Capital Account Liberalization and Capital Flows to Sub-Saharan Africa: A Panel Threshold Approach

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Abstract

Theory on capital account liberalization (CAL) posits that opening up capital accounts should result in inflows of capital to developing countries. Empirical evidence of this for Sub-Saharan Africa (SSA) remains wanting. This study was, therefore, aimed at examining the effects of CAL on capital inflows to SSA. We employ both Fixed Effects and System-GMM estimators for a panel of SSA 13 countries from 1996 to 2013. We also employ sample splitting and threshold effects methodology to examine possible asymmetries in capital flows to SSA. From our study, we find that capital account liberalization promotes capital flows to SSA. We also find evidence of the existence of threshold effects of financial sector development and institutional quality. That is, higher levels of intuitional quality and financial sector development are deemed beneficial to maximize benefits from CAL.

1 Introduction

Whether or not capital account liberalization (CAL) increases capital flows to developing countries has been an issue of great academic debate. On one hand, some studies find positive significant effects of CAL on capital flows (Henry, 2006; Noy and Vu, 2007; Sedik and Sun, 2012). Other studies, however, find negative effects of CAL on capital flows (Ayinde and Bankole, 2015; He *et al*, 2012). The Lucas paradox went far ahead to show that, contrary to neoclassical theory, capital was not flowing into capital scarce countries as predicted (Lucas, 1990). This was a result of differences in fundamentals in a country which affect the production structure of the economy and can hence affect the marginal product of capital (Alfaro and Kalemli-Ozcam, 2003). Hence the effects of CAL on capital flows remain heavily questioned.

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The collapse of the Bretton Woods system, in the 1970s prompted the move towards liberal capital accounts in developed countries. This culminated in a steady rise in the popularity of CAL which was brought to a halt after the Latin American and East Asian crises in the mid-1990s. These crises were associated with rapid liberalization and, as such, economists began to question CAL as a policy (Eichengreen *et al*, 1999: Lichetta, 2006). The crises were characterized by massive reversals in capital flows which led to some countries re-imposing capital controls. The experiences in Asia and Latin America contributed to the slow pace in liberalization in SSA as countries were wary to liberalize their capital accounts rapidly (Chea, 2011). Recently, however, there has been a resurgence in the interest in CAL under the new financial architecture which advocates for enhanced regulation and supervision.

Capital account liberalization (CAL) involves removal or easing of restrictions in the capital account of the Balance of Payments (BoP). The capital account captures many capital flows including foreign direct investment (FDI), portfolio flows and bank borrowing. Controls on capital are broad and encompass price-based measures, volume-based measures and administrative controls. The motivation to liberalize capital accounts is often drawn from the neoclassical postulations that CAL promotes efficiency in resource allocation. This occurs when CAL leads to an increase in capital flows into developing countries that are capital scarce from capital-rich developed countries thus promoting a temporary increase in investment in the former (Henry, 2006).

Sub-Saharan Africa countries began embarking on policies aimed at fostering enhanced financial integration in the mid-1980s. This was often part of broad reform packages which involved market and economic reforms under the World Bank/IMF led structural adjustment programmes. As part of these reforms, countries began to pursue more liberal capital account regimes in the 1980s with CAL taking full force in the mid-1990s. To date countries with fully liberalized capital accounts in SSA include Seychelles, Botswana, Uganda, Mauritius and Zambia. Countries like Ghana, Nigeria and South Africa have opted for a more gradualist approach (Murinde, 2009).

In the past couple of years, Sub-Saharan Africa has experienced a surge in capital inflows (Kundu, 2015; Murinde, 2009). The increase in capital flows to SSA was attributed to financial sector reforms and improved investor demand. Chea (2011) also attributed the rise in capital flows to factors like increasing global liquidity, improved economic policies, improved business climate and increased natural resources. Evidently, determinants of capital inflows go far beyond government policy decisions to remove restrictions on capital flows. Other factors which determine capital flows are grouped into *push* and *pull* factors. *Pull* factors include country-specific conditions which attract capital flows into a country and *push* factors are conditions prevalent in countries where capital is flowing out of.

In as much as capital flows to SSA have been increasing, they remain low compared to other regions (Battachrya *et al,* 1997; Insaidoo and Biekepe, 2013). Such trends point towards a possible Lucas paradox (Lucas, 1990; Alfaro and Kalemli-Ozcam, 2003). Furthermore, this begs the question of whether CAL

does indeed promote capital flows into SSA. This is an issue which has not been fully explored and empirical evidence remains wanting. The importance of the matter is underscored by the fact that capital inflows are a potential channel through which CAL can promote economic growth. Furthermore, increased capital inflows can lead to enhanced financial sector development and consumption smoothing (Lichetta, 2006; Singh, 2003). Lastly, capital flows like FDI can also result in job creation and generate more taxes for a country.

This study, therefore, seeks to examine the effects of CAL on capital flows in SSA from 1996 to 2013[1]. The choice of the period is largely due to the fact that a bulk of liberalization in SSA took place during this time frame. Countries like Ghana, Uganda, Zambia, Kenya and Tanzania began to liberalize in the mid-1990s (Murinde, 2009; Ndikumana, 2003). To add on to this, the Wang-Jahan CAL index, used in this study, ranges between 1996 and 2013.

We also seek to examine whether threshold effects are prevalent in our sample. It is widely agreed that countries must achieve a certain threshold level of development if they are to benefit from CAL (Kose *et al*, 2011; Noy and Vu, 2007). Hence, CAL is viewed as more beneficial to those countries that achieve certain levels of development. Assibey and Adu (2016) and Chea (2011) pointed to some heterogeneity and asymmetry and observed that capital inflows to SSA are not evenly distributed as some countries receive more inflows than others. A report by Ernst and Young (2017) further showed that, in 2016, Kenya, Nigeria and South Africa attracted 58 per cent of the continents total FDI projects. Despite the evidence of heterogeneity, few studies for SSA have brought the issue to the fore. This study, therefore, contributes to growing knowledge on CAL and capital flow literature by using sample splitting and threshold regression methods to examine threshold effects.

In the study of CAL and capital flows, issues of reverse causality may arise due to the fact that some countries impose capital account restrictions in a bid to curb volatile capital flows. Hence, this may make CAL dependent on capital flows as well. To control for any possible endogeneity that may ensue, the study shall also employ System-Generalized Method of Moments (GMM) estimators to control for possible endogeneity in the sample.

The study departs from other studies on CAL by employing a new measure of CAL called the Wang-Jahan Index. The index is derived by using a binary coding of 0 for restricted and 1 for fully open in all 12 sub-components of the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database. The index departs from other measures of CAL by disaggregating CAL based on asset type thus giving separate indices on FDI liberalization portfolio liberalization and so forth.

This is important since CAL involves many aspects including liberalization of many assets as well as inflow or outflow liberalization. Hence, this measure will give us concise effects of particular asset liberalization, such as foreign direct investment on the volume of flows of that particular asset. This is relevant

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[1]We examine effects for 13 countries based on availability of data. The methodology employed requires the use of well-balanced panel data hence we drop some observations which do not have all the data readily available.

given that SSA does not receive large inflows of portfolio equity compared to FDI. Hence using an aggregated index may not give a proper indication of the situation on the ground. The Wang-Jahan measure used in this study combines the broad country coverage of the commonly used Chinn-Ito index whilst also capturing the intensity of capital flows.

The rest of this study is organized as follows. Section two reviews the literature on CAL and capital flows. Section three provides a background of CAL and capital flows in SSA. Section four and five outline the methodology and results of the study respectively. Section six concludes the paper.

2   Literature Review

There are several schools of thought which seek to explain the effects of CAL on capital flows. The most prominent one is the Allocative Efficiency view which stems from the Neoclassical Growth Model. This stipulates that CAL facilitates efficient international allocation of resources from capital abundant countries, where returns are low, to capital scarce countries, where returns are high (Henry, 2006: Shen and Yang, 2015; Lichetta, 2006). The influx of capital inflows to capital scarce countries then reduces the cost of capital in those countries. As a result, capital scarce countries experience a temporary increase in investment and economic growth. In essence, CAL results in a higher steady-state level of capital in developing countries. Although this model gives a concise overview of the effects of CAL on capital flows, the model is based on several limiting assumptions including the assumption that countries produce the same goods with the same constant returns to scale production and same factors of production (Alfaro and Kalemli-Ozcam, 2003). The model is also limited in its assumption of perfect information when in reality information asymmetries are a well-known characteristic of financial markets. Imperfect information may result in failure to efficiently allocate resources ad lead to home bias or herding resulting in low capital inflows to some countries (Bonizzi, 2013).

Drawing from the limitations of the Neoclassical Model, Mankiw, Romer and Weil (1992), developed the Augmented Neoclassical Model which posits that countries with low levels of physical capital and high levels of human capital benefit from net capital inflows and capital movements persist till the domestic and foreign interest rates are equalized. This view has been criticized however, based on the idea that developing countries do not benefit from capital inflows because of underdeveloped capital and money markets (Bonizzi, 2013). Similar to this, the Modified Lucas model (1988) states that countries with low physical capital and high human capital benefit from increased capital flows. This model departs from the Mankiw, Romer and Weil (1992) model by postulating that this will only occur if only physical capital is mobile.

Several studies have been conducted which sought to test the predictions of the Neoclassical theory. One of the most prominent studies was conducted by Henry (2006) who, from a sample which included emerging and developing countries, found that liberalization led to 22 per cent growth in investment in

emerging countries. For developing countries, however, liberalization did not increase investment, growth and reduce the cost of capital. The study used a dummy variable to capture the period in which the country liberalized and this was used to measure short term effects which are suggested by theory. However, using a dummy variable to measure CAL, does not give any indication of the intensity of capital restrictions and hence can be a limited way to capture CAL.

Similar to Henry (2006), Noy and Vu (2007) found that CAL is positively, but moderately associated with the amount of FDI inflows after controlling for other macroeconomic and institutional measures. This study employed dynamic panel methods in a study of 62 developing and 21 developed countries from 1984 to 2000. The study also looked into the threshold effects of institutional quality. However, their sole focus is on corruption and political stability, leaving out other factors of institutional quality which can affect FDI such as the rule of law and government effectiveness.

Sedik and Sun (2012), using a dynamic panel model for 37 emerging market economies, analyzed the experience of emerging countries with liberalized capital flows for a period between 1995-2010.

Like Henry (2006) and Noy and Vu (2007), the study found that openness led to increased capital flows. CAL also led to increased equity returns and decreased inflation. The study employed dynamic panel methods and used System-GMM estimators. This study attempts to evaluate the threshold effects on capital flows, however, by using a composite threshold it does not give a clear picture of which threshold is more pertinent in promoting increased capital flows.

In a study for 14 Middle Eastern countries, Mouna and Cherif (2014) sought to assess the link between CAL and FDI from 1985 to 2009. They used a dynamic panel model and GMM estimators. The findings from the study were that countries are able to reap benefits from CAL if they met certain threshold levels of financial sector development and institutional quality. For instance, CAL was seen to have a negative impact on FDI but this was mitigated in countries that had exceeded the threshold level of financial development of 0.62. This study examines threshold effects but uses interactive terms to do so. We differ from this study by employing sample splitting methods to examine threshold effects in the hope that they give a more concise picture of the effects of CAL. Furthermore, this study employs the number of telephone lines per 1000 people to measure infrastructure quality. We develop a composite measure in order to capture other infrastructure aspects such as electricity.

Asiedu and Lien (2003) examined the effects of CAL on capital flows for 96 developing countries between 1970 and 2000. This paper is one of the few which looks into the different aspects of capital account liberalization namely such as the presence of multiple exchange rates, and removal of restrictions on export proceeds. They employed fixed effects and found that CAL was beneficial and increased FDI in the sample. It is important to note that the study recognizes possible endogeneity but does not fully address the issue.

In a study for Nigeria from 1980 to 2011, Ayinde and Bankole (2015) found that liberalization of the capital account in Nigeria did not lead to an increase in FDI. The study employed a Bounds-Testing Approach to determine the ef-

fects in the long run and in the short run. To measure CAL, the study employs the Chinn-Ito index. The study cites factors like qualitative governance, price stability and institutional development which can enhance foreign direct investment in Nigeria.

A review of the extant literature indicates that most of the studies conducted have employed the Chinn-Ito index to measure CAL (Ayinde and Bankole, 2015; Noy and Vu, 2007). This measure, however, does not disaggregate liberalization based on assess type. Henry (2006), suggested that disaggregating CAL based on asset could help bring clarity to the debate since there are different ways to liberalize the capital account. This study, therefore, employs the Jahan -Wang index which disaggregates CAL based on asset type as well as the direction of capital flows. Previous studies which examined threshold effects have employed a composite threshold (Sedik and Sun, 2012). However, examining individual threshold effects may offer more meaningful results and help ascertain which threshold variables are more pertinent in the CAL-capital flow nexus. In addition, evidence for SSA remains lacking. The few studies which sampled SSA countries combined them with developed countries that began to pursue liberalization as early as the 1970s. Henry (2006) suggested that this may result in insignificant findings given that developing countries began to liberalize capital accounts at a later stage compared to their counterparts in developed countries.

3   Capital Account Liberalization and Capital Flows: Trends in SSA

SSA countries began to pursue CAL in the mid-1980s under the Structural Adjustment Policies (SAP's). However, CAL began to gain major traction in SSA in the 1990s. Initial reforms involved removing restrictions on FDI while maintaining controls on short term flows. Many countries in SSA began to liberalize as part of the regional integration agenda. For instance, countries SADC committed to fully liberalize their capital accounts by 2018 under the SADC Finance and Investment Protocol (FIP) (Smith *et al*, 2014). This is because the region is moving towards a monetary union, as with other regions, in preparation for a continental common monetary union. Table 1 summarizes some of the major CAL reforms implemented in SSA over the past couple of years.

Figure 1 shows varying degrees of CAL in SSA as shown by the Wang-Jahan Index. The index ranges from 0 for countries that are sufficiently closed and 1 representing countries that are fully liberalized. Countries that are fully liberalized include Zambia, Liberia and Rwanda. Other countries like Angola, Burundi, Malawi and Tanzania maintain sufficient controls on their capital accounts.

The major motive for CAL is that it promotes convergence and catch up with developed countries as a result of capital flowing from capital abundant regions to capital scarce regions. SSA being a capital scarce region is thus

expected to receive inflows of capital and to be catching up with developed regions. However, in Figures 2 and 3 below, we see that SSA is lagging behind compared to the rest of the world with regards to portfolio inflows and FDI. The relatively low capital flows to SSA can be attributed to factors such as poor macroeconomic management, high country risk and exchange rate misalignment (Ndikumana, 2003). The poor macroeconomic environment can reduce the marginal product of capital in developing countries (Chea, 2011). Battacharya *et al* (1997) attributed low capital flows to SSA to large structural deficits and erratic monetary policies which contributed to variable inflation and interest rates.

The link between CAL and capital flows in SSA is an issue which warrants deeper analysis. Countries like Uganda that have liberalized capital accounts have witnessed increased capital inflows (Kasekende, 2000). However, some countries with relatively closed capital accounts have also been experiencing high capital inflows (Murinde, 2009).

South Africa experienced a massive inflow of capital after becoming re-integrated with world capital markets (Insaidoo and Biekepe, 2013). However, this coincided with the dramatic political shift in the country which led to the removal of sanctions and made South Africa an attractive investment destination. Hence, it is uncertain if re-integration into world capital markets is what led to increased capital flows or rather the changing political climate.

The uncertainty of whether CAL led to increased capital flows in SSA underscores the fact that there are a number of factors which affect the efficacy of CAL as a policy. Efficacy of CAL is dependent on country characteristics including the level of trade openness, institutional quality and financial sector development. To provide a SSA context Figure 4 shows the levels of financial sector development, Real GDP per capita, institutional quality and trade openness for selected SSA countries. In SSA, countries with high levels of GDP per capita, financial sector development include South Africa, Mauritius, and Seychelles. It is also apparent that most of SSA countries have very low levels of institutional quality ranging in the negative values. Few countries like South Africa and Mauritius have positive levels of institutional quality. Regarding trade openness, Botswana, Seychelles, and Mozambique are some of the most open countries. In this aspect, South Africa is relatively less open to trade.

4 Methodology

4.1 Hansen's sample splitting model

Assibey and Adu (2016) showed that capital inflows to SSA are uneven with some countries receiving more capital than others. This is indicative of heterogeneity in the countries. Kose *et al*, (2011) suggested that countries with better institutions and higher financial sector development attract more FDI inflows.

Taking this in mind, we examine threshold effects by employing sample splitting methods first suggested by Hansen (2000). This approach splits the sample into two 'classes' or 'regimes' that are either below or above a certain threshold

level. This will enable the examination of the asymmetries in capital flows to SSA region. To test the existence of the threshold effects, the study employs Hansen's (2000) test for threshold effects. The null hypothesis for this test is that there are no threshold effects.

Following Kose *et al* (2011) we specify a level-level sample splitting model as follows:

$$CF_{it} = \beta_1 kal_{it}(q_{it} < \gamma) + \beta_2 kal_{it}(q_{it} \geq \gamma) + \theta X_{it} + \mu_i + \varepsilon_{it} \qquad (1)$$

Where CF_{it} are capital inflows for country i at time t. kal is the measure of capital account liberalization. $\mathbf{X}$ is a vector of other explanatory variables[2]. The choice of other explanatory variables is based on the inclusion by Mouna and Cherif (2014) and Sedik and Sun (2012) and the variables enter the equation in levels. q_{it} is our threshold variable and γ is our threshold parameter. We divide the sample into two regimes with coefficients, β_1 and β_2 which are the coefficients for the low and high regimes respectively. μ_i are individual effects and ε_{it} are white noise error terms. To estimate this equation, fixed effects estimators are used[3].

4.2   System-GMM Estimation

In the initial specification of the model, problems may arise in the sense that independent variables may be endogenous due to possible simultaneity. The question of reverse causality arises because in some cases countries impose capital account restrictions in a bid to curb volatile capital flows. To counter this problem, the study shall also examine findings from Arellano and Bover's (1995) System-GMM estimators.   Following Sedik and Sun (2012), all right-hand variables are treated as endogenous.

The 1-step estimator is employed in lieu of the 2-step estimator because Hwang and Sun (2015) argued that efficiency gains of the 2-step estimator may not be materialized in finite samples and suggested employing the two-step estimator only if the benefits outweigh the costs.

Thus, a dynamic panel equation is hence specified as follows:

$$\Delta CF_{it} = \alpha_i + \beta_0 \Delta CF_{i,t-1} + \beta_1 \Delta kal_{it} + \theta \Delta X_{it} + \Delta \varepsilon_{it} \qquad (2)$$

Specification of a dynamic model makes intuitive sense given that lagged values of FDI are likely to influence present FDI. That is, countries that have attracted large FDI in previous years are expected to continue attracting large amounts of FDI. Inclusion of a lagged dependent variable also helps us to ascertain the short term effects of CAL since coefficients from GMM represent short-run effects (Sedik and Sun, 2015). These short-term effects of CAL are of particular interest given that, the neoclassical theory postulates that liberalization will lead to a

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[2] These include: real interest rates, real exchange rates, trade openness, inflation, infrastructure quality and inflation

[3] The *xthreg* command in Stata 14 estimates the threshold regression using fixed effects estimators

temporary increase in investment (Henry, 2006). The variables in the equation are in levels.

4.3   Data and descriptive statistics

Measures of Capital Flows

We sample 13 countries in SSA annually between 1996 and 2013. This is the period when most SSA undertook policies aimed at liberalizing their capital accounts (Murinde, 2009; Ndikumana, 2003). The countries sampled are a representative mix of countries in West, East and Southern Africa. The choice of countries was determined by the availability of data given that the sample splitting methodology requires data to be heavily balanced. The countries sampled are outlined in Appendix 1. The study looks at the effects of CAL on capital flows, with a particular focus on FDI. This is because, save for a few countries like South Africa, most SSA countries receive more FDI compared to portfolio inflows. As such, data on portfolio inflows is very scant for SSA. Appendix 2 provides a summary of the data that has been used and the various data sources.

Measures of Capital Account Liberalization

For the purposes of this study, the Wang-Jahan Index for CAL is employed. The index is derived by using a binary coding of 0 for restricted and 1 for fully open. This criterion is applied in all 12 sub-components of the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database. The index is thus an aggregate index of various components of capital account liberalization which include equity liberalization, bond liberalization, money market liberalization, derivative liberalization and direct investment liberalization. It is constructed for 164 countries over the period 1996 to 2013. The advantage of this measure is that it builds upon the Chinn-Ito index by increasing the coverage for developing countries. Currently, the Chinn-Ito index is limited in its coverage for developing countries.

Another major improvement on the Chinn-Ito index is that the Wang-Jahan index disaggregates CAL based on various types of capital flows and also based on the direction of capital flows (inflows versus outflows). In this regard, the index allows for more in-depth analysis of the workings of CAL. Employing this measure will help provide a clearer picture of the effects of CAL on capital inflows to SSA. This is because composite measures may capture many different aspects of liberalization of capital flows which do not have a direct bearing on certain capital inflows. The Wang-Jahan index also captures the intensity of capital restrictions which is vital for the analysis of effects of CAL.

Furthermore, the measure builds upon other indices such as the Schindler (2009) index which only disaggregates some of the sub-components of the AREAER database. The index also provides more variation over the years compared to the Chinn-Ito which has very little variability in its values. Hence, the Wang-Jahan index captures gradual adjustment in the capital account.

Other Explanatory Variables (X):

Infrastructure Quality:

Well-developed infrastructure helps to attract capital inflows. In this regard, we expect a positive relationship between infrastructure quality and FDI. This study develops a composite index of infrastructure quality which encompasses telecommunications, electricity, and sanitation.

Composite measures of infrastructure quality are beneficial in that they help reduce measurement errors associated with using only one index (Chakamera and Alagidede, 2017). Following Calderon (2009), principal components analysis (PCA) is used to derive the infrastructure quality index. This involves deriving a linear combination of variables that are weighted. The weights are the eigenvectors derived from the principal components analysis. The advantage of using PCA is that it reduces noise in data by selecting maximum variations and leaving out minor variations as well as allowing for data variation with only the most relevant information retained (Chakamera and Alagidede, 2017). The infrastructure quality index is calculated as follows:

$$IQ = 0.4661 * \ln ele + 0.42745 \ln mobil + 0.5521 \ln tele + 0.5429 \ln sani \quad (3)$$

ele is access to electricity as a percentage of the rural population, $mobil$ is mobile cellular subscriptions per 100 people, $tele$ is fixed telephone subscriptions per 100 people and $sani$ is improved sanitation facilities as a percentage of the population with access.

Real exchange rates:

Investors often take into account the movement in exchange rates when making investment decisions. Lily *et al* (2014) argued that the effects of an appreciation in exchange rates on the FDI inflows can be in two directions depending on the objective of the FDI. The relationship between exchange rates and FDI inflows is positive if FDI is aimed at benefitting domestic markets, but the relationship becomes negative if the objective of FDI is for re-exports or cost reduction. Hence the sign for this variable could be either positive or negative.

Trade Openness:

Countries that are sufficiently open to trade flows are believed to attract more FDI. This is because many investors view countries with trade restrictions as potentially risky (Chea, 2011). Fernandez and Arias (1996) also emphasized that trade liberalization was vital in attracting FDI because it involves removing economic distortions in the form of trade regulation which would hinder inflows of capital. Hence, the more open a country is, the more capital inflows it is expected to earn and thus trade openness is expected to positively influence FDI. The measure for trade openness is given as exports and imports as a share of GDP.

Inflation:

This variable is included to proxy macroeconomic stability. In essence, inflation is an indicator of the quality of monetary policy and investors are more likely to be drawn to countries with stable macroeconomic environments. In Fernandez and Arias (1996), inflation is included as one of the domestic factors which determine the inflows of capital into a country. Countries with high inflation are expected to be less attractive FDI destinations and hence a negative effect of inflation on FDI is expected.

Real interest rates:

Lower interest rates reflect a lower cost of borrowing money and can thus lead to an increase in capital flows. In this regards, an inverse relationship with FDI inflows is thus expected.

Threshold variables

For the threshold variables, an institutional quality index is developed measured as the average of the World Governance Indicators (WGI). These are Voice and Accountability, Government Effectiveness, Regulatory Quality, Political Stability and Absence of Violence, Rule of Law, Control of Corruption. The proxy used to measure financial sector development is the net credit to the private sector as a share of GDP growth.

Descriptive Statistics

Table 2 presents the descriptive statistics for the sample. The sample is divided into countries that are sufficiently liberalized (Wang-Jahan index greater than 0.5) and those that are less liberalized (Wang-Jahan Index less than 0.5). The data is presented in levels. Examining Table 2, it is apparent that countries that are more liberalized on average receive more foreign direct investment inflows compared to countries that are less open. In addition, countries with more open capital accounts are seen to have higher levels of GDP per capita, more developed institutions and well-developed infrastructure.

For the sample, the level of financial sector development ranges between 2.01 and 160. The diversity in levels of financial sector development provides an incentive to examine whether there are threshold effects of financial sector development exist and whether countries with more developed financial sectors attract more capital inflows.

Maximum institutional quality is 9.24 while the minimum is -1.67. Again there is evidence of variability in SSA institutional quality which further underscores the need to examine threshold effects.

5   Results and discussions

5.1   Effects of CAL on FDI: Findings from Fixed Effects Estimation

Findings from the fixed effects regression analysis are presented first in Table 3. The study starts by examining, the effects of overall capital account liberalization on FDI in the level-level fixed-effects model. This is presented in the first column of Table 3. From this, it is found that a unit increase in overall capital account liberalization leads to a 2.03 increase in FDI. However, this is statistically insignificant to warrant meaningful economic implications. This finding echoes that of Henry (2006), who found that CAL has insignificant effects on investment for developing countries.

However, after employing the disaggregated measure for FDI liberalization, it is observed that unit increase FDI liberalization leads to a 4.57 increase in FDI inflows which is statistically significant. This can be seen in the second

column of Table 3. This makes intuitive sense and implies that *specific* capital inflows are responsive to deliberate government policy to liberalize them. This result contradicts findings by Ayinde and Bankole (2015) who found that CAL does not drive FDI in Nigeria. Their finding could simply be due to the fact that they employ the Chinn-Ito index which does not disaggregate liberalization based on asset type. In essence, since CAL is broad we are more likely to observe significant effects on capital flows by looking at effects of specific asset liberalization.

Findings from other countries in SSA have been varied. South Africa experienced a surge in capital inflows after being reintegrated into the international capital markets after the collapse of apartheid and the 1994 elections (Cross, 2003). In addition, a report by the IMF (2008) showed that, after CAL, capital inflows to Nigeria and Tanzania increased. In Tanzania FDI inflows increased from 1 % to 2% of total GDP between 1995 and 1997 after liberalizing FDI. Hence, it is evident that opening up of capital flows can lead to an increase in the inflows. For Uganda however, since initiating liberalization in 1997, capital flows only picked up in 2004 (IMF, 2008).

Looking at other independent variables in the regression as presented in Table 3, it is observed that an increase in real interest rates reduces FDI on average by 0.08 units. This is in line with *a priori* expectations since, in standard macroeconomic theory, high-interest rates increase the cost of borrowing which can deter investment. Real exchange rates, on the other hand, are, found to be insignificantly related to FDI. This corroborates the findings by Ogun, Egwaikhide and Ogunleye (2012) that showed that real exchange rates had insignificant effects on FDI in most SSA countries and only had significant effects at a lag in a few countries like Botswana and Nigeria. These effects were found to be larger in countries that had floating exchange rates vis-a-vis currency pegs.

Regarding trade openness, this is also seen to significantly increase FDI inflows into SSA by 0.2 points. This is because many investors view countries with trade restrictions as potentially risky (Chea, 2011). Hence countries that are more open to trade are more likely to attract foreign investors.

Studies have even gone to show that, in SSA, trade, and FDI should be regarded as complements rather than substitutes (Duval and Utoktham, 2014; Asiedu, 2002). This is because trade openness can be beneficial for multinational enterprises (MNE's). This is especially true where goods are produced domestically and sold in foreign markets (Martens, 2008). A report by Ernst and Young (2016) highlighted that China is the highest contributor of FDI in SSA and, not surprisingly, China happens to be Africa's largest trade partner thus confirming that FDI and trade are complements.

Turning to macroeconomic fundamentals, inflation is seen to reduce FDI with a coefficient of -0.004 and this is consistent with expectations. High inflation is more likely to portray poor macroeconomic conditions and make a country less attractive to potential investors. With regards to infrastructure quality, it is found that this has an insignificant influence on FDI in SSA. Amusa, Monkam, and Viegi (2016), in their study, found a negative significant effect of infrastructure on FDI when they used the number of telephone subscriptions as a proxy.

In this case, the insignificant effect could simply mean, this proxy does not affect FDI much in SSA. Aspects of transport infrastructure are likely to be more relevant to FDI. In this regard, Seetanah and Khadaroo (2007) showed that the availability of transport infrastructure contributes to the attractiveness of SSA as an FDI destination.

5.2 Findings from Hansen's Test for Threshold Effects

The analysis of thresholds kicks off by performing Hansen's (2000) test for threshold effects in order to examine if there are any threshold effects present. Findings of this are presented in Figure 5. This is a Heteroscedasticity-consistent Lagrange-Multiplier (LM) test for thresholds. The null hypothesis for this test is that there are no threshold effects. Since thresholds are not identified under the null hypothesis, P-Values for this test are computed by bootstrap analogues which produce asymptotically correct P-values. Failing to reject the null hypothesis implies that there is a need to specify the model in linear form. The threshold tests are conducted for two potential threshold variables, namely financial sector development and institutional quality.

The bootstrap dependent variable follows the distribution $N(0, e^2)$ where e^2 is the OLS residual from the estimated threshold model. Examining the results of the test, the study fails to reject the null of no threshold effects.

This implies that there are possible threshold effects in the CAL-Capital flow nexus for SSA. The vertical line presents the critical value at the 95 per cent significance level.

5.3 Findings from the Institutional Quality Threshold Regression

The results from the sample splitting and threshold regression are presented in Table 4. Based on the findings of significant threshold effects, the study examines the effects of CAL on FDI using a non-linear threshold regression. First of all, a single threshold model is estimated with institutional quality as a threshold variable. From this, the study obtains a threshold estimate of 0.2092 at a 95 per cent confidence interval (0.1885, 0.2270). The study also obtains a large F statistic of F (8,213) =13.32 which further justifies the specification of a non-linear model with threshold effects.

In conjunction with the previous analysis, the findings from our analysis indicate that CAL has a positive influence on FDI inflows in sub-Saharan Africa. However, CAL is seen to have a larger effect on FDI in countries with higher levels of institutional quality.

In essence, a unit increase in CAL increases FDI by 13.87 units in countries that are above the threshold level of institutional quality which is 0.2092. On the other hand, a unit increase in CAL only increases FDI by 3.19 units for those countries below a threshold level of institutional quality. The analysis of the threshold effects confirms that higher levels of institutional quality enhance the effect of CAL on FDI. This implies that for countries to experience maximum

effects from liberalizing policies there is a need to foster the development of institutions. The importance of institutions to capital flows has been underscored by other researchers. For Nigeria, it was emphasized that despite receiving large FDI flows, poor institutions impeded Nigeria's FDI potential (Akpo and Hassan, 2015; Ayinde and Bankole, 2015). The importance of institutions was also observed in South Africa where they experienced massive capital outflows during apartheid (Cross, 2003). This was a period characterized by the poor application of the rule of law and political instability.

5.4 Findings from the Financial Sector Development Threshold Regression

Table 5 presents the findings for the threshold regression with financial sector development as a threshold variable. From this, a threshold estimate of 3.78 is obtained with a 95 per cent confidence interval (3.36, 4.12). The finding shows a statistically significant F-statistic of $F_{(8, 213)} = 12.55$ which justifies the non-linear specification of the model.

Examining the results of this regression indicates that a unit increase in CAL increases FDI by 21.2 units in countries below the threshold level of financial sector development of 3.78 and by 2.94 units in countries that are above the threshold level of financial sector development. However, CAL only has a positive statistically significant effect on capital flows for countries below the threshold level of financial sector development. The implications of this are that financial sector development has an enhancing effect on the CAL-FDI nexus only at low levels of financial sector development. Beyond the threshold, financial sector development ceases to have a large effect on FDI.

5.5 Effects of CAL on FDI: Findings from the System-GMM Estimation

The findings from the System-GMM estimators are presented in Table 6. The findings show that unit increase FDI liberalization leads to an increase in FDI by 29 units. A unit increase in trade openness is also seen to increase FDI by 2 units. Real interest rates and inflation maintain the same signs as in the previous analysis. However, their effects are statistically insignificant.

To determine whether the System-GMM specification is well specified, the Arellano-Bond tests for first and second-order autocorrelation are examined as well as the Sargan test statistic for over-identification. The findings suggest the presence of first-order autocorrelation and reject the evidence of second-order autocorrelation. This justifies the inclusion of the lagged dependent variable as an extra regressor and verifies that the specification is appropriate. The analysis also provides a Sargan test statistic of P>Chi =0.075 which shows that the model is not weakened by many instruments and thus validates the specification.

5.6 Findings from the Robustness Tests

To examine the robustness of the results, several extensions of the initial fixed effects model are estimated. The findings of this are presented in the Appendices.

In the first instance, we re-estimate the fixed effects model after including external debt as a share of GDP and GDP per capita as extra regressors. These are included based on the stipulations by Fernandez-Arias and Montiel (1996) that domestic economic factors (GDP) and country creditworthiness ($debt$) are other determinants of FDI. Findings from this estimation indicate that a unit increase in CAL leads to a 4.5 unit increase in FDI. However, GDP per capita and external debt as a share of GDP are found to be insignificant determinants of FDI.

An alternative specification of the model is also estimated where we replace the infrastructure quality index that was developed with a measure of transport infrastructure[4]. A unit increase in CAL is again found to positively influence FDI increasing FDI by 5.4 units. However, transport infrastructure is found not to significantly enhance FDI in the sample. This reaffirms our stance that having a composite infrastructure index provides for more meaningful findings and analysis.

In the third alteration, we examine the effects of portfolio equity liberalization portfolio equity inflows using the fixed effects regression. Currently, portfolio inflows to SSA are very minimal. The few countries that receive large amounts of portfolio inflows are countries like South Africa that have well developed financial sectors. From this analysis, it is observed that the major significant determinant of portfolio inflows into SSA is the level of financial sector development. This could be because countries whose financial sectors are more developed are believed to be more equipped to allocate capital efficiently in the economy and have adequate demand for portfolio assets. Murinde (2009) pointed out that, apart from South Africa, other countries with relatively well-developed financial sectors like Kenya, Ghana, Nigeria, and Botswana have also managed to attract a few portfolio inflows. The other independent variables also do not have significant effects on portfolio flows. This could be because factors that affect FDI and portfolio inflows are likely to be different. Chea (2011) suggested that factors like trade openness which positively influence FDI to play a minimalistic role in attracting portfolio inflows.

In summary, portfolio equity liberalization is found not to significantly enhance portfolio flows as these are largely determined by levels of financial sector development.

Lastly, we also employ the Chinn-Ito index for CAL to verify the robustness of our results. When this index is employed, it is evident that liberalization has a positive and significant effect on FDI. A unit increase in CAL is seen to increase FDI by 5.2 units. This finding corroborates the finding from the first part of the analysis. This would seem to suggest that the use of either measure is

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[4] Transport services as a share of exports and imports are used with the data obtained from the World Development Indicators

appropriate in examining effects of CAL. However, this does not undermine the need to examine the effects of CAL using measures that are more direct as the findings have a more meaningful connotation. Furthermore, the Wang-Jahan index provides more knowledge on the effects of specific asset liberalization on the specific asset inflows and hence is more informative.

6 Conclusions and policy recommendations

Whether or not capital account liberalization promotes capital flows has been an issue of great debate. This chapter sought to examine if CAL promotes capital flows into SSA. From the findings, it was observed that an increase in FDI inflow liberalization led to a rise in FDI in SSA. This is so regardless of whether fixed effects or System-GMM estimators are employed.

The study also sought to examine if there are any threshold effects in the relationship between CAL and capital flows. The study was able to obtain evidence of significant threshold effects. It was found that institutional quality helps to enhance the effects of CAL on the capital flows in SSA. That is, countries with sufficiently developed institutions are able to attain greater benefits of CAL on FDI inflows. This effect increases as the level of institutional quality increases. The study also unearthed that financial sector development helps to enhance the effects of CAL on capital flows. However, the effect of financial sector development was found to be meaningful only at low levels of financial sector development. Hence, unlike the case of institutions, financial sector development is only beneficial up to a certain point. Beyond a specific point, the influence of financial sector development ceases to be meaningful. In summary, the study has established the existence of significant thresholds which influence the CAL-capital flow nexus.

Based on the empirical findings of the study, it can be recommended that countries pursuing CAL improve their institutions in order to attain enhanced benefits from CAL. There is a need for improved governance and accountability, enhanced political stability and strengthened rule of law. SSA countries could also stand to benefit from an improved regulatory environment.

The study also observed that increased trade openness helps to attract FDI into SSA. Hence, if countries are to attract more capital inflows, there is need to ensure sufficiently open trade accounts.

There is also a need for SSA countries to pursue sound macroeconomic policies which foster inflation levels that are low enough to attract FDI. This is because high levels of inflation were found to deter FDI inflows to SSA.

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Table 1: Summary of Major Capital Account Reforms in SSA

Country	Year	Reform
Tanzania	1997	Full liberalization of foreign direct investment
Kenya	1991	Introduction of foreign exchange bearer certificates of deposits
Uganda	1997	One step liberalization as part of broader macroeconomic reforms
RSA	1994	Dismantled restrictions forex transactions by residents and non-residents
Malawi	2012	Liberalization of the kwacha
Zambia	1994	All forms of restrictions of capital transactions were removed
Nigeria	1995	Nationals allowed to invest in securities abroad
Senegal	1999	Elimination of controls on inward FDI and foreign borrowing by residents
Ghana	1995	Partial liberalization of portfolio and direct investment
Cameroon	2000	Liberalization of capital flows within CEMAC

Source: Murinde (2009); Ndikumana (2003); Kasekende, Kitabire and Martin (1996)

Table 2: Descriptive Statistics

Variable	Liberalized				Not Liberalized			
	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Foreign Direct Investment	4.42	5.67	-0.6	54	4.39	8.35	-5.9	41.8
Capital Account Liberalization	0.83	0.12	0.55	1	0.20	0.13	0	0.48
Institutional Quality	5.9	2.13	0.71	9.24	-0.53	0.56	-1.67	0.41
Financial Sector Development	23.88	21	4.12	106.	34.47	47.9	2.01	160
Infrastructure quality	5.90	2.13	0.71	9.24	4.83	2.23	0.42	8.27
Real interest rates	9.11	10.3	-42.3	34.9	5.14	17.2	-94.2	32.25
GDP	3567.4	3510.7	352	13153	2474	2351	209	7617

Source: Stata output

Table 3: Effects of capital account liberalization on FDI

FDI	Overall Liberalization	Liberalization of FDI
CAL	2.03 (3.22)	4.57 (1.85)**
Real interest rates	-0.08 (0.03)**	-0.073 (0.032)**
Real exchange rates	-0.002 (0.003)	-0.003 (0.003)
Inflation	-0.004 (0.002)**	-0.003 (0.002)*
Institutional quality	0.114 (0.309)	0.27 (0.308)
Trade openness	0.156 (0.021)***	0.154 (0.02)***
Constant	-9.33 (2.71)***	-11.61 (2.58)***
Number of observations	234	234
Number of groups	13	13
Adjusted R^2	0.2	0.3
Overall F-statistic	F (6,215)=12	F (6,215)=13

Source: Stata output. Note: ***P<0.01, ** P<0.05,* P<0.1

Table 4: Threshold regression for institutional quality

FDI	Coeff. (Std. Err)
CAL< threshold	3.19 (1.86)*
CAL> threshold	13.87 (2.79)***
Real Interest Rate	-0.07 (0.03)**
Real Exchange Rate	-0.003 (0.003)
Inflation	-0.0033 (0.002)**
Infrastructure Quality	0.66 (0.33)**
Trade openness	0.184 (0.022)***
Institutional Quality	-5.41 (2.51)**
Constant	-19.08 (3.12)***
Number of Observations	234
Number of Groups	13
Adjusted R^2	0.14
F-Statistic(8,213)	13.32

Source: Stata output.
***P<0.01, ** P<0.05,* P<0.1

Table 5: Threshold regression for FDI

FDI	Coeff. (Std. Err)
CAL< threshold	21.16 (4.69)***
CAL> threshold	2.94 (1.87)
Real Interest Rate	-0.05 (0.032)
Real Exchange Rate	-0.002 (-0.003)
Inflation	-0.002 (0.002)
Infrastructure Quality	0.311 (0.35)
Trade openness	0.141 (0.02)***
Institutional Quality	0.05 (0.05)
Constant	-11.77 (2.6)***
Number of Observations	234
Number of Groups	13
Adjusted R^2	0.14
F-Statistic (8,213)	12.55

Source: Stata output.   ***P<0.01, ** P<0.05,* P<0.1

Table 6: Results from System-GMM effect of CAL on FDI

FDI	Coeff.	Std.Err.
FDI_{t-1}	-0.539***	0.088
CAL	29.05***	8.17
Trade Openness	0.202**	0.083
Real Exchange Rate	-0.003	0.006
Real Interest Rate	-0.016	0.079
Infrastructure Quality	2.064***	0.774
Inflation	0.009	0.034
AR (1)	0.001	
AR (2)	0.951	
Sargan OIR	0.075	
DST for instruments	
GMM Instruments for levels:	
Excluding group	0.138	
Dif (null H=exogenous)	0.00	
IV (eq (level)):	
Excluding group	0.002	
Dif (null H=exogenous)	0.46	
Instruments	55	
Observations	221	

Source: Stata output. Note: ***P<0.01, ** P<0.05,* P<0.1. FDI_{t-1} is the lag of FDI. DST: Difference in Sargan Test for Exogeneity of Instruments. Dif: Difference. OIR: Over identifying restrictions test. AR (1) and AR (2) Test statistics for first and second-order autocorrelation.

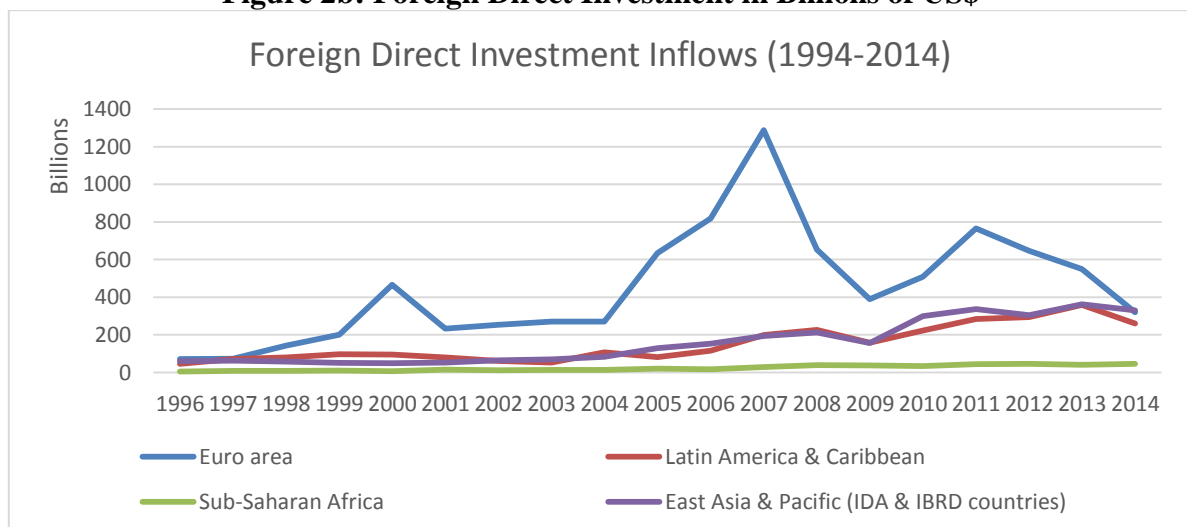# Figure 1: Capital Account Openness Index for SSA Countries
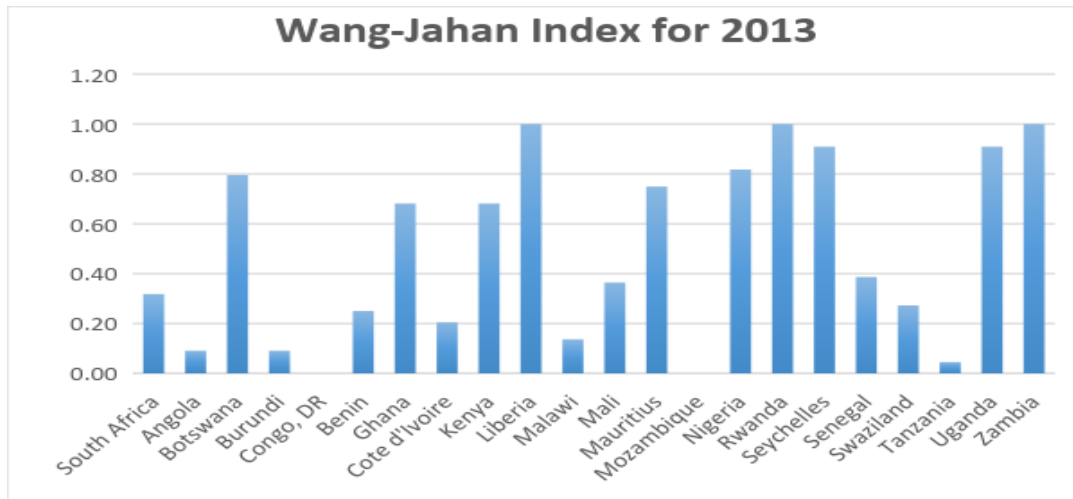
Source: IMF capital account openness database

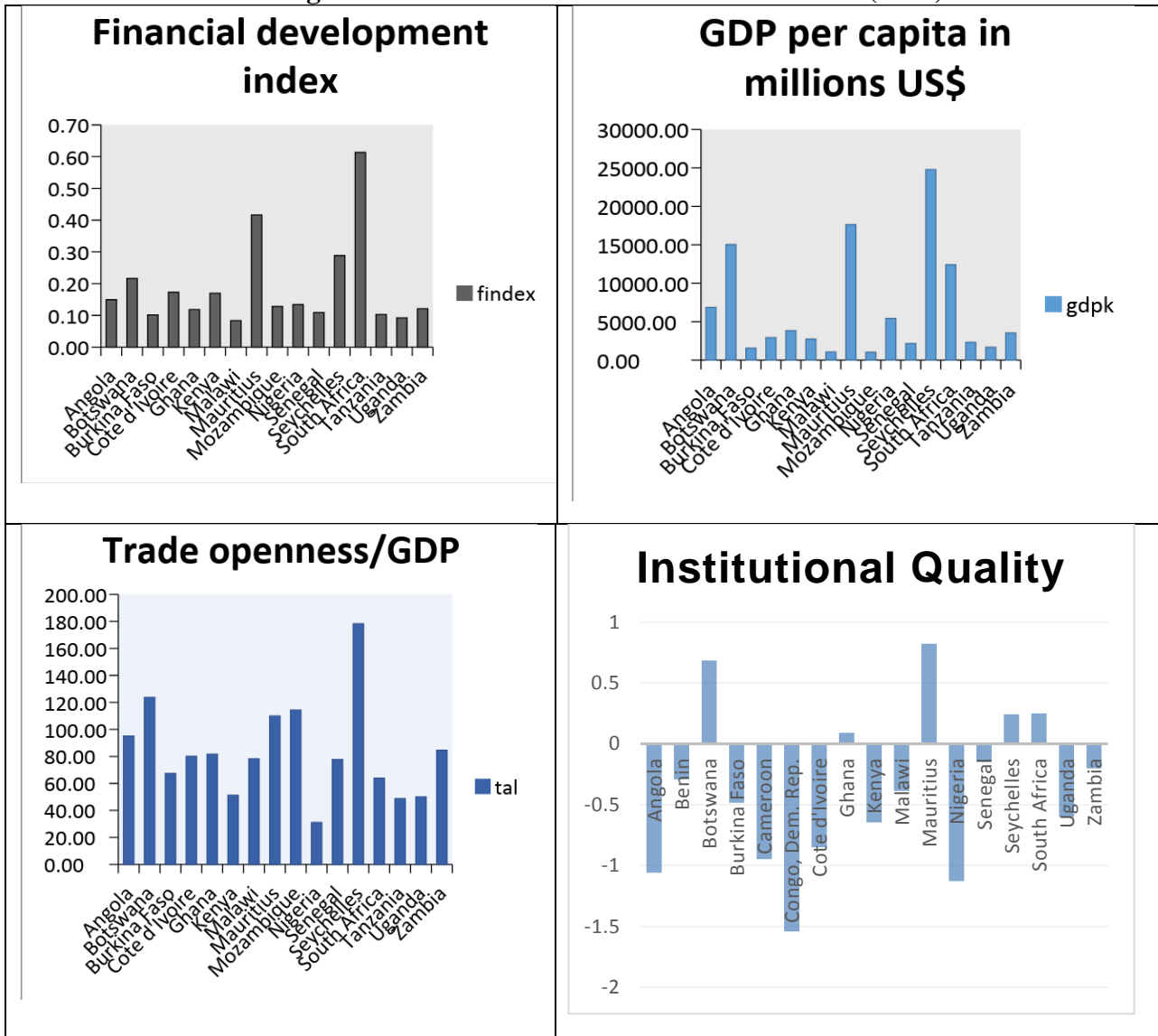# Figure 2: Portfolio Direct Inflows to SSA in Billions of US$
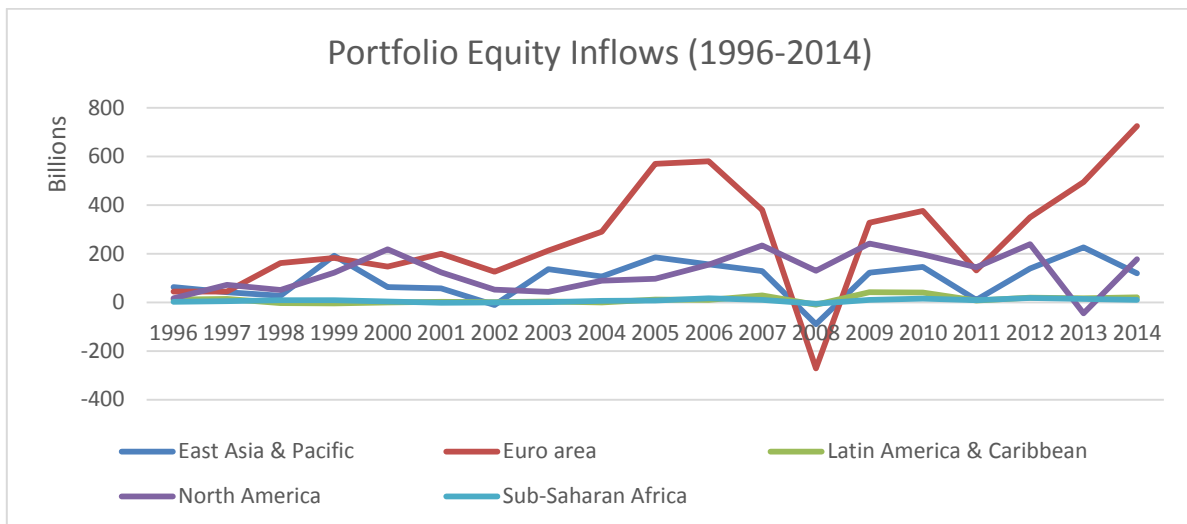
Source: World Development Indicators

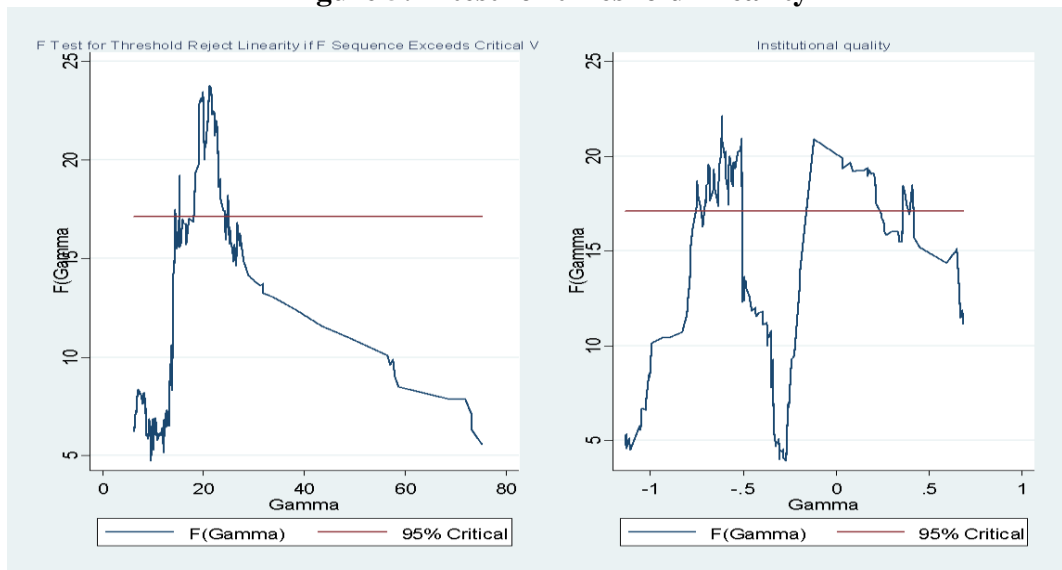# Figure 2b: Foreign Direct Investment in Billions of US$

Source: World Development Indicators

Figure 4: Selected economic indicators for SSA (2016)

Source: IMF and World Bank Development Indicators

Figure 5: F-test for threshold linearity

APPENDICES

A1. Countries sampled in the study

Angola, Botswana, Kenya, Malawi, Mozambique, Mauritius, Nigeria, Rwanda, Seychelles, South Africa, Swaziland, Uganda, Zambia

A2. Summary of Variables Used

Variable	Description	Source
FDI	Foreign Direct Investment Inflows as a share of GDP (%)	World Development Indicators
CAL	Wang-Jahan Capital Account Liberalization Index	IMF capital account openness database
Infrastructure Quality	Index calculated using Principal Components Analysis. Comprised of telecommunications, electricity and sanitation	World Development Indicators
Real Interest Rates	Real Interest Rate	World Development Indicators
Real Exchange Rates	Local Currency Unit to the US dollar (Real)	World Development Indicators
Trade openness	Exports and Imports as a share of GDP	World Development Indicators
Inflation	CPI inflation (end of year average)	World Development Indicators
Financial Sector Development (FSD)	Net Credit to the private sector as a share of GDP	World Development Indicators
Institutional Quality	Average of Voice and Accountability, Political Stability and Lack of Violence, Government Effectiveness, Regulatory quality, Rule of Law and Control of corruption	World Governance Indicators
GDP per capita	Gross Domestic Product per capita	World Development Indicators
External debt as a share of GDP	External debt as a share of GDP	World Development Indicators
Portfolio Equity	Portfolio Equity Inflows in millions of current US dollars	World Development Indicators

Source: Authors compilation. The variables are incorporated in the threshold model in levels.

A3. Findings from the Robustness Tests

	1	2	3	5
CAL	4.5 (1.9)**	4.5 (2.2) **	-5.2 (4.5)	1.3 (0.7)**
Real Interest Rate	-0.1 (0.03)**	-0.07 (0.03)**	-0.04 (0.1)	-0.08 (0.03)**
Real Exchange Rate	-0.003(0.003)	-0.001(0.003)	0.002 (0.01)	-0.002 (0.003)
Inflation	-0.003(0.2)*	-0.003 (0.002)*	-0.0001 (0.004)	-0.004 (0.002)**
Infrastructure Quality	0.2 (0.4)	0.003 (0.4)	-0.51 (0.8)	-0.002 (0.3)
Trade Openness	0.2 (0.02)***	0.14 (0.02)***	-0.04 (0.04)	0.149 (0.02)
GDP per capita	0.0004 (0.00)	-		-
External Debt	0.002 (0.01)	-	-	-
Transport	-	0.008 (0.02)	-	-
Financial sector development	-	-	0.4 (0.12)	-
Constant	-12.57 (2.9)***	-10.98 (3.8)**	-0.58 (5.3)	-6.97 (2.35)
Number of observations	234	210	234	234
Number of groups	13	13	13	13
Adjusted R^2	0.3	0.4	0.3	0.3
F-statistic (8,213)	2.4	8.90	2.4	12.9

Source: Stata output. Note: ***P<0.01, ** P<0.05,* P<0.1.

Note:
1. *Column 1 presents the robustness tests with GDP and external debt included as extra regressors*
2. *Colum 2 presents findings with transport infrastructure employed as a measure of infrastructure quality*
3. *Column 3 presents findings with portfolio equity flows as the dependent variable*
4. *Column 4 presents findings with the Chinn-Ito index employed to measure CAL*