Capital Mobility in African Countries

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Abstract

It is well known that one of the important aspects of achieving sustainable development is to preserve macroeconomic stability, which is closely related to the extent of capital mobility. Given the importance of the subject for open economies, this paper examines the degree of capital mobility for African countries by using among other methodologies the Feldstein- Horioka coefficients. To determine those coefficients, we use time series data and methods, along with the Dynamic Heterogeneous panel approach. We find significant cross-country heterogeneity in the dynamic of income per capita, investment rate, and saving rate; and conclude that it is invalid to pool data across our sample countries. Furthemore, the empirical findings reveal that for African countries included in the sample, the estimated saving retention coefficients are at the same time, small and high indicating respectively higher and lower degrees of capital mobility and therefore, challenging the results of Feldstein – Horioka on developing countries.

Keywords: capital mobility, F-H puzzle, heterogeneity, panel unit roots, Johansen Maximum Likelihood (ML) approach

1. Introduction

To achieve sustainable development, it is quite important to sustain macroeconomic stability, which is closely related to the extent of capital mobility allowed by an economy. For this reason, measuring the level of capital mobility is an important task to achieve. While higher capital mobility was encountered as one of the reasons behind the recent worldwide financial crisis, the subject is also important for policy and firms for a number of reasons; (i) the effectiveness of macroeconomic policies is closely related to the degree of international capital mobility; (ii) higher international capital mobility helps firms to allocate resources efficiently and achieve risk diversification; (iii) higher international capital mobility may also increase volatility which may end up with financial crisis. For example, the global financial crisis began in the USA and spread to Europe and then to the whole world. Therefore, we realize that devastating effect of global financial crisis is more important in developed countries than developing countries.

In the economics literature, the presence of capital mobility is tested alternatively by using the saving-investment correlation, interest parity condition, and finally the consumption – smoothing approach to the current account. In this regard, one of the famous international macroeconomic hypotheses that is concerned with the presence or absence of mobility of capital is the Feldstein-Horioka Hypothesis (1980), which states that in the absence of capital mobility, domestic saving and investment are highly correlated since investment is financed by domestic saving. On the other hand, provided that saving depends on the inter-temporal consumption decision and capital is highly mobile in an open economy, domestic savings will be globally very responsive to higher real rate of return and thus the country can finance its investment by foreign savings. Contrary to the maintained assumption that in the developed countries, which are generally open-economies and where capital is highly mobile, Feldstein-Horioka (1980) presented econometric evidence showing that in a cross-section consisting of 16 OECD countries for the period 1960-1974, saving and investment are highly correlated indicating that capital is not mobile. Hence this finding is known as the Feldstein- Horioka (F-H) Puzzle. The present paper attempts to employ time series data and methods, along with the Dynamic Heterogeneous panel approach, to empirically assess the validity of the F-H puzzle using a panel of 22 African countries. In compliance with the interpretation made by F-H, small coefficients will be seen as high capital mobility.

The remaining of this paper is organized as followed: in section 2 we set up the literature review on international capital mobility; in section 3 we provide the sources of Data; in section 4 we give evidence of heterogeneity; in section 5 we outline the estimation methods; in section 6 we spread out the results and conclude in section 7.

2. Literature Review

The prevalence of capital mobility among countries has many interesting economic implications for optimization of savings, efficacy of fiscal and monetary policy actions and the speed of convergence of countries to the steady-state economic growth. Given the importance of the subject for open economies, a number of different empirical methodologies (saving-investment correlation, interest parity condition, and the consumption –smoothing approach to the current account) were developed aiming to measure the extent of capital mobility. The F-H model has found widespread use in the empirical literature because the model is simple as well as providing an intuitive explanation for the level of capital mobility.

Using data over 1960-74, F-H (1980) found that the savings-retention coefficient is very close to one for 16 OECD countries, implying low capital mobility. Since then, an enormous literature has accumulated to test the F-H puzzle and explain the puzzle. In general, the empirical literature on the subject provides mixed results for both developed and developing countries.

A survey of the literature in this area reveals that there have been many empirical attempts to test the F-H Puzzle (hereafter, FH-puzzle) for OECD countries; Murthy (2005), Coakley, et al. (2004), Hoffman (2004), Sinha (2004), Ho (2003), Banerjee and Zanghieri (2003), Obstfeld and Rogoff (2000), Coakley, et al. (1998) and Jansen (1996, 1998)) and a recent study on the Asian economies by Kim et al. (2005). Ozmen (2005), Bahami-Oskooee and Chakrabarati(2005), and Sinha and Sihna (2004) find that the correlation between saving and investment is high in larger economies.

Some studies test the puzzle for developing countries and found out that the saving retention coefficient is small, indicating that the level of capital mobility is high in these countries (Payne and Kumazawa, 2006; Apergis and Tsoumas, 2009; Coakley et.al., 1999). On the contrary, other studies provide evidence that capital mobility is low in developing countries (Murthy, 2008; Ghosh and Ostry, 1995). While Wong (1990) argues that the high capital mobility observed in developing countries can be attributed to the size of the non-traded sector, Kasuga (2004) argues that small-sized and inefficient financial mechanisms in developing countries lead to high capital mobility.

Bangake and Eggoh (2010) mention the importance of the legal protection system provide for investors in relation to capital mobility. They tested the F-H puzzle for 37 African countries using the panel cointegration technique and found that savings and investment are a non-stationary and cointegrating series. Their estimation results indicate that capital mobility is higher (0.34) in countries with strong legal protection of investors than in countries with worse protection (0.85). Overall, the test of the F-H puzzle for the developing countries, including Middle East countries, shows high capital mobility because the magnitude of foreign aid and the extent of the non-traded sector are high in these countries and they have weak financial markets and are relatively open economies (Apergis and Tsoumas, 2009).

Studies which exclusively deal with capital mobility in Sub-Saharan Africa, have been undertaken by Payne and Kumazawa (2005) and De Wet and Van Eyden (2005). These afore-mentioned studies use the panel data for the period 1980-2000, but they do not undertake time series data and methods, along with the Dynamic Heterogeneous panel approach to deal with the concerns surrounding the panel and cross-country regressions. In order to fill in the void, the present paper attempts to employ time series data and methods, along with the Dynamic Heterogeneous panel approach to empirically assess the validity of the F-H puzzle using a panel of 22 African countries over a minimum of 28 (Gabon) to a maximum of 40 (South Africa) years.

3. Data

This paper attempts to investigate the relationship between investment rate and saving rate to measure the level of international capital mobility for African countries. The heterogeneity in the sample period across countries is mainly due to the lack of data. Data on gross savings as share of GDP and gross investment as share of GDP are obtained from Online World Development indicators data base, 2010. Data frequency, determined simply by data availability, is annual and the sample period is: 1974 – 2005 for Madagascar, Senegal, and Togo; 1974 – 2008 for Benin; 1975 – 2006 for Ghana; 1975 – 2007 for Mali; 1975 – 2009 for Botswana, Cote d'Ivoire, Kenya, and Morocco; 1976 – 2009 for Mauritius, Seychelles, and Tunisia; 1977 – 2009 for Egypt, Sierra-Leone, and Sudan; 1978 – 2005 for Gabon; 1978 – 2007 for Congo; and 1980 – 2009 for Mozambique and Uganda.

In table 1 where descriptive statistics of data are plotted, Botswana is the fastest growing economy (4.9% growth of real capita income per annum) and Cote d'Ivoire the slowest (- 1,6%). Comparing performances between the first 5 years and the last 5 years for each country, Uganda has the highest growth rate of savings while Mozambique the lowest. The saving rate of Uganda grows about 233% and that one of Mozambique falls off about 282%. At the same period, the investment rate of Uganda has grown about 209% and the investment rate of Mozambique about 72%. These performances are far away bigger than the whole sample performances which are about 13.2% for saving rate and 18.2% for investment rate.

Table 1. Summary statistics

Country	Growth of Real per capita GDP	Gross Investment as share of GDP (S/Y)			Gross Savings as share of GDP (I/Y)		
		F 5-Y	L 5-Y	SMV	F 5-Y	L 5-Y	SMV
Benin	0.005	17.600	19.625	16.980	11.316	9.244	7.941
Botswana	0.049	36.544	26.519	30.091	26.374	34.942	35.095
Cameroon	0.006	27.286	18.002	20.022	10.740	17.623	15.890
Congo, Rep.	0.015	39.391	24.426	27.717	23.292	13.951	15.923
Cote d'Ivoire	-0.016	26.099	9.825	14.578	18.775	11.506	9.709
Egypt	0.028	30.140	19.841	23.580	21.934	21.745	22.463
Gabon	-0.009	33.368	23.976	29.100	44.018	36.221	33.206
Ghana	0.007	8.917	24.330	15.448	9.674	19.890	12.297
Kenya	0.005	21.986	19.033	20.139	17.494	15.570	18.160
Madagascar	-0.014	8.519	19.246	12.504	5.976	12.382	5.697
Mali	0.016	15.173	22.619	20.025	9.150	13.462	11.008
Mauritius	0.035	28.567	24.912	25.927	18.945	17.846	22.668
Morocco	0.022	27.404	32.960	25.832	16.522	31.902	23.099
Mozambique	0.023	10.366	17.826	17.987	-3.698	6.731	3.877
Senegal	0.002	16.461	21.395	16.030	11.836	15.246	8.128
Seychelles	0.022	38.695	25.999	28.427	35.512	3.447	21.567
Sierra Leone	0.001	15.133	15.044	10.588	5.390	8.486	5.722
South Africa	0.003	28.171	20.060	20.832	25.588	14.647	20.030
Sudan	0.017	15.510	28.018	17.233	6.004	15.667	6.889
Togo	-0.006	31.189	18.837	21.079	37.026	8.238	16.656
Tunisia	0.027	30.150	24.694	27.302	24.917	21.365	22.852
Uganda	0.026	7.281	22.482	15.277	5.603	18.636	12.507
Average Change	0.012	0.182			0.132		

Growth of Real Per Capita GDP indicates the average annual growth rate over the sample period. Subscripts F5 – Y and L5 – Y denote mean values of the first 5 years and the last 5 years of the sample for each country, subscript SMV denotes the sample mean value. The average change in the last raw is calculated as: $\sum_{1}^{22} \left(\left(X_{L5-Y} - X_{F5-Y}\right) / X_{F5-Y}\right) / 22$ where X represents (S/Y) and (I/Y).

Generally, countries which have positive rate of saving have also positive rate of investment. But this is not a rule since Benin has negative rate of saving and at the same time positive rate of investment. Similarly, Botswana and Cameroon which have positive rate of savings hold negative rate of investment.

4. Heterogeneity

Our sample is composed of low and middle income countries. From table 1 were data statistics are plotted, countries represent different stage of development, different investments, and different savings policy. As there is concern of growth, saving, and investment about the panel and cross-section tests, it is necessary to previously test whether it is valid to pool data set of these economies. Formal tests of the dynamic heterogeneity of the investment rate and saving rate are conducted as followed:

We use two aspects of residual tests: Breusch-Godfrey Serial Correlation LM Tests and Heteroskedasticity Tests. From the both aspects, as plotted in table 2, all of the F-Statistics are bigger than the F-statistics read from Fisher and Snedecor table and (n*R-squared) is higher in all specifications than the relative Chi-squared read from the table. From these results, the tests reject the null hypothesis under all specifications. Specifically, the LM test confirms that error variances across sample countries are significantly different and this also holds across all specifications. It follows that the elasticity of $(I/Y)_{it}$ with respect to $(S/Y)_{it}$ is heterogeneous across countries. Also, the error dynamics across sample countries are significantly heterogeneous. Consequently the data set cannot be pooled.

Table 2. Heterogeneity tests

Breusch-Godfrey Serial Correlation LM Test:					
F-statistic	313.8618	125.1844	90.6998	63.8157	43.1578
Obs*R-squared	336.9987	337.2339	340.3011	341.9820	345.8385
Probability	0.0000	0.0000	0.0000	0.0000	0.0000
DOF	F(2,719)	F(5,716)	F(7,714)	F(10,711)	F(15,706)
Heteroskedasticity Test:					
	B-P-G	Glejser	White	Arch	Arch
F-statistic	12.3498	7.5008	30.8189	59.8162	26.4041
Obs*R-squared	12.1755	7.4441	57.0138	102.9748	112.3085
Probability	0.0005	0.0063	0.0000	0.0000	0.0000
DOF	F(1,721)	F(1,721)	F(2,720)	F(2,718)	F(5,712)

DOF: Degree of freedom; obs = number of observations; B-P-G: Breusch-Pagan-Godfrey

5. Model Specification and Econometric Methodology

5.1 Specification

In order to ascertain the presence of a long-run equilibrium relationship between the investment rate (I/Y) and the saving rate (S/Y); the model suggested and empirically estimated by Feldstein and Horioka (1980) is as followed:

$$(I/Y)_{it} = \alpha_i + \beta_i \, (S/Y)_{it} + \varepsilon_{it} \tag{1}$$

$i = 1, \dots N$ and $t = 1, \dots, T$. I, S, and Y represent respectively, domestic investment, domestic saving, and gross domestic product. The coefficients α_i and β_i denote respectively constant term and saving retention coefficients. In equation (1), the dependent variable (domestic investment) and the independent variable (domestic saving) are given as shares of the gross domestic product. Using data over 1960-74, Feldstein and Horioka (1980) found that the saving retention coefficient is very close to one for 16 OECD countries, implying low capital mobility. For the purpose of this paper, we are more interested in the significance of the coefficient β, rather than its sign.

It is common that cross-section studies use several other factors influencing the investment rate for instance, political stability, efficiency of financial mechanisms, the importance of the legal right system provided for investors, human capital, indicators of corruption, taxes etc. We recall that the specification (1) compares favorably with the model suggested by F-H.

5.2 Econometric Methodology

Under the Johansen (1988) maximum likelihood (ML) approach, a k-dimensional and p th order vector (X) can be re-parameterized to a vector error correction model (VECM):

$$\Delta X_t = \mu + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + ... + \Gamma_{p-1} \Delta X_{t-p+1} + \Pi X_{t-p} + \varphi D_t + \varepsilon_t \qquad (2)$$

In our analysis, $X_t [I / Y, S / Y]$ is a 2x1 vector of first-order integrated $[I(1)]$ variables, Γ_i are (2x2) short run coefficient matrices; $\Pi_{(2x2)}$ is a matrix of long run (level) parameters; D_t captures the usual deterministic components; μ is a constant term and ε_t is a vector of Gaussian error. A co-integrated system, X_t, implies that: (i) $\Pi = \alpha_{(2xr)} \beta '_{(rx2)}$ is rank deficient, i.e. $r < k$ (r = number of distinct co integrating vectors; k = 2); and (ii) $\{\alpha \perp \Gamma \beta \perp\}$ has full rank, (k - r), where $\alpha \perp$ and $\beta \perp$ are (2x(2 - r)) orthogonal matrices to α and β. The rank of Π is tested by Maximal Eigen value $(\lambda - \max)$ and Trace statistics (Johansen, 1988).

The Johansen method is a reduced-form dynamic system estimator, which addresses the issues of multi co-integration and normalization. A number of issues are important for the estimation of the VAR model. It is the time span of data rather than the number of observations, which determines the power of co-integration tests (Campbell and Pearson, 1991). Our data extend from a minimum of 28 (Gabon) to a maximum of 40 (South Africa) years, which we suppose, can provide sufficient time length to capture the long-run relationship between (I/Y) and (S/Y)(Note 1) We specify the VAR lengths (p) such that the VAR residuals are rendered non-autocorrelated(Note 2) A constant term is entered in the co-integrating space to allow for non-zero mean of the system variables. A trivariate VAR can exhibit two co-integrating vectors at the most. Pesaran and Shin (2002) suggest identification of multi-cointegration through the tests of over identifying restrictions. We follow their approach of identification if multiple co-integrating vectors are found.

6. Results

In order to evaluate the time series properties of the data formally, we implement the Phillips-Perron stationary test statistic, which tests the null of stationary. The results are reported in table 3. (I/Y) and (S/Y) are non-stationary, tests reject the null of stationary in all cases at levels. The both series appear unequivocally stationary in their first differences, so the finding of the Phillips-Perron test statistic is that (I/Y) and (S/Y) are I(1).

Note that evidence in favor of a stationary current account or cointegration of saving and investment can be interpreted in two diametrically opposing manners. On one hand it can be interpreted as confirmation of the FH result; on the other it can be interpreted as evidence of open capital markets imposing a solvency constraint on countries. The empirical evidence on the stationarity of the current account employing conventional cointegration techniques is mixed (Miller, 1988; Gulley, 1992; Gundlach and Sinn, 1992; Argimo´n and Rolda´n, 1994; Ghosh, 1995). Some recent approaches have employed panel unit root tests to test for the stationarity of the current account (Coakley *et al*., 1996a,b; Krol, 1996; Coakley and Kulasi, 1997). The panel tests of Im *et al*. (1995) have higher power than individual, pair wise tests and the general conclusion is that the current account is a stationary series in both in developing and OECD countries.

Table 3. Phillips-Perron stationary test statistic

Levels	I/Y		S/Y	
	Intercept	Trend & intercept	Intercept	Trend & intercept
Benin	-3.501731 ^{c}	-3.693904 ^{c}	-4.147669	-4.116588 ^{c}
Botswana	-3.042764 ^{c}	-3.244372 ^{b}	-1.754372 ^{a}	-1.270131 ^{a}
Cameroon	-1.720717 ^{a}	-1.613612 ^{a}	-3.494422 ^{c}	-3.523483 ^{b}
Congo	-2.218749 ^{a}	-2.507241 ^{a}	-2.671701 ^{b}	-2.96281 ^{a}
Cote d'Ivoire	-1.393004 ^{a}	-1.601982 ^{a}	-2.006561 ^{a}	-1.909066 ^{a}
Egypt	-1.355643 ^{a}	-2.198409 ^{a}	-2.437184 ^{a}	-2.386039 ^{b}
Gabon	-2.826297 ^{b}	-3.635676 ^{c}	-1.946566 ^{a}	-1.738482 ^{a}
Ghana	-1.195118 ^{a}	-2.640558 ^{a}	-2.341427 ^{a}	-3.747293 ^{c}
Kenya	-3.154267 ^{c}	-4.251704 ^{c}	-3.769445	-3.82682 ^{c}
Madagascar	-1.295662 ^{a}	-2.715823 ^{a}	-2.490314 ^{a}	-3.227642 ^{b}
Mali	-2.488297 ^{a}	-3.777605 ^{c}	-2.428497 ^{a}	-3.083541 ^{a}
Mauritius	-2.813133 ^{b}	-2.785708 ^{a}	-1.79278 ^{a}	-1.7704 ^{a}
Morocco	-0.798895 ^{a}	-0.911765 ^{a}	-0.686969 ^{a}	-3.086427 ^{a}
Mozambique	-2.729172 ^{b}	-2.907579 ^{a}	-3.621383 ^{c}	-5.679832
Senegal	-0.876253 ^{a}	-1.405511 ^{a}	-1.540934 ^{a}	-2.926342 ^{a}
Seychelles	-2.963108 ^{c}	-2.936739 ^{a}	-1.115784 ^{a}	-3.081704 ^{a}
Sierra Leone	-2.091107 ^{a}	-1.738097 ^{a}	-3.220026 ^{c}	-3.15497 ^{a}
South Africa	-1.534667 ^{a}	-2.215328 ^{a}	-1.234854 ^{a}	-3.294941 ^{b}
Sudan	-1.326063 ^{a}	-1.97107 ^{a}	-2.102714 ^{a}	-3.002636 ^{a}
Togo	-2.292499 ^{a}	-2.993323 ^{a}	-4.575702	-6.104609
Tunisia	-2.226245 ^{a}	-2.586549 ^{a}	-3.508432 ^{b}	-3.957517 ^{c}
Uganda	-0.859904 ^{a}	-5.078755	-1.929875 ^{a}	-3.191486 ^{a}

Intercept and trend & intercept test the nulls of level and trend stationary. Subscripts a, b, and c indicate rejection of the null of stationary at 1%, 5%, and 10%, respectively.

Table 4 reports the Johansen rank tests and a range of VAR diagnostics obtained from the Error Correction Model (ECM). Trace tests show that (I/Y) and (S/Y) are co-integrated and exhibit a single rank (vector) for all sample countries. This is also supported by the maximal Eigen value statistics. So, given the superiority of trace statistics over the maximal Eigen value statistics in testing the null of no co-integration, we conclude that (I/Y) and (S/Y) are co-integrated with single co-integrating vector for all of our sample countries.

Table 4. Co-Integration tests and VAR diagnostics between GI and GS (Johansen Method)

Country	Trace Statistics,H0		Max Eigen value, H0		Loading Factor	LM(3)	Nor	Lag
	$r \leq 0$	$r \leq 1$	$r \leq 0$	$r \leq 1$				
Benin	21.693* (0.017)	4.396* (0.036)	17.297* (0.048)	4.396* (0.036)	-0.577 [a] (0.165)	0.129	0.207	2
Botswana	15.353 (0.127)	2.217 (0.137)	13.136 (0.175)	2.217 (0.137)	-0.319 [b] (0.140)	0.760	0.845	3
Cameroon	11.687 (0.173)	2.740 (0.098)	8.947 (0.291)	2.740 (0.098)	-0.188 [b] (0.082)	0.837	0.164	2
Cote d'Ivoire	29.754* (0.001)	5.654* (0.017)	24.100* (0.004)	5.654* (0.017)	-0.136 [b] (0.066)	0.169	0.087	3
Congo	14.874 (0.145)	5.194* (0.023)	9.680 (0.427)	5.194* (0.023)	-0.317 [c] (0.159)	0.810	0.025	3
Egypt	17.478 (0.067)	6.411* (0.011)	11.067 (0.307)	6.411* (0.011)	-0.151 (0.095)	0.546	0.217	3
Gabon	15.439 (0.124)	5.287* (0.022)	10.151 (0.383)	5.287* (0.022)	-0.668 [a] (0.160)	0.314	0.173	3
Ghana	17.898 (0.059)	8.718* (0.003)	9.180 (0.477)	8.718* (0.003)	-0.255 [c] (0.137)	0.695	0.029	1
ken	20.501* (0.025)	4.914* (0.026)	15.586 (0.083)	4.914* (0.026)	-0.451 [a] (0.149)	0.751	0.431	2
Madagascar	21.348* (0.019)	7.957* (0.005)	13.392 (0.162)	7.957* (0.005)	-0.317 [b] (0.150)	0.563	0.136	2
Mali	10.502 (0.433)	4.554* (0.033)	5.948 (0.822)	4.554* (0.033)	-0.524 [a] (0.161)	0.642	0.007	3
Mauritius	13.355 (0.220)	5.301* (0.021)	8.054 (0.597)	5.301* (0.021)	-0.527 [a] (0.154)	0.973	0.524	3
Morocco	12.140 (0.150)	1.701 (0.192)	10.439 (0.185)	1.701 (0.192)	-0.220 [c] (0.123)	0.224	0.033	1
Mozambique	15.837* (0.044)	3.457 (0.063)	12.380 (0.097)	3.457 (0.063)	-0.459 [b] (0.172)	0.581	0.658	3
Senegal	12.289 (0.144)	0.417 (0.519)	11.873 (0.116)	0.417 (0.519)	-0.177 (0.115)	0.607	0.115	4
Seychelles	15.371 (0.126)	6.921* (0.008)	8.450 (0.554)	6.921* (0.008)	-0.489 [a] (0.150)	0.810	0.716	2
Sierra Leone	26.008* (0.048)	8.427 (0.219)	17.581 (0.090)	8.427 (0.219)	-0.318 [b] (0.143)	0.533	0.880	1
South Africa	24.221* (0.002)	7.672* (0.006)	16.550* (0.021)	7.672* (0.006)	-0.297 [a] (0.106)	0.449	0.362	5
Sudan	16.019* (0.042)	0.295 (0.587)	15.723* (0.029)	0.295 (0.587)	-0.321 [b] (0.145)	0.642	0.007	5
Togo	15.164 (0.056)	4.473* (0.034)	10.690 (0.170)	4.473* (0.034)	-0.539 [a] (0.140)	0.298	0.000	1
Tunisia	24.363* (0.007)	4.186* (0.041)	20.177* (0.018)	4.186* (0.041)	-0.414 [a] (0.123)	0.458	0.868	3
Uganda	13.721 (0.200)	3.906* (0.048)	9.815 (0.415)	3.906* (0.048)	-0.316 [b] (0.151)	0.490	0.345	3

Figures within parenthesis (.) are p-values under H0: $r \leq 0$ and $r \leq 1$; * denotes rejection of the hypothesis at the 0.05 level. For the loading factors, figures within the parenthesis (.) are standard errors. LM (3) reports p-values of the third order LM test of the null of no serial correlation in VAR residuals. The column NOR reports p-values of Bera-Jarque normality tests of VAR residuals, Chi-squares distributed. The column LAG reports the VAR lag lengths used. Subscripts a, b, and c indicate significance at 1%, 5%, and 10% respectively.

For a valid normalization and error-correction representation, the associated loading factors must be negatively signed and significant. On this basis all of the countries can be normalized on (I/Y). The whole sample countries have their loading factors negatively signed; among them, 20 are significantly negative at 10% or better. Given the signs of loading factors and the existence of a single co-integrating vector, the parameters of our empirical model are then uniquely identified. LM tests show the absence of serial correlation in VAR residuals in all cases. The VAR residuals also pass normality tests for all cases. Thus, utilizing the ECM, we identify a long run investment rate relationship based on the saving rate.

Table 5 reports the normalized co-integrating coefficients (long run coefficients). The elasticity of (I/Y) with respect to (S/Y) is positive and significant for countries such as Botswana, Congo, Kenya, Mali, Mozambique, and Seychelles; and negative and significant for the remaining countries. The panel elasticity in absolute value (0.542) being too small relative to the most country specific coefficients, exhibits heterogeneity.

Table 5. Normalized co-integrating coefficients (standard error in parentheses)

Section A: Country by country time series parameters								
	BEN	BWA	CAM	COG	CIV	EGY	GAB	GHA
S/Y	-0.879	0.476	-0.879	0.436	-0.897	-0.177	-0.163	-0.972
	(0.183)	(0.221)	(0.379)	(0.338)	(0.092)	(0.142)	(0.129)	(0.288)
	KEN	MAD	MLI	MUS	MCO	MOZ	SEN	SYC
S/Y	0.738	-0.816	0.290	-0.524	-0.964	0.708	-0.939	0.922
	(0.224)	(0.226)	(0.380)	(0.184)	(0.278)	(0.688)	(0.247)	(0.590)
	SLE	ZAF	SDN	TGO	TUN	UGA	Section B: Panel Results	
S/Y	-0.919	-0.844	-0.978	-0.844	-0.888	-0.231	-0.542	
	(0.220)	(0.113)	(0.129)	(0.165)	(0.358)	(0.103)	(0.062)	

Figures within parenthesis (.) are standard errors. The country mnemonics are: BEN = Benin; BWA = Botswana, CGO = Congo; CIV = Cote d'Ivoire, EGY= Egypt; CAM = Cameroon; GAB = Gabon; GHA = Ghana; KEN = Kenya; MDG = Madagascar; MOZ = Mozambique; MLI = Mali; MUS = Mauritius; MCO = Morocco; SEN = Senegal; SYC = Seychelles, SLE = Sierra Leone; ZAF = South Africa; SDN = Sudan; TUN = Tunisia; TGO = Togo; UGA = Uganda.

It is important to note that the positively signed large coefficients (0.922, 0.738, and 0.708) of respectively Seychelles, Kenya, and Mozambique; contribute to reduce the size but not sufficient to turn the overall coefficient of the panel into positive (-0.542). The entire existing panels tests suffer from this typical caveat – results of some countries dominate the whole panel – and one of the contributions of our results is that they bring this issue to focus(Note 3). This further lends support to our preference to country-by-country (time series-based) results.

If we refer to the interpretation of the results of F-H, we have two distinct results as regards the developing countries. Indeed, taking into account country by country time series parameters, β is higher for some countries and lower for other countries indicating respectively low and high mobility of capital. These results violate findings of F-H, which states that developing countries have a high mobility of capital that is to say low saving ratio. This violation holds on even if we refer to panel data results. The panel estimated saving retention coefficient (-0.542) is relatively small (approximately a half of one) indicating a moderate degree of capital mobility and therefore for these countries, the Feldstein-Horioka puzzle does not hold valid. This suggests different groups of financial integration within African countries included in the sample.

7. Conclusion

This paper extends the literature on capital mobility. By pooling data, the estimated saving-retention coefficient is relatively small indicating that a moderate degree of capital mobility prevails and therefore for these countries, the Feldstein-Horioka puzzle does not hold valid. Because of the heterogeneity, when we use time series data and methods, along with the Dynamic Heterogeneous panel approach, the empirical findings reveal both lower and higher degrees of capital mobility for these countries. Again, the Feldstein-Horioka puzzle does not hold valid since it provides mixed results for the sample countries.

The economic and financial integration of these countries can be effective only if these countries decide to harmonize effectively their economic and financial policy. To reach integration ambition, they have to: - make economic reforms and structural adjustments, - fight against inflation by setting up flexible exchange rate system, - set up very effective capital control policies for fiscal and monetary policies. Raise such a challenge will enable those countries to: reduce the size of the non-traded sector, settle efficient financial mechanisms, provide better legal protection system for investors, reduce the magnitude of foreign aid, strengthen financial markets, and open without any restriction their economies. The success of maintaining better economic policies and therefore the exhibition of capital immobility depend above all on the discipline of policy makers and politicians of Africans countries.

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Notes

Note 1. In our view, 40 years at least provide sufficient time length to capture the long-run relationship between investment rate and saving rate.

Note 2. Johansen (1992) suggests that the lag length in the VAR should be specified whereby the VAR residuals are rendered uncorrelated. Selection of lag length based on information criteria may not be adequate to render the VAR residual uncorrelated (Cheung and Lai, 1993). Hence, we specify lag length based on the test of serial correlation in VAR residuals.

Note 3. Panel unit root tests, panel co-integration tests (dynamic heterogeneous or otherwise) and traditional (OLS- and/or IV- based) panel tests all suffer from this problem.