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Financial Openness and Capital Mobility: A Dynamic Panel Data Analysis

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Abstract

This study estimates saving and investment correlations for the Central and Eastern Europe (CEE) transition economies and the G-20 countries to assess the degree of capital mobility. Employing GMM, this study uses financial openness, financial freedom and foreign aid over the period 1990–2011. The study finds that saving-investment correlation for G-20 countries is lower than that for CEE transition countries. Our findings suggest that financial openness and financial freedom significantly increase capital mobility in the CEE transition countries, but does not have a significant impact on capital mobility in the G-20 countries. These findings indicate that a CEE transition country with more financial openness can have more access to external capital market for borrowings and increasing financial freedom will enhance capital mobility in CEE transition countries. Moreover, the estimation results do show that the previous findings in the FH literature, that capital is more mobile for G-20 countries than CEE transition countries.

Keywords: Feldstein-Horioka Puzzle, capital mobility, financial openness, financial freedom, savings-investment, dynamic panel data.
JEL Classification Codes: C33; E21; F35; G10; G15

1. Introduction

The seminal contribution of Feldstein and Horioka (1980) (hereafter FH) showed that there is a home bias in the allocation of domestic savings. FH interprets their finding of a strong correlation between domestic savings and investment as evidence of capital immobility among OECD countries. FH argued that, under perfect capital mobility, saving and investment would be uncorrelated since saving would go wherever global returns are highest whereas, in a closed economy, saving and investment would be related one-for-one by identity. In the FH sense, a higher estimated value of the coefficient of savings rate indicates low capital mobility, while its lower value reflects high capital mobility in a country (Younas, 2011).

This finding led to the controversial conclusion of the existence of significant home bias in the allocation of domestic savings. The home bias result spawned a huge literature as this empirical result seemed surprising in light of increased world capital market integration (Georgopoulos and Hejazi, 2005). In light of the increased integration of world capital markets, evidence of capital immobility among developed countries came to be known as the FH puzzle (Obstfeld and Rogoff, 2000; Feldstein and Bacchetta, 1989; Tesar, 1991).

A high correlation between domestic savings and investment can arise from excessive control of capital. Consequently, the across border movements of portfolio and direct investment encounter increasingly high barriers such as the restrictions on purchasing foreign assets and securities (Younas and Nandwa, 2010). However, capital market liberalization opens greater opportunities for domestic savings to be financed wherever it can earn highest marginal returns in the world. It can be argued that high savings–investment correlation is due to the omission of relevant variables and as such not an evidence of significant home bias. Therefore, the empirical models that do not account for financial openness and economic globalization would result in an upward bias on savings retention coefficient, thus understating the degree of capital mobility than is actually the case (Younas and Chakraborty, 2011).

In this context, this paper uses financial openness, foreign aid, and financial freedom to examine their impacts on saving– investment relationship in CEE transition economies and G-20 countries over the period 1990–2011. In addition, we employ the dynamic panel difference Generalized Method of Moment (GMM) estimator technique to improve upon the previous literature. This paper contributes to the empirical FH literature in a significant way by incorporating two major improvements over the existing research: First, this is the first study that uses data on financial freedom. Second, this is the first study that examines transition economies and G-20 countries.

The main purpose of this paper is to reconsider the saving– investment relationship and to determine whether the relationship is sensitive to the degree of financial openness, financial freedom, foreign aid. The next section presents the model, explains the econometric method, and describes the data. Section 3 reports the results and relates them to the findings of the existing literature. Section 4 concludes with policy implications of our results.

2. Previous Research

Subsequent analysis finds this correlation to be high for OECD countries, but less than what was observed in the 1960s and 1970s (Feldstein and Bacchetta, 1991; Tesar, 1991). The majority of subsequent works has focused on cross-country regressions while some have produced time series and fewer panel estimates.

Although a number of subsequent cross-country analysis by Feldstein (1983), Penati and Dooley (1984), Obstfeld (1986), Golub (1990), Feldstein and Bachetta (1991), Tesar (1991) and Obstfeld (1995) confirmed Feldstein and Horioka's (1980) findings, some authors have questioned the robustness of the empirical regularity they observed. Murphy (1984), for instance, found that the average estimate was significantly lower (0.59) for the 10 smallest countries in his sample than the average estimate (0.98) for the seven largest countries. Murphy (1984) and Baxter and Crucini (1993) suggest that a high domestic saving–investment correlation reflects the country's financial size in the world economy. Dooley et al. (1987) reported that the saving investment correlation was significantly lower in non-OECD economies than in OECD economies. Wong (1990) reported a strikingly low (0.08) correlation. Bayoumi (1990) concluded that during the gold standard period there appears to be no evidence of a significant correlation between saving and investment rates. Wong (1990), Tesar (1991), Obstfeld (1995), and Coakley et al. (1998), argue that in cases such as in the US, where since the 1980s foreign investment massively entered the country, the saving–investment retention coefficient (β) should be much lower.

Notable time-series studies include Obstfeld (1986), Miller (1988), Tesar (1993), Mamingi (1997), and Coakley et al. (1999). Coakley et al. (1999) found that The Feldstein–Horioka cross-section regression coefficient for LDCs is lower than the corresponding OECD coefficient, indicating different policy responses in these countries rather than higher capital mobility. Finally, adjustment toward solvency is slower in LDCs, reflecting their vulnerability to external shocks and the impact of financial repression. Mamingi (1997) reported that many developing countries are financially integrated in the long run. Moreover, the estimation results do show that saving-investment correlations for middle-income countries tend to be lower than those for low-income countries.

Relatively few studies have employed panel data techniques to estimate the saving– investment association. Notable contributions include Coakley et al. (1999), Kim (2001), Cadoret (2001), and Coakley et al. (2004). The general conclusion that can be drawn from these studies is that panel estimates are largely similar to cross-country estimates and the estimates are close to unity for OECD economies but lower for developing countries. Although these studies have employed panel data to check the validity of the Feldstein–Horioka puzzle, none of these have investigated the integrating property of the variables involved and the cointegrating properties of the relationship for such a large panel. Also, none of these panel studies have looked at the role that openness plays in the saving–investment relationship. In addition, Chakrabarti (2006) reported a significantly lower saving–investment association for non-OECD countries relative to OECD countries. Corbin (2001) claims that the high saving–investment coefficient estimates found with panel data are attributable to specific individual country effects. Coakley et al. (2004) apply a mean group regression approach to a panel of 12 OECD economies for the period from 1980 to 2000; these authors find statistically insignificant and notably smaller estimates than the conventional cross-sectional ones.

It is easy to accept there will inevitably be some home bias due to barriers to entry, information cost, and attitude toward risks in investing in international portfolios. Contrarily, financial reforms and capital account openness in a country would weaken this correlation as domestic savings flow to countries with the highest marginal returns (Younas, 2011).

A few recent studies have captured this phenomenon by employing either de jure ''perceived'' measures of financial openness or a time trend in an augmented FH equation (e.g., Isaksson, 2001; Georgopoulos and Hejazi, 2005; Payne and Kumazawa, 2005; Bahmani-Oskooee and Chakrabarti, 2005; Younas and Nandwa, 2010; Younas and Chakraborty, 2011; Younas, 2011). These studies attribute their findings of increased capital mobility to the financial markets' liberalization in the world.

Isaksson's (2001) results indicate that for developing countries capital is relatively immobile. There is also evidence that access to international financial markets increases following financial liberalisation. Finally, including foreign aid in the saving–investment regression has an important positive effect on the saving coefficient. Georgopoulos and Hejazi (2005) come to the conclusion two points. First, a home bias is consistent with individual utility maximization in the face of higher costs and uncertain ties associated with investing in foreign and less familiar markets. Second, and most importantly, this home bias should be falling through time. Bahmani-Oskooee and Chakrabarti (2005) found that results from a panel of 126 economies over the period 1960–2000 provide strong support for systematic effects of country-size as well as openness on the saving–investment relationship. Payne and Kumazawa (2005) suggest the presence of capital mobility in line with previous studies of developing economies and that capital mobility has gradually increased over time. Moreover, foreign aid and openness both have positive and significant impacts on investment rates.

Recent studies (e.g., Younas and Nandwa, 2010; Younas and Chakraborty, 2011; Younas, 2011; Cyrille, 2010) on savings–investment methodology to examine the impact of financial openness on the degree of capital mobility using the Dynamic panel GMM estimator technique. Younas and Nandwa (2010) suggest that financial openness has increased capital mobility in developing countries, while its effect is statistically insignificant in OECD countries. This also implies that a developing country with more financial openness can have more access to external capital markets from which to

borrow. Foreign aid also appears to supplement domestic savings for investment in developing countries. In line with the previous findings, their study also confirms that capital is more mobile for developing countries. Younas and Chakraborty (2011) propose that economic openness and financial market integration have led to increased capital mobility in developed as well as developing countries. However, their effect appears to be larger for the latter. This also implies that countries with more financial openness can run higher current account deficits due to better access to external capital markets. Their results also support the previous findings that foreign aid supplements domestic savings for investment in developing countries. Younas (2011) reported that he found that de facto financial openness significantly increases capital mobility in the developing countries but does not have a significant impact on capital mobility in the developed countries and that capital is freely mobile in the most financially open developing countries but not in the most financially open developed countries. Cyrille (2010) argue that the downward movement in the saving-investment coefficient is due the omission of some factors (foreign aid and trade openness) which are relevant for developing countries in the framework of the Feldstein-Horioka analysis.

However, as it appears, the savings-investment relation in transition economies has not received the proper attention it deserves. There is no sufficient literature on the subject has been located for these economies. Payne and Mohammadi (2006) examine the relationship between savings and investment for 26 transition economies using a panel data set covering the 1991 to 2002 period. Estimates of the saving coefficient based on cross-sectional, fixed-effect, random-effect and mean-group estimators range from 0.263 to 0.315, which are significantly less than one. Payne and Mohammadi (2006) examine only the relationship between savings and investment for 26 transition economies using static panel data analysis. Given the importance of foreign investment in the transition process, it is believed that this is a major oversight. This study has aimed to fill this space and to contribute to the empirical FH literature.

3. Empirical Methodology and Data

Investigating the saving–investment relationship, FH regressed the Investment/GDP ratio to the Saving/GDP ratio using the equation:

$$(I/Y)_i = \alpha + \beta \, (S/Y)_i + u_i \tag{1}$$

The variables are defined as above, where $i = 1,…., N$ is a country index, I is investment, and S saving, and Y is national income (GDP), β the saving–investment retention coefficient, α a constant term, and u_i the error term. The *FH interpretation* of β is that it is a measure of international capital mobility. FH regresses the ratio of investment to GDP on the ratio of savings to GDP for OECD countries over the period 1960–1974. FH, estimate of β close to one reflects perfect capital immobility, while one close to zero indicates perfect capital mobility. FH estimates the savings retention coefficient to be between 0.8 and 0.9, an evidence of high degree of capital immobility and strong home bias in the allocation of domestic savings. FH concluded that their results implied a low level of international capital mobility across countries.

We employ the dynamic panel data model based on the Generalized Method of Moment (GMM) estimator proposed by Arellano and Bond (1991) which provides consistent estimates for such models. The choice of our econometric model is essentially based on the following set of concerns: (i) the potential endogeneity of domestic savings; (ii) the dynamic relationship between domestic savings and investment as both are impacted by the prior values of each other; and (iii) unobserved country-specific effects. This leads us to specify the dynamic panel GMM estimator proposed by Arellano and Bond (1991) to overcome these potential issues.

A planned process of transition to free market economy system, the lack of investment and capital mobility constitute an important place in transition countries. Capital movements are not up to the G-20 countries in transition economies. However, capital movements in the transition economies are not such as in a closed economy.

The study covers 15 transition economies and the G-20 countries during the time period 1990-2011. Younas' (2011) model of the study conducted by developing in the sample countries was applied. Using the augmented FH specifications, we estimate the following two transformed models in first differences:

A. *CEE Transition Countries:*

$$I_{it} = \alpha_0 + \alpha_1 I_{i,t-1} + \alpha_2 S_{it} + \alpha_3 F_{it} + \alpha_4 (S \times F)_{it} + \alpha_5 FA_{it} + \alpha_6 FF_{it} + \lambda_t + \varepsilon_{it} \qquad \text{(Model 1)}$$

B. *G-20 Countries:*

$$I_{it} = \beta_0 + \beta_1 I_{i,t-1} + \beta_2 S_{it} + \beta_3 F_{it} + \beta_4 (S \times F)_{it} + \beta_5 FA_{it} + \eta_t + \mu_{it} \qquad \text{(Model 2)}$$

Where subscripts *i* and *t* indicate country and time period, respectively. The intercept includes a component, α_0 (β_0) that is common to all recipient countries. All variables, except for *FF and FA*, are defined as a ratio to GDP. *I* is gross fixed capital formation used to measure investment, *S* is gross national savings, *F* is net foreign direct investment used to measure financial openness, *(S×F)* is the interaction term of the domestic savings rate and financial openness and *FA* is official development assistance used to measure foreign aid. Model for CEE transition countries also includes financial freedom *(FF)*. The data for investment, savings, financial openness and foreign aid variables, except for financial freedom index, are taken from World Development Indicators (WDI, 2012) and World Economic Outlook (WEO, 2012). The data for financial freedom index is also taken from The Heritage Foundation websites. Following standard practice in this literature, we standardize all data obtained to get involved in the model at the same level. Standardization was realized by using mean / standard deviation the formula. (See Table 1 for definitions, expected signs and related studies of variables).

Table 1: Definitions, expected signs and related studies of variables

Variables	Description	Expected sign	Related studies
Investment rate	Gross fixed capital formation as a ratio to GDP.		Younas (2011),Younas and Chakraborty (2011), Younas and Nandwa (2010), Chakrabarti (2006),Payne and Mohammadi (2006), Obstfeld (1986), Golub (1990), Feldstein and Bachetta (1991), Tesar (1991), Feldstein and Horioka (1980).
Saving rate	Gross national savings as a ratio to GDP.	+	Younas (2011),Younas and Chakraborty (2011), Younas and Nandwa (2010), Chakrabarti (2006),Payne and Mohammadi (2006), Bahmani-Oskooee and Chakrabarti (2005), Feldstein (1983), Penati and Dooley (1984), Obstfeld (1986), Golub (1990), Feldstein and Bachetta (1991), Tesar (1991), Feldstein and Horioka (1980).
Financial openness	Net foreign direct investment as a ratio of GDP.	+	Younas (2011), Younas and Nandwa (2010), Payne and Kumazawa (2005), Bahmani-Oskooee and Chakrabarti (2005).
Foreign aid	Official development assistance as a ratio GNI	+	Younas (2011),Younas and Chakraborty (2011), Payne and Kumazawa (2005), Younas and Nandwa (2010), Isaksson (2001)
Financial freedom	Heritage Foundation financial freedom index value ranging from 0 to 100.	+	
Financial openness × saving rate	The interaction term of the domestic savings rate and financial openness	-	Younas (2011),Younas and Chakraborty (2011), Younas and Nandwa (2010)

As Isaksson (2001) argues, if foreign aid is important but omitted from the regression, the coefficient of the savings rate will have a downward bias. Younas and Chakraborty (2011) attribute this idea to higher capital mobility. Younas and Nandwa (2010) suggest that higher financial openness index values reflect the more open financial policy, implying that a country is more open to cross-border capital transactions.

Table 2: Descriptive statistics

G-20 Countries					
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Investment Rates	418	22.260	6.901	10.75	48.28
Saving Rates	416	23.302	8.408	-1.56	53.47
Financial Openness	361	1.870	1.897	-5.11	11.14
Foreign Aid	196	0.404	0.878	-0.06	7.38
CEE Transition Countries					
Investment Rates	270	24.232	6.190	0.10	50.96
Saving Rates	290	18.455	5.756	-8.52	43.55
Financial Openness	268	4.737	6.018	-32.87	52.05
Foreign Aid	239	3.410	4.250	-2.45	3.79
Financial Freedom	229	62.00	16.014	10	90

It is known that financial freedom index is a determining factor capital movement in transition countries. Therefore, the index is included in the model. Financial freedom index gets a value between 0 and 100. Zero indicates that financial freedom is nil, while 100 indicates complete financial freedom. Financial freedom index of the CEE transition economies are 62 points (See Table 2 presents descriptive statistics for the data set over the sample period.), implying that CEE transition economies are semi-independent. The interaction term of the domestic savings rate and financial openness, (S×F), aims to capture the impact of financial markets' integration on the degree of capital mobility in a country. In other words, the interaction term examines whether capital mobility increases due to increased financial openness in a country.

Theoretically, more financial openness should weaken the correlation between domestic savings and investment, as the latter is financed by the pool of world savings (Younas and Nandwa, 2010). Thus, we expect a negative and significant value for this interaction term. The partial effect of savings on investment $\alpha_2 + \alpha_4 f_{it}$ (Model 1) and $\beta_2 + \beta_4 f_{it}$ (Model 2) – will be assessed at maximum value of financial openness index in our sample. This shows the actual savings–retention coefficient measuring the actual degree of capital mobility. As a result, it is expected that $\alpha_2 (\beta_2) > 0$, and $\alpha_4 (\beta_4) < 0$.

4. Estimation Results

Table 3 presents the results for basic FH equation for all, transition economies and the G-20 countries in our sample. A positive and significant coefficient on lagged investment rates in all regressions suggests a strong correlation of investment across time. Younas and Nandwa (2010) argue this finding implies that financial decisions of a firm for investment are impacted by its long-term commitment for investment in a country.

The coefficient on the savings rate is positive and significant at the 1% level in all these regressions. However, its magnitude suggests that capital is more mobile in G 20 countries. This is consistent with the findings of previous studies.

The savings coefficients for developing economies are generally smaller than those found for industrialized economies. Payne and Kumazawa (2005) argue that this result seems counterintuitive given the belief that industrialized economies have more integrated capital markets as well as less restrictive regulatory environments than developing economies. However, a number of reasons have been set forth to explain the relatively low savings-investment correlation for developing economies. Dooley et al. (1987) and Isaksson (2001) attribute this finding to the presence of foreign aid. Wong (1990) emphasizes that the size of the nontraded sector and the degree of openness can explain the estimates, while Kasuga (2004) presents evidence to suggest that a country's financial structure influences the size of the savings retention coefficient.

Table 3:   Arellano–Bond generalized method of moment (GMM) estimation, dependent variable: Investment rates

Independent Variables: Investment Rates	CEE Transition Countries	G-20 Countries
Investment Rates Lagged	0.458*** (0.059)	0.618*** (0.054)
Saving Rates	0.419*** (0.067)	0.325*** (0.053)
Financial Openness	0.115** (0.058)	0.023 (0.036)
(Financial openness × saving rates)	-0.358*** (0.096)	-0.075** (0.030)
Foreign Aid	-0.007 (0.058)	0.051 (0.043)
Financial Freedom	0.107** (0.047)	
Sargan Test (p-value)a	0.203	0.226
Arellano-Bond Order (p-value) 2b	0.1908	0.1224
Number of observations	138	167
Number of countries	15	20
$\partial(I_{it}) / \partial(S_{it}) = \alpha 2 + \alpha 4 fit$	0.646	
$\partial(I_{it}) / \partial(S_{it}) = \beta 2 + \beta 4 fit$		0.494

Numbers in parentheses are standard errors.
* Significance level at 10%, ** Significance level at 5%, *** Significance level at 1%.
a The null hypothesis is that the instruments are not correlated with the residuals.
b The null hypothesis is that the error term in the first difference regression exhibits no second order serial correlation.

Although financial openness has a positive and significant impact on investment rates for CEE transition countries, it is statistically insignificant for G-20 countries. This implies that a CEE transition country with more financial openness can have more access to external capital market for borrowings. The finding of insignificant impact of financial openness on capital mobility for G 20 countries is consistent with the theoretic argument made by Yasutomi and Horioka (2011). Adam Smith explained the FH paradox, arguing ''that it is the pursuit of security that leads owners of capital to invest at home and that it is the pursuit of security, not profit, that leads them to promote the good of society as a whole via invisible hand''(Yasutomi and Horioka (2011).

To evaluate whether capital mobility has increased due to financial markets' integration, we include the variables of interaction term. As expected, the interaction effect of financial openness and savings rate is negative and significant, respectively at the 1%, 5% level, for CEE transition countries as well as G 20 countries. To get the actual magnitude of savings– retention coefficient, we evaluate the marginal effect of domestic savings (MES) on investment at maximum values of financial openness index in our study. We utilize these variables to present that with increased financial openness, savings retention coefficient decline. The results in Table 3 shows that the savings retention coefficients for CEE transition countries evaluated 0.65, while for G 20 countries those are 0,49, respectively. This suggests that savings–investment correlation weakens considerably as a G-20 country lowers restrictions on the cross-border movement of capital.

Foreign aid has a not significant impact on investment rates for CEE transition countries as well as for G-20 countries. Isaksson (2001) argues, if foreign aid is important, but omitted, from the regression, the coefficient of the savings rate will have a downward bias. Younas and Chakraborty (2011) attribute this idea to higher capital mobility. Foreign aid has a not significant impact on investment rates for CEE transition countries as well as G 20 countries, implying that the coefficient of the savings rate will have not a downward bias and not higher capital mobility in CEE transition countries as well as G 20 countries.

Financial freedom index has a positive and significant impact on investment rate for CEE transition countries. This finding indicates that increasing financial freedom will enhance capital mobility in CEE transition countries.

5. Concluding Remarks

This study uses financial openness, financial freedom and foreign aid to examine their impacts on the degree of capital mobility in CEE transition economies and G-20 countries over the period 1990–2011. We employ the dynamic panel data model based on the Generalized Method of Moment (GMM) estimator proposed by Arellano and Bond (1991) to capture the effect of lagged investment rates and to address simultaneity issues.

We find that the coefficient on the savings rate is positive and significant in CEE transition countries as well as G-20 countries. We find also that the coefficient for G-20s is lower than the corresponding CEE transition countries coefficient; indicating capital is more mobile in G-20 countries. Our finding suggests that financial openness significantly increases capital mobility in the CEE transition countries but does not have a significant impact on capital mobility in the G-20 countries. This finding shows that a CEE transition country with more financial openness can have more access to external capital market for borrowings. Our results suggest that foreign aid has a not significant impact on investment rates for CEE transition countries as well as the G-20 countries, implying that the coefficient of the savings rate will have not a downward bias and not higher capital mobility in CEE transition countries and the G-20 countries. Our results also suggest that financial freedom index has a positive and significant impact on investment rate for CEE transition countries. This finding indicates that increasing financial freedom will enhance capital mobility in CEE transition countries. Our study supports that the previous findings in the FH literature, that capital is more mobile for G-20 countries than the CEE transition countries.

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