVERHEAD	6.457	0.009	42.723	3.852
SAVINGS	8.807	−50.016	58.969	15.484

Source: Authors' computation

Table I.
Descriptive statistics

Variable	LLC *t*-Statistics Statistics	I(*X*)	Breitung *t*-Statistics Statistics	I(*X*)	IPS *W*-Statistics Statistics	I(*X*)	ADF-Fisher χ^2 Statistics	I(*X*)	PP-Fisher χ^2 Statistics	I(*X*)
INVE	−5.962 (0.000)	I(0)	−1.882 (0.030)	I(1)	−6.505 (0.000)	I(1)	77.267 (0.092)	I(0)	121.079 (0.000)	I(0)
SAV	−3.159 (0.000)	I(0)	−2.161 (0.015)	I(1)	−1.539 (0.062)	I(1)	95.442 (0.004)	I(1)	100.742 (0.001)	I(0)
CAB	−3.184 (0.000)	I(1)	−2.145 (0.000)	I(1)	−3.100 (0.000)	I(1)	120.373 (0.000)	I(1)	425.630 (0.000)	I(1)
GDP^{-1}	−2.157 (0.000)	I(0)	−4.515 (0.000)	I(1)	−2.254 (0.030)	I(1)	82.973 (0.067)	I(0)	145.214 (0.000)	I(0)
FIN	−3.693 (0.000)	I(0)	−1.890 (0.029)	I(1)	−0.792 (0.096)	I(1)	76.938 (0.096)	I(1)	87.416 (0.018)	I(0)
OVERHEAD	−10.912 (0.000)	I(0)	−2.304 (0.000)	I(0)	−3.253 (0.000)	I(0)	113.861 (0.000)	I(0)	174.863 (0.000)	I(0)
INTEREST	−12.930 (0.000)	I(0)	−1.486 (0.067)	I(0)	−3.749 (0.000)	I(0)	107.253 (0.000)	I(0)	179.535 (0.000)	I(0)

Notes: LLC and IPS represent the panel unit root tests of Levine *et al.* (2002) and Im *et al.* (2003), respectively; Fisher-ADF and Fisher-PP is for Maddala and Wu (1999); exogenous variables: individual effects and individual linear trends; Fisher test is computed using an asymptotic χ^2 distribution; all other tests assume asymptotic normality
Source: Authors' computation

Table II.
Unit root test

(1) Panel *v*-statistics;
(2) Panel rho-statistics;
(3) Panel PP-statistics;
(4) Panel ADF-statistics;
(5) Group rho-statistics;
(6) Group PP-statistics; and
(7) Group ADF-statistics.

The results of these tests are presented in Table III. In sum, there is evidence of long-run relationships among the series in the model. Based on the foregoing, we can now proceed to system GMM estimation whose result is presented in Table IV below.

The savings retention coefficient in the spirit of Feldstein and Horioka (1980) is about 0.42. The inclusion of CAB and GDP substantially increased this coefficient, which makes the retention coefficient to hover between 0.419 and 0.720. This supports the claim about the increase in the intra-FDI flows in Africa. This serves as a point of departure to existing studies because previous studies failed to consider the increasing African-sourced investment. A plausible factor that might have necessitated increase in investment might not be unconnected to the increasing efforts in curtailing the incidence of capital flight. Africa

Null hypothesis: no co-integration	Statistics	Weighted statistics
Alternative hypothesis: common AR coefficients (within-dimension)		
Panel *v*-statistics	−4.642 (0.099)	−2.222 (0.953)
Panel rho-statistics	2.345 (0.989)	4.728 (1.000)
Panel pp-statistics	−4.262 (0.000)	−5.367 (0.000)
Panel ADF-statistics	−3.327 (0.054)	−3.109 (0.030)
Alternate hypothesis: Individual AR coefficients (between dimension)		
Group rho-statistics	6.812 (1.000)	
Group PP-statistics	−8.971 (0.000)	
Group ADF-statistics	−3.920 (0.000)	

Source: Authors' computation

Table III.
Panel co-integration test

Variable	1	2	3	4	5	6
SAV	0.419* (0.075)	0.509* (0.070)	0.510* (0.075)	0.533* (0.073)	0.720* (0.122)	0.589* (0.083)
CAB		−0.545* (0.055)	−0.546* (0.055)	−0.529* (0.061)	−0.618* (0.089)	−0.553* (0.065)
GDP^{-1}			2.142 (4.271)	3.986 (15.805)	47.292** (24.141)	3.488 (2.184)
FIN				0.050 (0.078)		
INTEREST					0.117 (0.073)	
OVERHEAD						1.603** (0.730)
Hansen test (p-value)	0.456	0.334	0.421	0.694	0.688	0.877
Arellano–Bond test for autocorrelation (p-value)	0.230	0.494	0.384	0.536	0.427	0.534

Notes: "*" and "**" indicate 1 and 5% level of statistical significance, respectively; while the figures in parentheses are the standard error statistics
Source: Authors' computation

Table IV.
Empirical results

has lost a huge value of resources to capital flight (Ndikumana and Boyce, 2010; Boyce and Ndikumana, 2012; Raheem, 2015b). As there seems to be no safe haven anymore, Africans are constrained to invest domestically and, hence, the increase in θ_1.

The results suggest that "better finance"-based indicators are weightier in explaining the relationship between savings and investment. Noteworthy is Model 5, which has the inclusion of net interest margin. All the indicators of FD are positively related to investment. It should be noted that "better finance" indicators do count more for investment as compared to "more finance" indicators, which elicited lower savings retention coefficients. The positive relationship in the investment–FD nexus supports the theoretical intuition.

An attempt is made to compare our results with other related existing studies. In the light of this, it was evident that our coefficients of θ_1 are quite similar. For instance, Bangake and Eggoh (2010) using PMG, FMOLS and DOLS found θ_1 to be 0.36, 0.38 and 0.58, respectively. The FH coefficients for Adedeji and Thornton (2006) ranged between 0.51 and 0.73. However, it was found that some studies' estimates of the savings retention coefficients are relatively smaller in magnitude than ours. Classical examples include the study by Payne and Kumazawa (2006) where FH coefficients are 0.20 and 0.24 using OLS and fixed effect techniques of estimation. Equally Adeniyi and Egwaikhide (2013) estimates (0.32 [OLS], 0.21 [FE], 0.24 [RE]) validated the existence of the puzzle, while de Wet and van Eyden (2005) also obtained 0.31(OLS), 0.34 (FE) and 0.28 (RE).

As a preview to the conclusion, the findings in summary, is that "better finance" are more important to the savings-investment nexus as compared to the "more finance" indicators. Hence, improvement in both the quantity and quality of the financial sector might be helpful in the mobilization, distribution and utilization of savings for investment purposes. However, it is economically effective to first lay emphasis on the quality of the financial sector in the short and immediate term and then focus on the quantity of the system in a later or long-term stage.

To further shed light on the role of finance in the relationship between savings and investment, we further interacted measures of finance (i.e. "better finance" and "more finance") with savings. The intuition behind this is to provide information on how finance helps create and mobilise savings for effective and productive use, and as such how it affects the magnitude of savings retention coefficients. The results from this exercise show that, of all the indicators of finance only overhead ensures the increase of the FH coefficient. This result is considered to be puzzling. Also, the coefficients of the interactive term are positive

Variable	1	2	3
SAV	0.305*** (0.157)	0.531* (0.086)	0.619* (0.093)
CAB	−0.569* (0.064)	–0.527* (0.056)	–0.498 (0.058)
GDP	13.569 (7.550)	–6.379 (4.131)	–3.345 (5.853)
SAV × FIN	0.016 (0.010)	–	–
SAV × INTEREST	–	0.006 (0.008)	–
SAV × OVERHEAD	–	–	0.022** (0.010)
Hansen test (*p*-value)	0.746	0.836	0.753
Arellano–Bond test for autocorrelation (*p*-value)	0.822	0.687	0.783

Table V.
Alternative result with interaction

Notes: "*" and "**" indicate 1 and 5% level of statistical significance, respectively; while the figures in parenthesis are the standard error statistics; "***" 10% level of significance
Source: Authors' computation

and significant. This further lays credence to the merit of qualitative measures of finance in performing their microeconomic functions; among which seeks to decrease overhead cost, increase net interest margin as well as channelling savings to the most productive sector selecting, leading to reduction in negative net present value projects by banks. Also, the results confirmed the existence of the macroeconomic functions of the quantitative ("more finance") indicators of finance, which seeks to pool and allocate savings for the most productive use. We present these results in Table V, below.

5. Conclusion

The study contributes to the existing stock of knowledge by expanding the measures of FD to account for the qualitative nature of the financial sector. Using annual dataset for 31 countries in SSA and for the period 1999 to 2010, results of the unit root tests showed the absence of unit root among the series used in the model. This is just as the cointegration test confirms the existence of a long-run relationship among the series.

System-GMM was used to account for reverse causality between savings and investment. The FH coefficients obtained ranged between 0.419 and 0.720. The qualitative measures of FD have higher FH coefficient as compared with the traditional measure of FD. The high FH coefficients obtained suggest that the FH puzzle does not hold in the SSA region. Hence, policymakers should formulate and design polices that will seek to ensure the development of the financial sector both in terms of quantity and quality. In this regard, special attention should be devoted to the qualitative measure of finance. The issue of cross-sectional dependence is now gaining increasing attention in recent times. Hence, as a suggestion for future research, it would be worthwhile if this line of inquiry could be pursued.

Notes

1. The seminal papers by McKinnon (1973) and Shaw (1973) set the theoretical foundation to which subsequent studies based their investigation on. See Levine (2005) and Pasali (2013) for a stylized literature survey on finance–growth nexus. There is a general conclusion as regard the positive relation in the FD-growth nexus.
2. Suggested by Obstfeld and Rogoff (2000).
3. See the references in these two studies for more information on the earlier literature.
4. For instance, the recent bilateral FDI flows dataset released by United Nations Conference on Trade and Development (UNCTAD) shows that FDI among SSA member countries is estimated to be in

excess of $300bn between 2001 and 2012. Of this amount, Nigeria was able to attract $109bn, South Africa $33, Mozambique $10bn, Niger $30bn, Malawi $18bn. On an individual basis, South Africa's investment in Namibia, Zambia, Zimbabwe, Seychelles are $45bn, $5.4bn, $4.4bn and $2.3bn, respectively.

5. The countries under investigation are Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central Africa Republic, Chad, Cote d'Ivoire, Congo Democratic Republic, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Rwanda, South Africa, Senegal, Sierra Leone, Swaziland, Togo, Uganda, Zambia and Zimbabwe.

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