Analysis of Capital Mobility in 37 Sub-Saharan African Countries

By Rajabu Mfumo

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The study findings show that there is low saving-investment correlation in Sub-Saharan African countries, which is consistent with the previous empirical studies that employed the Feldstein-Horoika methodology in less developed countries. This indicates presence of high degree of capital mobility in the region.

The study findings also uncover that foreign aids and international finance play a crucial role in financing domestic investments for Sub-Saharan African countries due to the presence of low saving ratio among the countries in the region with exception to South Africa. The study recommends improvement in domestic savings as well as improving the regional investment environment.

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1. INTRODUCTION

It is well known that mobility of capital plays a crucial role in economic performance for instance; promoting effectiveness of macroeconomic policies (Padawassou, 2012), determining the exchange and tax rates (Levich, 1985), optimize savings and speed up the pace towards stable economic growth (Murthy, 2005). Furthermore, understanding the degree to which country’s domestic investment respond to domestic savings offers crucial insights to policy makers (Payne and Kumazawa, 2005). As such, examining the evolution of capital flows is vital, still most of the recent literatures regarding capital mobility (Drakos et al 2018; But and Morley 2016; Ketenci 2015) have focused on developed countries and few on African Sub-Saharan countries. In spite of massive economic and social changes undergone by the region, of which in one way or another they are likely to affect the levels of capital flows, taking into account the recent world economic crisis that took place on 2007-2009.

Overall, the continent achieved average real annual GDP growth of 5.4% between 2000 and 2010. But growth slowed to 3.3%, or $69 billion, a year between 2010 and 2015. Recently, there have been efforts to promote economic openness in many Sub-Saharan countries; however, there is a noticed gradual decrease in Foreign Direct Investment (FDI) inflows. According to UNCTAD’s World Investment Report (2017), over the period of 2013-2016 FDI flows to Sub-Saharan Africa and Africa in general have been declined by 7% and 3% percent respectively. On the other hand, Also the region suffers largest illicit financial outflows due to poor governance (Ndikumana, Boyce & Ndiaye 2015). According to Fjeldstad et al (2017) if the flight capital would have been invested domestically, state of poverty in Africa would have been reduced by an additional 2.5% annually and also there would have been 5.5% poverty reduction between the year 2002 and 2012. Furthermore, low saving rate is a persistent challenge. According to the African Economic Outlook report (2018) the region experienced gradual decrease of saving rates from the average of 21.7% in 2004 up to 15.9% in 2018 , whereas in 2005 the World Bank estimates shows that the region marked the lowest saving rate than the rest of the underdeveloped such as South Asia, and East Asia. The region accounted for the saving ratio averaged about 18% of the GDP compared with 43% and 26% in East and South Asia respectively. Also, some of the donor countries and international organizations have started to cut aids to developing countries including those located in Sub-Saharan Africa and this have possibly affected capital movements as recently suggested by But and Morley (2016).

Furthermore, in accordance with Global Financial Index (2017), increased financial inclusion through digital technology have expanded the possibilities of accessing financial services for the unbanked adults in Sub-Saharan Africa. The report indicates that about 21% of adults in the region own a mobile money accounts, the highest share of any region in the world. Notably, the ongoing financial technology evolution have delivered big benefits including the increase in savings for some of the countries in the region. This can be evidenced by the study of Jack and Suri (2014), that was carried out in Kenya, the study found out that access to mobile money services enabled the women-headed households to increase their savings by more than a fifth:

The present paper applies Feldstein and Horoika framework to investigate the evolution of capital mobility using the most recent set of data ranging from the period of the year 1980 - 2015 that covers 37 Sub-Saharan countries for the purpose of understanding whether the results of the previous studies regarding capital mobility are still valid or not as well as providing additional empirical evidence. Also, the study assesses the driving forces behind the existing level of capital mobility...
flows. In addition, the study incorporates other factors which are found to have an influence on variation of the level of capital mobility especially for underdeveloped countries. Such factors include foreign aids, current account balance and trade openness.

II. Literature Review

The Feldstein-Horoika model is the most prominent approach when it comes to testing the level of capital mobility through examining the correlation between investment and savings. Using data from the year 1960-1974, (Feldstein Horoika 1980) carried out the study in 16 OECD countries and found that there was high correlation between savings and investments. He obtained the slope coefficient of about 0.88, which indicates the low degree of capital mobility. The results observed were surprising because the OECD countries were perceived to have the high level of capital flows due to higher degree of financial integration attained by the countries in the region, volume of trade among OECD countries as well as higher rate of investments. Other Economists considered this model to be contrary to the economic theories, for that reason others termed it as “the mother of all puzzles” (Obstfeld and Rogoff, 2000). Following the study by Feldstein Horoika many other studies (Dooley 1984; Frankel 1985; Obstfeld 1985) were carried out to test and explain the puzzle. However, there have been mixed results for the previous studies carried out in both developed and underdeveloped countries. This study focuses on reviewing the studies that employed panel data and cross-section methods for testing the correlation between savings and investment. For convenience sake, this study categorized the literatures into three parts namely;

i. Studies based on developed economies.

ii. based on developing economies.

iii. Studies based on both developed and developing economies.

a) Studies based on Developed Economies

Feldstein (1983) once again examined savings and investment relationship for OECD countries by extending the sample period for five years from 1960-1979 period, contrary to his previous study with Charles Horoika that covered the period of 1960-1974. The purpose of re-examining the extent of capital mobility in OECD countries was to capture the effects of various events that happened within that timeframe. For example, the effects of OPEC dramatic increase of prices in 1973 that begun to alter industrial nations current account deficits, the ending of interest equalization tax on foreign borrowing in 1974 by United States, which lowered the needs to borrowing abroad by United States multinationals for the purpose of financing their overseas investments. The study estimated saving retention of about 0.86 which implies low level of capital mobility. The result obtained by Feldstein (1983) corresponds to what was previously obtained by Feldstein and Horioka (1980).

However, Frankel (1991) challenged that high correlation between investments and savings is not necessarily a sign of low level of capital mobility, sometimes savings-investments correlation can be high for the other reasons which have nothing to do with the extent of capital mobility. Bayoumi (1990) argued that government policies targeting the current account of a country have been an important factor that exerts influence on the unitary correlations between savings and investment. Obstfeld (1985) argued that population growth can result in strong saving - investment correlation. Ozmen (2007) stated that the fixed rate exchange regime can influence the strong correlation between savings and investment. Tesar (1991) argued that the existing correlation between saving and investment is due to the fact that both saving and investment tend to react to some common conditions such as productivity shocks and low integration of international goods markets. Finally, omission of some of the variables driving both saving and investment such as interest rates, the terms of trade, growth and demographic variables might have significant effects on saving investment relationship.

Many other studies regarding capital mobility have been carried out in the OECD countries in order to test the validity of the work of Feldstein and Horoika. Some of those studies include, Frankel et al. (1986), who conducted a study in 64 countries from around the world, 50 developing countries and 14 developed countries. They categorized the two groups of countries into two periods 1960-1973 and 1974-1984, and tested Feldstein-Horoika approach. The findings showed that savings and investment are highly correlated in developed countries than for developing countries. This implies that the level of capital mobility is high in developing countries in comparison to developed countries. They also concluded that their results cast doubt as to whether the capital markets are well integrated. However, they found out that the capital is mobile in developing countries. 

One of the most current and comprehensive studies on saving–investment relationship is that of Petreska and Blazevski (2013). They examined the strength of correlation between domestic savings and domestic investment in transition countries by dividing them into three groups of countries namely, Central and Eastern Europe (CEE), Commonwealth of Independent States (CIS) and South East Europe (SEE). For the period of 1991–2010 the study established that the puzzle of Feldstein Horoika was valid for all three groups. However, Frankel’s (1991) argument that high correlation is not necessarily an indication of low level of capital mobility, sometimes savings-investments correlation can be high due to other reasons which have nothing to do with the extent of capital mobility. Petreska and Blazevski (2013) argued that population growth can result in strong saving - investment correlation. Ozmen (2007) stated that the fixed rate exchange regime can influence the strong correlation between savings and investment. Tesar (1991) argued that the existing correlation between saving and investment is due to the fact that both saving and investment tend to react to some common conditions such as productivity shocks and low integration of international goods markets. Finally, omission of some of the variables driving both saving and investment such as interest rates, the terms of trade, growth and demographic variables might have significant effects on saving investment relationship.

The studies based on both developed and developing economies that have been carried out are summarized below: 

1. Studies based on both developed and developing economies
   a) Studies based on Developed Economies
   b) Studies based on Developing Economies
   c) Studies based on both developed and developing economies

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increase in the value of the saving retention coefficient for the panel that consisted of richer and larger countries. This was partly due to the fact that as countries become richer and bigger they generate enough savings to finance their domestic investment and ultimately decrease the needs to borrow externally.

The most recent study based on the industrialized economies is that of Drakos et al. (2018), the study examined the correlation that exists between savings and investment in 14 European Union (EU) countries for the period of 1970-2015 and obtained saving-retention coefficient of 0.6 which is statistically significant. It is important to note that their study included globalization as one of the variables explaining the level of investment. Findings of their study indicate the existence of moderate capital mobility in EU zone. Moreover, they concluded that the Feldstein-Horoika model is partially valid for the panel of 14 EU countries. However, the study by Coakley (2004) noted lower saving retention of around 0.3 compared to this study, the possible explanation for this might have been the differences in the variables included by these two studies. As the study by Drakos et al. (2018), included the level globalization as one of the variables influencing investment but this factor was not included in Coakley (2004) study.

b) Studies based on both Developed and Developing Economies

Bahmani and Chakrabarti (2005) used Feldstein-Horoika puzzle to investigate the strength of the saving-investment relationship for the period of 1960 – 2000 in 126 countries. They employed the panel data regression techniques and their result show the savings retention coefficient of 0.54 to 0.69 which implies the existence of low level of capital movements. The study recommended that the country size had a significant effect on the strength of saving-investment correlation. They pointed out that countries with higher income levels are expected to have higher savings retention coefficient compared to the countries with low and middle incomes. The findings also revealed that countries that are taking part in international trade are likely to have a weaker savings-investment correlation compared to the countries that are not actively participating.

Dzhumashev and Cooray (2017) undertook the study to estimate capital flows for the panel of 116 countries disaggregated into Sub-Saharan Africa, OECD, Middle East, South Asia and North Africa also East Asia and pacific. The study revealed the savings retention coefficient of 0.32 for OECD panel, which is in line with the results of Feldstein and Horoika, 0.11 for East Asia and the Pacific. Where, Sub-Saharan Africa recorded the lowest savings retention coefficient of 0.01. However, the results reject the null hypothesis of perfect capital mobility for Sub-Saharan Africa. The paper obtained the low saving – investment coefficient ratio for all regions, except for the OECD panel which is constituted by high income countries. Moreover, savings-investment relationship is obtained in the Middle East, South Asia as well as North Africa was not statistically significant. Furthermore, it is important to note that their study included South Africa in a panel group of Sub-Saharan Africa which was used for estimation of capital flows. Other studies that included South African in estimation panel for emerging economies include the studies of the Chang and Smith (2014), and the work of Herwatz and Xu (2010).

c) Studies focused on Developing Economies

Padawassou (2012) carried out a study in 22 African countries by the use of Feldstein Horoika framework to examine the extent of capital mobility using time series and dynamic heterogeneous panel approach. His empirical findings revealed that the saving rate coefficients were higher for some countries and at the same time lower for the other countries. This implies that the level of capital mobility was found to be lower and higher at the same time. Therefore, his results violated the findings obtained by Feldstein-Horoika, which holds that less developed countries have a high degree of capital mobility. Furthermore, the saving retention coefficient results documented by a panel data results are estimated to be 0.542, this indicates a moderate extent of capital mobility, thus he concluded that the Feldstein Horoika puzzle does not hold valid for African countries. Also, Cooray and Sinha (2005) using a sample of 20 African countries to examine saving-investment relationship. Their study found out a weak saving-investment correlation, this implies that investments are not largely financed by domestic savings.

Islam et al. (2015) utilized Feldstein Horoika model to estimate the capital mobility level in 40 developing countries over the period of 1960 – 2013, by the use of panel data regression analysis. This study results revealed the existence of capital mobility in developing countries by reporting the obtained slope coefficient value of about 0.27. Moreover, the level of capital mobility they documented was much higher than that originally obtained by Feldstein and Horoika. Their study also noted the presence of restrictions on capital movements in some of the developing countries. For example, Zimbabwe imposed capital controls during the period of hyperinflation in 2008 for the purpose of limiting the considerable amount of funds that were moving outside the country (Pettinger, 2016). Furthermore, the attained degree of capital mobility which is much higher compared to that of the past decade has been strongly attributed by the effects of higher degree of globalization as well as economic integration.
There have been innovations in the Feldstein Horoika framework in order to take reality of the African economies by introducing other explanatory variables that exert an influence on investment such variables include openness, current account balance and foreign aid.

One of the few studies that focused exclusively on Sub-Saharan Africa and incorporated additional variables include that of the De Wet and Van Eyden (2005), they applied the Fixed Effects and Random Effects techniques to study savings-investment relationship in 36 Sub-Saharan countries over the period ranging between 1980 – 2000. Their study reported existence of capital mobility as reported by previous studies conducted in the region. They documented savings retention coefficient of 0.314, 0.286 and 0.349 by using pooled model, random effects and fixed effects techniques respectively. Furthermore, they found out that, South Africa had a crucial role to play in promoting capital mobility across the region given the nature of its economy, which is quite different from the rest of the countries within the region in terms of growth and market attractiveness.

Payne and Kumazawa (2005), used a sample of 29 Sub-Saharan African countries for the data set ranging between 1980 –2001, and employed pooled OLS, Fixed Effects and Random Effects methods to measure mobility of capital. They found that there was a low savings coefficient as indicated by the previous studies focused on developing countries. They also noticed that there was an ongoing increase in the extent of capital mobility enhanced by the increase in the level of investment which resulted from foreign aid and openness to trade. Moreover, they revealed that insertion of country-specific effects by the use of Fixed Effects and Random Effects models led the savings retention coefficient to range between 0.209 and 0.243 and that they are significant at the 1 percent level. The weak savings- investment correlation in the region could be explained by the number of factors which have a positive effect on investment such as foreign aid, and the degree of economic openness (Isaksson, 2001) and financial structures of the developing countries (Kasuga, 2004).

Cyrille (2010) used time series and panel data analysis techniques to test Feldstein Horoika puzzle accounting for correlation between inward and outward capital movements in 15 Sub-Saharan Africa over the period of 1980-2000. The findings supported earlier findings on the existence of low saving-investment correlation in case of developing countries. They obtained saving-investment coefficient that moves from 0.208 to 0.125 and 0.237 to 0.168 for 3 and 5 years averages respectively. Moreover, they pointed out that the reason for downward movement of saving retention coefficient documented by the previous studies focused in developing countries resulted from omission of some relevant factors that impact investment positively such as foreign aid and trade openness. The study also recommended the development of efficient financial market in order to assist portfolio diversification.

In this paper the number of countries included in the sample is enlarged to 37 Sub-Saharan African countries. Also, the study used the most recent set of data ranging from 1980-2015 to capture the evolution of capital mobility in the region and draw more accurate conclusions as well as suggesting meaningful policy recommendations for the countries involved in the sample.

III. Methodology

This paper seeks to investigate the level of capital mobility in 37 Sub-Saharan African countries using Feldstein and Horoika approach. Three different panel estimation techniques which are Pooled OLS, Random Effects and Fixed Effects were employed in estimating the extent of capital mobility. The advantages of utilizing panel data are twofold. First, the technique provides less bias, robust and more efficient estimation results (Balaghi, 2005). Second, the use of Fixed Effects model permits capturing of individual country heterogeneity (Gujarati and Porter, 2009). Finally, this study runs The Hausman Test in order to check the suitability of Fixed Effects and Random Effects (Hausman, 1978).

a) Data

The study employed a data set ranging for the year 1980-2015. The annual data for all of the variables namely; investment, savings, current account balance, foreign aid and economic openness are taken from the World Bank Development Indicators database. Moreover, conversely to the previous studies carried out in Sub-Saharan African region the sample period covered by this study incorporates the period of recent financial crisis 2007-2009. For the list of countries included in the sample and variables employed in this study, see Appendices A1 and A2.

Testing for panel unit roots is one of the standard practices in contemporary panel data econometrics. Panel unit root tests are employed to determine whether the variables are stationary or otherwise because it is necessary to assess the order of integration in any data series that involve time series data. This study used IPS unit root test as proposed by Im, Pesaran and Shin (1999). Application of the IPS test has showed all variables are stationary in levels, allowing the study to employ stationary panel data techniques.

b) Panel Estimation

The panel data techniques were utilized in investigating the level of capital mobility using the model proposed by Feldstein and Horoika (1980). Their model
was based on investigating the existing correlation between savings and investment in OECD countries. To accomplish their study objectives, they estimated the following equation:

\[ IY_i = i + SY_i + i \]

However, due to existing differences in economic context between OECD and Sub-Saharan African countries, this study applies modified form of equation as in the study of De Wet and Eyden (2005) in order to capture the realities of African countries economies and consequently obtain a robust estimation. Hence, this study employs the following equation:

\[ IY_{it} = i + SY_{it} + CAY_{it} + AidY_{it} + Open_{it} + \text{SA Dummy} \]

Where \( IY_{it} \) denotes the ratio of gross domestic investment to GDP ratio in country \( i \) at time \( t \), \( SY_{it} \) present domestic saving to GDP ratio, \( CAY_{it} \) stands for current account to GDP ratio and \( AidY_{it} \) is the ratio of aid to GDP. De Wet and Eyden (2005) included aid and current account variables in order to have a deeper insight into the contribution of foreign aids and international assistance on saving behaviour and also make provision for foreign investment funds influenced by the current account. Previous studies apart from that of De Wet and Eyden did not include the current account and the foreign aid variables in one equation to avoid multicollinearity. Furthermore, insertion of the openness into the model is important since it could have significant positive effect on the extent of capital flows as suggested by Younas and Chakraborty (2011), they argued that financial liberalization offer bigger opportunities for domestic savings to finance investment projects that provide the highest marginal returns in the world. Therefore, empirical models that do not take into account for financial openness would possibly face an upward bias on saving-investment coefficient.

As in De Wet and Eyden (2005) the model involved two interactive dummy variables. Interactive dummy for South Africa (SA) formed by multiplying the saving rate of each country by South African dummy variables in order to take into account the fact that South African economy is on different levels from the rest of the Sub-Saharan African countries. Therefore, it may possibly have dissimilar level of capital mobility and saving behaviour because it possesses some economic characteristics of a developed country. Therefore, if saving behaviour differences for South Africa is not well controlled then it can boost the saving rate coefficient for the rest of the region.

Following De Wet and Eyden (2005), the time interactive dummy (\( \delta \)) is created by multiplying a time trend with the saving rate of each country, the aim of introducing interactive dummy variable is to capture the changes taking place in the saving rate for the time period so as to assess the policy changes aimed at promoting capital mobility. Where, 6 is negative it indicates that there is a decrease in saving rate each year, and capital is becoming more mobile therefore, implemented policy changes are effective, while positive value of 6 implies that there is an increase in saving rate each year and capital is becoming more immobile. The heterogeneity of the country is captured by the country-specific coefficient \( \alpha_i \).

### IV. Empirical Results

In estimating the level of capital mobility in 37 Sub-Saharan African countries over the period of 1980-2015, panel data estimation techniques are employed; particularly pooled, random effects and fixed effects. See Table 1 for the estimates from pooled, fixed effects and random effects models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pooled Effects</th>
<th>Fixed Effects</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.156 (0.000)***</td>
<td>0.164 (0.000)***</td>
<td>0.165 (0.000)***</td>
</tr>
<tr>
<td>( \left( \frac{S}{Y} \right)_{it} )</td>
<td>0.231 (0.000)***</td>
<td>0.086 (0.000)***</td>
<td>0.101 (0.000)***</td>
</tr>
<tr>
<td>( \left( \frac{CA}{Y} \right)_{it} )</td>
<td>-0.249 (0.000)***</td>
<td>-0.233 (0.000)***</td>
<td>-0.233 (0.000)***</td>
</tr>
<tr>
<td>( (\text{Open})_{it} )</td>
<td>1.79 (0.911) *</td>
<td>-1.67 (0.922) *</td>
<td>-7.91 (0.963) *</td>
</tr>
<tr>
<td>( \left( \frac{\text{Aid}}{Y} \right)_{it} )</td>
<td>0.073 (0.000)***</td>
<td>0.135 (0.000)***</td>
<td>0.121 (0.000)***</td>
</tr>
<tr>
<td>SA Dummy</td>
<td></td>
<td>-0.037 (0.5791)</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.601</td>
<td>0.516</td>
<td>0.139</td>
</tr>
</tbody>
</table>

Note: P-values reported in parentheses.
The Random effects model

The random effects model, revealed the presence of significant low saving rate coefficient of 0.100849 (0.101) as depicted from Table 1. Moreover, this results in Feldstein and Horoika model would imply the presence of capital mobility in the region. Furthermore, the random effects model demonstrated that financial aid is significant on generating investment with the coefficient of 0.121 compared to that of the fixed effects model which was 0.135. The time dummy implies that the degree of capital mobility has increased from 1980. On the other hand, capital account ratio coefficient shows that there is an inflow of investment fund into the Sub-Saharan region.

On the other hand, Hausman test results are insignificant which implies it is in favour of the random effects models, See Appendix A3 for the Hausman Test Results.

V. Conclusion

This paper re-examines the capital mobility level in 37 Sub-Saharan African countries over the period of 1980-2015 taken into account the recent financial crisis of 2007-2009. Based on panel data estimation techniques, the empirical results indicate the presence of low saving rate coefficient in Sub-Saharan African countries which implies presence of high degree of capital mobility in the region. This result is in line with the previous empirical studies that employed Feldstein-Horoika approach to estimate the extent of capital mobility in the region by the use of panel data econometric modelling. It includes the study by De Wet and Van Eyden (2005), and that of Payne and Kumazawa (2005).

However, existence of a robust low saving investment correlation might be due to the fact that there is excessive consumption of foreign aids by these countries in financing their domestic investment. More than that, low saving rate among the Sub-Saharan African countries is another cause of the weak correlation between savings and investments. This is due to low capacity of these countries in generating adequate domestic savings to meet their domestic investment. Also, economic openness is favourable to higher levels of investment. Since the wave of structural adjustments in the 1980s, many least developed countries have undergone economic reforms including opening their economies to international trade and international investment; therefore, such actions are more likely to have an influence on the degree of capital movements in the region. Moreover, targeting current account can have a significance influence in the level of capital mobility.

In this light, the policy makers in Sub-Saharan countries should place more emphasize on boosting the level of domestic savings in order to generate adequate funds for financing domestic investment and move away from dependence of foreign aids. Because, the region loses considerable amount of financial resources that are not deposited in savings. This is achieved through transfer pricing, tax evasion and capital flight.

Moreover, because the region seems to depend much on foreign investments, the Sub-Saharan African countries should ensure they provide protection for available investors by placing adequate efforts on maintenance of existing laws and regulations in order to attract financial inflows, because in the countries with no protection for investors as well as poor maintenance of laws and order seems to be less attractive to investors. A good case for this could be Zimbabwe, where capital flight has been coupled as a result of exercising its indigenisation law.

Because the results indicate that the domestic savings are largely financed by foreign investment, then there is an importance of analyzing macroeconomic policies, particularly taxes that are levied on foreign investments, as investors normally prefer to invest in countries with better yields. Therefore, if taxes levied on capital investments are very high in relation to the other...
parts of the world, it is likely to; discourage financial inflows in terms of investments. However, transparency and policy consistence still remain as the key factors for attaining investors’ confidence.

References Références Referencias


**Appendix**

A 1: List of countries included in the sample

<table>
<thead>
<tr>
<th>Country</th>
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</tr>
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<tbody>
<tr>
<td>Benin</td>
<td>Mali</td>
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<td>Botswana</td>
<td>Mauritania</td>
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<td>Burkina Faso</td>
<td>Mauritius</td>
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<td>Burundi</td>
<td>Mozambique</td>
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<td>Namibia</td>
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<td>Central African Republic</td>
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<td>Rwanda</td>
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<td>Sao Tome and Principe</td>
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<td>Gambia</td>
<td>Seychelles</td>
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<td>Ghana</td>
<td>South Africa</td>
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<td>Guinea-Bissau</td>
<td>Swaziland</td>
</tr>
<tr>
<td>Kenya</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Lesotho</td>
<td>Togo</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Uganda</td>
</tr>
<tr>
<td>Malawi</td>
<td>Zambia</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td></td>
</tr>
</tbody>
</table>

A 2: List of Variables

<table>
<thead>
<tr>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aid</td>
<td>Net official development aid (ODA) from all donors as a ratio of gross domestic product</td>
</tr>
<tr>
<td>CA</td>
<td>Current account balance as a ratio of gross domestic product</td>
</tr>
<tr>
<td>IR</td>
<td>Gross capital formation (Gross domestic investment) as a ratio of gross domestic product</td>
</tr>
<tr>
<td>Open</td>
<td>Measurement of the degree of openness of the economy to international trade calculated as ((X/GDP+(M/GDP))/2) with X and M total exports and imports and GDP gross domestic product</td>
</tr>
<tr>
<td>SR</td>
<td>Gross domestic saving as a ratio of gross domestic product</td>
</tr>
</tbody>
</table>

A 3: Hausman Test Results

**Correlated Random Effects**

Method: Hausman Test  
Date: 06/28/18   Time: 10:40  
Sample: 1980 2015  
Pool: POOL 1

Test Cross-sections random effects

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi- square Statistic</th>
<th>Chi-sq. d.f.</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>2.828185</td>
<td>4</td>
<td>0.5870</td>
</tr>
</tbody>
</table>

Cross-section random effects test comparisons

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fixed</th>
<th>Random</th>
<th>Var (Diff.)</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>0.102588</td>
<td>0.100848</td>
<td>0.0000013</td>
<td>0.6314</td>
</tr>
<tr>
<td>CA</td>
<td>-0.236946</td>
<td>-0.233293</td>
<td>0.000009</td>
<td>0.2146</td>
</tr>
<tr>
<td>OPEN</td>
<td>-0.000000</td>
<td>-0.000000</td>
<td>0.000000</td>
<td>0.9644</td>
</tr>
<tr>
<td>AID</td>
<td>0.123837</td>
<td>0.120620</td>
<td>0.000007</td>
<td>0.2296</td>
</tr>
</tbody>
</table>