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## Regional integration, capital mobility and financial intermediation revisited: Application of general to specific method in panel data



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### ABSTRACT

We utilize the Feldstein–Horioka puzzle to investigate the impact of regional integration agreements (AFTA, EU, EFTA, CARTAGENA, MERCOSUR and NAFTA) on the international capital mobility. In doing so, we employed a novel empirical technique i.e. the general to specific (GETS) method of Hendry (1995) to estimate the cointegrating equation and dynamic adjustments in panel data. Using the classical fixed and random effects estimators, we estimate the long- and short-run effects in the same model and we show that it is possible to estimate the lagged adjustment process. The procedure used is general enough to allow for the presence of endogeneity, heteroscedasticity, serial correlation and cross-sectional dependence in the residuals. Our findings show that the estimate of saving retention has declined and the speed of adjustment has increased in the post-integration period, implying that the international mobility of capital has increased in these countries. Moreover, our findings reveal that regional integrations stimulate financial intermediation, which in turn, improves real productivity.

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## 1. Introduction

The relationship between investment and saving has been extensively analyzed since the publication of the seminal article of Feldstein and Horioka (1980) (henceforth *FH*). According to *FH*, high correlation between domestic savings and investment implies that the mobility of capital is low; this relationship is well known as the Feldstein–Horioka puzzle. Using the cross-section data of 16 OECD countries over the period 1960–1974, they estimated the relationship between domestic investment share of GDP (*ITY*) and domestic saving share of GDP (*STY*). The null hypothesis is that under complete capital mobility the savings retention coefficient should be zero. They found that this estimate is close to unity and this implies that domestic saving is the main source of funds for investment.

Testing the *FH* puzzle using cross-section data was extremely popular in the 1980s and 1990s and majority of the studies appeared to confirm the original *FH* result and revealed that the savings retention estimate for the OECD countries did not decline when data was extended up to 1980 and beyond, for instance among others were Feldstein (1983), Murphy (1984), Penati and Dooley (1984), Obstfeld (1986, 1995), Dooley et al. (1987), Golub (1990), Tesar (1991), Artis and Bayoumi (1991),

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Sinn (1992) and Coakley et al. (1996). A few studies found that the savings retention coefficient had only marginally declined (Feldstein and Bacchetta, 1991; Coakley et al., 1996; Artis and Bayoumi, 1991).

Since the 1990s, the application of non-stationary time series and panel methods has become of special interest in testing the validity of the *FH* puzzle. The first group of studies have followed the time series estimation route through using the country-specific time series techniques. Among them, we can highlight contributions by Miller (1998), Alexakis and Apergis (1992), Argimon and Roldan (1994), Ghosh (1995), Goldberg et al. (1995), Coakley et al. (1996), Jansen (1996), Liu and Tanner (1996), Hussein (1998), Kim (2001), Schmidt (2003), Hoffmann (2004) and Kumar et al. (2012). These studies provide evidence of non-stationarity in *ITY* and *STY* i.e. integrated of order one  $I(1)$  and therefore they support the use of nonstationary cointegration techniques to investigate the *FH* puzzle.<sup>1</sup> Obstfeld (1986) and Coakley et al. (1998) suggest that the country-specific time series estimates are vital especially as a guide for pooling time series observations from different countries.

The second group of studies investigated the *FH* puzzle using panel methodologies (Coakley et al., 1999, 2001, 2004; Krol, 1996; Coakley and Kulasi, 1997; Oh et al., 1999; Coiteux and Olivier, 2000; Cadoret, 2001; Corbin, 2001; Ho and Chiu, 2001; Kim, 2001; Tsung-wu, 2002; Pelgrin and Schich, 2004; Kim et al., 2005; Bahmani-Oskooee and Chakrabarti, 2005; Chakrabarti, 2006; Murthy, 2007; Christopoulos, 2007; Di Iorio and Fachin, 2007; Herwartz and Xu, 2009; Fouquau et al., 2009). The results in these studies reinforce the previous results based on a time series framework. They attained lower saving retention estimates, although the relationship between saving and investment is shown to be stronger for OECD than the less developed countries. In spite of varied panel techniques applied, these studies all start from the same premise that the saving and investment are non-stationary processes.

While many accept the high association between investment and saving, controversy remains with the interpretation of the savings retention coefficient; in particular how informative is this estimate about capital mobility. Ghosh (1988), Obstfeld (1986), Uctum and Wickens, 1990, Genberg and Swoboda (1992) and Argimon and Roldan (1994) suggest that capital mobility should be examined within the inter-temporal model of saving and investment behaviour. Baxter and Crucini (1993) argued that in the long run, technological variables and the demographic structure of the population could drive investment and saving, thereby inducing positive correlation even with perfect capital mobility. According to Jansen (1996, 1998), Coakley and Kulasi (1997) and Pelgrin and Schich (2004), the long run relationship between the investment and saving could be treated as solvency conditions that must be satisfied. Byrne et al. (2009) have argued that this correlation could be due to common global shocks and therefore it may not be interpreted as evidence against capital mobility. Nevertheless, we take the view of many that the *FH* puzzle is a simple and an indirect test on the extent to which capital is mobile across countries. If tested for structural breaks (for example, considering regional economic integration in the sample) it may also give an indication about changes in capital mobility. Obstfeld and Rogoff (2000) have called *FH* puzzle the mother of all puzzles because it provides useful insights on the international capital mobility.

In our view, the empirical *FH* puzzle literature is notoriously fragile because in most studies the unit root and stationarity hypothesis testing ignored to consider the presence of structural breaks. Perron (1989, 1997) showed that the ability to reject a unit root decreases when the stationary alternative is true and an existing structural break is ignored. Carrion-i-Silvestre et al. (2005) pointed out that this kind of misspecification error can lead to spurious non-stationarity. However, there exist a few studies that have employed the structural break tests to determine breaks in the cointegrating relationship of investment and saving. Westerlund (2006) considers the presence of multiple breaks in a sample of 15 OECD countries and found that saving and investment are cointegrated under the presence of level and trend shifts. Using the structural break test in Westerlund (2006), Kumar and Rao (2011) found that structural changes did reduce the savings retention estimates in OECD countries, especially in the post Bretton Woods and Maastricht periods. Analogous inferences were made by Rao et al. (2010) using the exogenous structural break tests in Mancini-Griffoli and Pauwels, 2006. Di Iorio and Fachin (2007) have used panel bootstrap tests to examine the *FH* puzzle for a sample of 12 EU countries; their results show that the bootstrap panel stability tests allow for cointegration between saving and investment in the long run with at least one break.

This paper investigates the stationarity properties of investment and saving series for panels that comprise six regional investment agreements.<sup>2</sup> The contribution of this paper is threefold. Firstly, we utilize the panel stationarity test of Carrion-i-Silvestre et al. (2005) to test for integrated order of the variables. The innovative aspect of this test is that it allows for cross-sectional dependence (CSD) and multiple structural breaks. Our results suggest that *ITY* and *STY* series can be characterized as stationary processes evolving around a broken trend. Our results reveal that regional economic integrations are a major source of structural change in the *ITY* and *STY* series. This result casts doubt on almost all recent empirical studies on *FH* that utilized nonstationary time series methods to test the puzzle. Secondly, we provide empirical evidence on how international capital mobility has been affected by various regional investment agreements. In doing so, we employ the London School of Economics (LSE) Hendry's (1995) general to specific (GETS) method to estimate the savings retention coefficients in a panel framework. The procedure used is general enough to allow for the presence of endogeneity, heteroscedasticity, serial correlation and CSD in the residuals. GETS specifications have received limited attention in panel data estimations; therefore in this paper we use GETS approach to estimate the short run dynamic adjustment equations with panel data. Since the *ITY*

<sup>1</sup> Some studies did use rates of investment and savings instead of the ratios; for a comprehensive survey see Apergis and Tsoumas (2009).

<sup>2</sup> ASEAN Free Trade Area (AFTA), European Union (EU), European Free Trade Association (EFTA), Codification of the Andean Sub-regional Integration Agreement (CARTAGENA), Southern Common Markets (MERCOSUR) and North American Free Trade Agreement (NAFTA).

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