# Capital Mobility in African Countries: Evidence from Panel Data Cointegration Tests

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**Abstract**

This paper employs the recently developed panel data unit root tests and the Pedroni panel data cointegration techniques to test the validity of the Feldstein-Horioka puzzle for a non-stationary and heterogeneous panel of 17 African countries during the period, 1965-2001. Furthermore, the paper extends the literature by employing the Pedroni Panel FM-OLS estimators to estimate the savings-retention coefficient for the panel and individual countries. The empirical findings reveal that in the African countries studied, the estimated savings-retention coefficient is relatively small indicating a moderate degree of capital mobility.

**JEL (Classification):** C32, F21, F32

**Keywords:** Panel unit roots; capital mobility; cointegration, panel FM-OLS cointegration

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## Introduction

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. 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 were highly mobile in an open economy, domestic saving will be very responsive to higher real rate of return globally and thus the country can finance its investment by foreign saving. 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 indeed is not mobile. Hence this finding is known as the Feldstein- Horioka Puzzle. A survey of the literature in this area reveals that there have been many empirical attempts to test the Feldstein- Horioka Puzzle (hereafter, FH-puzzle) for the Organization for Economic Co-operation and Development Countries (OECD) (for details see 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). While there have been a limited number of studies on testing the relevance of the FH puzzle for developing countries (Schneider (2004), Rocha( 2000),Montiel (1994),Vamvakidis and Wacziarg (1998)) , there is a limited number of empirical attempts to verify the presence of capital mobility using the FH approach for African countries. The studies that deal with the phenomenon of capital mobility in developing countries including some African countries are by De Wet and Koekemoer(2003), Isaksson(2001),Rocha(2000), Hussein and Mello(1999), Mamingi(1997), Mamingi(1993),Haque and Montiel(1991), Haque and Montiel(1990), Montiel(1990) and Dooley, Frankel, and Mathieson (1987). Recently, two recent studies that 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, which use the panel data for the period 1980-2000, but they do not undertake a battery of panel unit root and cointegration tests. In order to fill in the void, the present paper attempts to employ a battery of new heterogeneous panel unit root and cointegration tests to empirically assess the validity of the FH puzzle using a panel of 17 African countries over the period 1965-2001[1]. The paucity of required data has precluded testing of capital mobility for African countries, based on interest parity condition and consumption-smoothing approach to the current account. Use of panel data besides controlling the country size effects and business cycles effect, allows for heterogeneity in individual countries, gives more variability and thus reducing the possibility of collinearity among variables and finally, being more informative, yields more degrees of

freedom. Increased information from both time-series and cross-sectional data besides yielding more efficient parameter estimates, renders statistical inference much more precise. In the case of panel unit root tests, the estimators and the unit root test statistics are distributed normally unlike in the case of time- series where they follow complicated Weiner processes. Additionally, panel data unit root tests and cointegration tests have greater power and less size distortions than the standard time series unit root tests (see Levin and Lin (1992)).

**Model specification and data**

In order to test for the existence of a long-run equilibrium relationship between the investment rate (*I/Y*) and the savings rate (*S/Y*) in a heterogeneous panel consisting of 17 African countries over the period 1965-2001, the following model is specified:

$$(I/Y)_{it} = \alpha_i + \beta_i (S/Y)_{it} + \gamma_t + \mu_{it} \qquad (1)$$

$i = 1,\ldots,N$ and $t = 1,\ldots,T$

In model (1), $\alpha_i$ show the possibility of country fixed effects and $\beta_i$ allow for heterogeneous cointegrating vectors. $\beta$ is called the savings-retention coefficient. $\gamma_t$ represents time-dependent common shocks, captured by common-time dummies, that might simultaneously affect all the African countries included in the study. Model (1) is estimated by the recently proposed Pedroni (2000, 2001) panel Fully- Modified Ordinary Least Squares cointegration technique (hereafter Panel FM-OLS), which adjusts for the presence of endogeneity and serial correlation in the data. This method is an appropriate technique, especially if there are endogenous macroeconomic factors that can cause co-movements in saving and investment rates. The data on $(I/Y)$, gross domestic

investment as share of GDP and $(S/Y)$, gross domestic savings as share of GDP are obtained from *World Bank Africa Data Base 2003*.

Before estimating model (1), it is required that the order of integration of the variables be determined by using panel unit root tests. If both saving rate and investment rate series are found to be I(1), then by using the Pedroni panel cointegration tests (1999, 2000, 2001), it will be investigated whether they are cointegrated. These above-mentioned tests and techniques are warranted to make sure that no spurious regression phenomenon exists in the estimation of savings-retention coefficient which can be used to infer the presence of the degree of capital mobility. In order to test for the presence of a unit root in the panel data series under study, recent panel unit root tests proposed by Im, Pesaran and Shin (1997, 2003) (hereafter IPS), Maddala-Wu (1999) (hereafter MW) and the Breitung (2000) tests are employed. In all these tests, the null hypothesis is non-stationarity (see for details Baltagi (2003)). Im, Pesaran and Shin (1997, 2003) have proposed the following panel unit root test statistic, $t_{IPS}$, which is applicable to heterogeneous cross-sectional panels:

$$t_{IPS} = \frac{\sqrt{N}\left(\bar{t} - E\left[t_i|\rho_i = 0\right]\right)}{\sqrt{Var\left[t_i|\rho_i = 0\right]}} \sim N(0,1) \qquad (2)$$

Where N is the number of countries, $\bar{t}$ is the mean of the computed Augmented Dickey-Fuller (ADF) statistics for individual countries included in the panel, $\rho_i$, is the auto- regressive root, $E\left[t_i|\rho_i = 0\right]$ and $Var\left[t_i|\rho_i = 0\right]$ denote respectively, the moments of mean and variance tabulated obtained from Monte Carlo simulation and tabulated by IPS (1997,2003). The statistic $t_{IPS}$ approaches in probability a standard normal distribution as *N* and *T* tends to infinity. The MW panel data unit root test is a much more flexible

test and is applicable even to unbalanced panels and it is valid for individual ADF tests with different lag lengths. The MW test statistic $\lambda$, which has a chi-square distribution with 2N degrees of freedom under the null hypothesis is expressed as:

$$\lambda = -2\sum_{i=1}^{N} \lambda_n P_i \tag{3}$$

Where $P_i$ refers to the probability values from individual ADF unit root tests for each country in the panel. Breitung(2000) formulates a panel unit root test statistic which corrects for the dramatic loss of power associated with the IPS test when individual ADF tests include a trend in the specification. Breitung panel unit root test has greater power than that of IPS test.

In order to determine whether in the panel under study, the series $(I/Y)$ and $(S/Y)$ are cointegrated, Pedroni's panel cointegration tests are conducted (see Pedroni (1999)). Following Pedroni (1999, 2001), the null hypothesis of no cointegration against the alternative of cointegration is tested using the seven test statistics, proposed by Pedroni, which consist of four panel and three group test statistics. Each of these panel test statistics under appropriate standardization is distributed asymptotically as a normal distribution and expressed as follows:

$$\frac{\theta_{NT} - \mu\sqrt{N}}{\sqrt{v}} \rightarrow N(0,1) \tag{4}$$

Where, $\mu$ and $v$ are the mean and variance respectively of the underlying individual series. The values $\mu$ and $v$ are simulated and provided by Pedroni (1999, 2001) and their numerical values depend upon the presence of a constant, time trend, and the number of regressors in the cointegration regression. While the critical value at the 5% level for

panel –*v* statistic is 1.65, for others it is -1.65. The rejection of the null hypothesis of no cointegration requires that the absolute value of the calculated test statistics exceed the critical value.

**Empirical Results**

**Table 1 About Here**

Table 1 presents the panel unit root test results. The IPS, MW, and Breitung panel unit root test results for both levels and first-differences of the series show that the $(I/Y)$ and $(S/Y)$ series in the panel are integrated of the order one and zero respectively.

**Table 2 About Here**

In Table 2, the ADF statistics and the associated p-values for individual countries' ADF tests are reported. The results show that the panel and individual countries, the $(I/Y)$ series, with the exceptions of Burkino Faso and Madagascar, is I(1). The results, not reported here for space consideration, also indicate that the first-differenced (I /Y) and S/Y) series are stationary and therefore are integrated of the order zero, I(0). For the panel and individual countries, the $(S/Y)$ series, with the exception of Botswana, is I(1). Thus, the panel unit root tests and the individual ADF tests strongly suggest that the $(I/Y)$ and $(S/Y)$ series are generated by a non-stationary stochastic process. Table 3 presents the Pedroni panel cointegration test results.

**Table 3 About Here**

The computed panel and group test statistics are well below the critical value and therefore they reject the null hypothesis of no cointegration. Since the Pedroni panel cointegration test results support the existence of a long-run equilibrium relationship

between investment and saving rates, an attempt has been made to estimate the savings-retention coefficient by employing Pedroni's (2000, 2001) panel FM-OLS method. Pedroni (2000) has demonstrated that FM-OLS technique can be modified to make statistical inference in cointegrated heterogeneous panels with a large cross-section dimension and a relatively short time-series dimension.

**Table 4 About Here**

Table 4 reports the savings- retention coefficient estimates using the individual, and the Panel Group FM-OLS procedures. The panel savings-retention coefficients estimated with and without common time dummies are found empirically statistically significant from zero and one at the one percent level. Common time dummies are incorporated in the panel FM-OLS to pick up any possible shocks that might affect all the African countries in the sample. The magnitude of the estimated retention coefficient for the panel is well below the cutoff point of 0.60, as suggested by Murphy (1984) indicating that in the African countries a moderate degree of mobility of capital exists. The majority of the country-by-country savings-retention coefficients estimated by FM-OLS method are similar in magnitude and basically they are in agreement with the panel results. The estimated panel savings- retention coefficient implies that, contrary to the expected notion, the degree of capital mobility in African countries is much lower. The panel savings-retention coefficients are slightly higher than 0.39, those found during the period 1980-1998 for Asian countries (see Kim, Oh and Jeong, 2005). The findings of this paper, although not strictly comparable with earlier studies, are qualitatively consistent with those reported by Payne and Kumazawa (2005) and Rocha (2000). Rocha (2000), using a sample of 36 developing countries that include several African countries of

Botswana, Egypt, Ghana, Kenya, Malawi, Mauritius, Nigeria, Senegal, Tunisia and Zambia, presents empirical evidence to support a high degree of capital mobility for developing countries . Rocha's estimated savings-retention coefficient is 0.3617, which is significantly different from zero and one at the one percent level. Payne and Kumazawa(2005), using Pooled Ordinary Least Squares, Fixed Effects and Random Effects, report that during the period 1980-2001, the degree of capital mobility has increased in a sample of 29 Sub-Saharan African countries . They also highlight the positive and significant impact of foreign aid and openness on the savings rates in these countries. Dooley, Frankel and Mathieson (1987) report a savings- retention coefficient of 0.45 for the period 1960-1973, and 0.61 for the period 1974-1984 for a sample consisting of 48 developing countries. The findings, reported in this paper that individual-country results are similar in magnitude and statistical significance, supports that pooling of the data in the heterogeneous panel is advantageous and appropriate. Furthermore, it has been demonstrated in the econometrics literature that in the presence of parameter heterogeneity, the panel data results are much more reliable.

**Conclusions**

This paper extends the literature on capital mobility by employing the most recent panel unit root tests and cointegration techniques that take into consideration the dynamic properties as well as the cross-sectional variation properties of saving and investment rate series of 17 African countries over the period 1965-2001. The empirical findings reported in the paper reveal that in the African countries included in the sample, a moderate degree of capital prevails and therefore for these countries, the Feldstein-Horioka puzzle does not hold valid. The observed moderate degree of capital mobility

could be due to economic reforms and structural adjustments, which are aimed at liberalization of markets, taking place in many of these countries, especially during the last two decades. A moderate degree of capital mobility found in these countries might also reflect the less diversified nature of these mostly small countries and the inflow of capital to these countries. The finding of a moderate degree of capital also implies that in these countries, the prospects for economic growth need not be severely constrained by the prevailing low level of domestic savings. Higher capital mobility would indicate that in these African countries, the transmission mechanism of the monetary policy now includes the exchange rate de facto and the monetary authorities find it hard to pursue independent monetary policies. In the presence of capital mobility, the distributive impact of monetary policy actions will be enormous. The presence of moderate capital mobility also suggests that a softened crowding out-effect on investment and it offers the policy makers in these countries a choice of having a flexible exchange rate system and pursuing the most important domestic macroeconomic policy goal, such as inflation targeting. Furthermore, the finding of a moderate degree of capital mobility reported in this paper denotes that in these countries, capital control policies have not been very effective and increased capital inflow into these countries can be a major source of modern technology. Had capital controls and restrictions, which are placed in these countries for their implications for fiscal and monetary policies, been highly effective, then these countries would have exhibited capital immobility. The presence of a moderate degree of capital inflow imposes a much warranted, for augmenting economic growth, discipline on policy makers and politicians in African countries to adopt and maintain better economic policies.

## NOTES

1. The countries included are Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo, Cote d' Ivories, Egypt, Ghana, Kenya, Madagascar, Malawi, Mauritius, Morocco and Niger.

## REFERENCES


Baltagi, H.B. (2003). *Econometric Analysis of Panel Data*, John Wiley & Sons Ltd, New York.

Banerjee, A., P.and Zanghieri (2003). "A New Look at the Feldstein-Horioka Puzzle Using

An Integrated Panel," CEPII Working Paper.

Breitung, J. (2000). "The Local Power of Some Unit Root Tests for Panel Data," in B.Baltagi (ed.), "Non Stationary Panels, Panel Cointegration and Dynamic Panels," *Advances in Econometrics*, Vol. 15, Jai Press, Amsterdam, 161-178.

Coakley, J., F., Kulasi, and R. Smith (1998). "The Feldstein-Horioka Puzzle and Capital Mobility: A Review," *International Journal of Finance and Economics*, Vol. 3, 169-188.

Coakley, J., A.M., Fuertes, and Spagnoto (2004). "Is the Feldstein-Horioka Puzzle History?,"

*Manchester School*, Vol. 72, 569-590.

De Wet, A.H., and R. Van Eyden (2005). " Capital Mobility in Sub-Saharan Africa: A Panel Data Approach", *South African Journal of Economics*, Vol.73, 1-22.

De Wet, A. R., and Koekemer (2003). "Capital Mobility in Sub-Saharan Africa: A Panel Data Approach," Working Paper 2002, University of Pretoria, 1-33.

Dooley, M., J.Frankel and D. Mathieson(1987), " International Capital Mobility in Developing Countries versus Industrialized Countries: What Do Savings-Investment Correlations Tell Us?", *IMF Staff Papers*, Vol.34, 503-529.

Feldstein, M., and C. Horioka (1980). "Domestic Saving and International Capital Flows,"

*Economic Journal*, Vol. 90, 314-329.

Haque, N., and P. Montiel (1991), "Capital Mobility in Developing Countries: Some Empirical Tests", *World Development*, Vol.19, No.10, 1391-1398.

Haque, N.,and P. Montiel (1990), "How Mobile is Capital in Developing Countries", *Economics Letters*, Vol.33, 359-362.

Ho, T.W. (2002). "The Feldstein-Horioka Puzzle revisited 2002," *Journal of International Money and* Finance, Vol. 21, 555-564.

Hoffman, M. (2004). "International Mobility in the Long-run and the Short-run: Can We Still Learn from Saving-Investment Data?," *Journal of International Money and Finance*, Vol. 23, 113-131.

Hussein, K.A., and L.R. Mello (1999), "International Capital Mobility in Developing Countries: Theory and Evidence", *Journal of International Money and Finance*, Vol.18, 367-381.

Im, K.S., M.H. Pesaran, andY.Shin (1997). "Testing for Unit Root in Heterogeneous Panels", University of Cambrdige . DAE Working Paper, No. 9526.

Im, K.S., M. H. Pesaran, and Y. Shin (2003). "Testing for Unit Roots in Heterogeneous Panels," *Journal of Econometrics*, Vol. 115, 53-74.

Isaksso, A.(2001), " Financial liberalization, Foreign Aid , and Capital Mobility: Evidence from 90 Developing Countries", *Journal of International Markets, Institutions , and Money*, Vol.11, 309-338.

Jansen, W.J. (1996)."Estimating Saving-Investment Correlations: Evidence for OECD Countries based on Error Correction Model", Journal of International Money and Finance, Vol.15, 749-781.

Jansen, W.J. (1998). "Interpreting Saving-Investment Correlations," *Open Economies Review*, Vol. 9, 205-217.

Kim, H., K.Y. Oh, and C.W. Jeong (2005). "Panel Cointegration Results in International Capital Mobility in Asian Economies," *Journal of International Money and Finance*, Vol. 24, 71-82.

Levin, A., and C.F. Lin (1992). "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties," *Discussion Paper* 92-93, Department of Economics, University of California at San Diego.

Mamingi, N. (1997). "Savings-Investment Correlations in Developing Countries", *Journal of Policy Modeling*, Vol.19, 605-626.

Mamingi , N. (1993). " Savings-Investment Correlations and Capital Mobility in Developing Countries", *The World Bank Policy Research Working Paper 1211*.

Maddala, G., S., and Wu (1999). "A Comparative Study of Unit Root Tests and a New Simple Test," *Oxford Bulletin of Economic and Statistics*, Vol. 61, 631-652.

Montiel, P.(1994). "Capital Mobility in Developing Countries: Some Measurement Issues and Empirical Estimates", *World Bank Economic Review*, 8, 311-350.

Murphy, R. (1984). "Capital Mobility and the Relationship between Savings and

Investment Rates in OECD Countries," *Journal of International Money and Finance*, Vol. 3, 327-342.

Murthy, N.R.V. (2005). "The Feldstein-Horioka Puzzle: New Evidence for the United States", *The ICFAI Journal of Applied Economics*, Vol.4, No.1, 7-12.

Obsfeld, M., K. Rogoff(2000). "The Six Puzzles in International Macroeconomics: Is There a Common Cause? ," *NBER Working Paper,* 7777.

Payne, J.E., and R. Kumazawa (2005). "Capital Mobility , Foreign Aid, and Openness: Further Panel Data Evidence from Sub-Saharan Africa", *Journal of Economics and Finance*, Vol.29, No.1, 122-126.

Pedroni, P. (1999). "Critical Values of Cointegration Tests in Heterogeneous Panels with Multiple Regressors," *Oxford Bulletin of Economics and Statistics*, Vol. 61, Special Issue, 653-670.

Pedroni, P. (2000). "Fully Modified OLS for Heterogeneous Cointegrated Panels," in Baltagi, B., C.D. Kao (Eds.), *Advances in Econometrics, Nonstationary Panels, Panel Cointegration and Dynamic Panels, Elsevier Science*, New York, 93-130.

Pedroni, P. (2001). "Purchasing Power Parity Tests in Cointegrated Panels," *The Review of Economics and Statistics*, Vol. 83, 727-731.

Quantitative Micro Software (2004). EVIEWS 5, Irvine, California.

Rocha, F. (2000). " Capital Mobility in Developing Countries: Evidence from Panel Data", *Universidade de Sao Paulo, Brazil, Department of Economics Working Paper.*

Schneider, B. (2004). "Saving-Investment Correlations and Capital Mobility in Developing Countries with Special Reference to India 1999," *Indian Journal for Research on International Economic Relations*, Working Paper 48.

Sinha, D.(2004). “the Mother of All Puzzles would not Go Away”, *Economics Letters*, Vol.82, 259-267.

Vamvakidis, A.A., and R. Wacziarg (1998). “Developing Countries and the Feldstein-Horioka Puzzle,” *International Monetary Fund Working Paper* 98/2, 1-24.

World Bank (2003). African Data Base, 2003.

Table 1: Panel Unit Root Tests

| Series | $t_{IPS}$ | Maddala-Wu $\lambda$ | Breitung |
|---|---|---|---|
| $I/Y$ | -1.089<br>(0.138) | 37.281<br>(0.321) | 0.096<br>(0.538) |
| $S/Y$ | -0.819<br>(0.206) | 34.060<br>(0.465) | -0.805<br>(0.210) |
| $\Delta(I/Y)$ | -3.079<br>(0.001)* | 52.059<br>(0.025)* | -4.51<br>(0.00)* |
| $\Delta(S/Y)$ | -7.16<br>(0.001)* | 111.32<br>(0.0)* | -8.56<br>(0.0)* |

Note: Probability values are reported in the parentheses. Lags for $I/Y$ and $S/Y$ series are 5 and 3, respectively. * Denotes the rejection of the null hypothesis. The standardized IPS tests are distributed as *N (0, 1)* and the Maddala-Wu Fisher type test distributed as $\chi^2$ with $2N$ degrees of freedom (34). The critical IPS test, the one tailed 5 percent critical value is -1.64. All the tests are conducted with a time trend included in the specification. The critical values for the MW tests are from EVIEWS 5.0.

Table 2: Individual Country Unit Root Tests (1965 – 2001): Levels

| | $I/Y$ | | $S/Y$ | |
|---|---|---|---|---|
| Country | ADF | P-Value | ADF | P-Value |
| Algeria | -2.300 | 0.421 | -1.925 | 0.619 |
| Benin | -1.923 | 0.619 | -1.372 | 0.851 |
| Botswana | -3.386 | 0.072 | -3.345 | 0.077*** |
| Burkina Faso | -3.847** | 0.027** | -2.123 | 0.515 |
| Burundi | -0.814 | 0.953 | -2.527 | 0.314 |
| Cameroon | -1.884 | 0.639 | -1.425 | 0.835 |
| Central African Rep. | -1.416 | 0.836 | -1.009 | 0.929 |
| Congo | -2.285 | 0.429 | -2.292 | 0.426 |
| Cote d' Ivorie | -2.206 | 0.469 | -2.720 | 0.235 |
| Egypt | -1.892 | 0.634 | -2.486 | 0.333 |
| Ghana | -1.731 | 0.713 | -2.794 | 0.209 |
| Kenya | -2.900 | 0.176 | -2.081 | 0.537 |
| Madagascar | -4.107* | 0.015* | -1.839 | 0.662 |
| Malawi | -2.410 | 0.368 | -2.370 | 0.387 |
| Mauritius | -1.474 | 0.817 | -2.345 | 0.399 |
| Morocco | -1.869 | 0.646 | -3.127 | 0.117 |
| Niger | -1.845 | 0.658 | -2.897 | 0.176 |

Note:* Denotes significance at the 1%, 3%, and 8% levels, respectively. For $I/Y$ and $S/Y$, lags are 5 and 3, respectively.

Table 3: Pedroni Panel Cointegration Tests

| Test Statistic | Value |
|---|---|
| Panel $\upsilon$-statistic | 0.781* |
| Panel $\sigma$-statistic | -4.609* |
| Panel $\rho\rho$-statistic | -6.292* |
| Panel ADF-statistic | -5.274* |
| Group $\sigma$-statistic | -2.894** |
| Group $\rho\rho$-statistic | -5.808* |
| Group ADF-statistic | -5.481* |

Note: Results with trend and time dummies. All tests reported here are distributed as $N(0,1)$. * and ** denote significance at the 1% and 5% levels, respectively.

Table 4: FMOLS: Individual and Panel Cointegration Coefficients

| Country | Savings retention coefficient |
|---|---|
| Algeria | 0.36 [1.97]** |
| Benin | 0.02 [0.12] |
| Botswana | 0.90 [4.17]* |
| Burkina Faso | 0.09 [0.32]* |
| Burundi | 0.64 [5.94]* |
| Cameroon | 0.88 [4.74]* |
| Central African Rep. | 0.18 [1.46] |
| Congo | 0.69 [6.82]* |
| Cote d' Ivories | 0.91 [3.35]* |
| Egypt | 0.38 [0.66] |
| Ghana | 0.37 [4.04]* |
| Kenya | 0.58 [1.69]*** |
| Madagascar | 0.32 [2.26]* |
| Malawi | -0.01 [-0.06] |
| Mauritius | 0.46 [1.20] |
| Morocco | 0.69 [7.70]* |
| Niger | 0.50 [3.44]* |
| Panel Group FMOLS | 0.47 [12.08]* |
| (without Dummies) | $\beta = 1$ [13.25]* |
| Panel Group FMOLS | 0.49 [9.36]* |
| (with Dummies) | $\beta = 1$ [10.20]* |

Note:With common time Dummies included. * and ** denote significance at the 5% and 10% levels, respectively