Current Account Dynamics and the Feldstein and Horioka Puzzle: the Case of Greece

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Abstract

In this paper we investigate the degree of integration of the Greek economy into international capital markets using the analytical framework proposed by Felstein-Horioka. We examine the time series properties of data on current account balance and national savings for the period 1960-2004. Structural breaks are explicitly taken into account on the basis of the historical evolution of the institutional framework that governs international transactions. The evidence suggests that the links of the Greek economy to international capital markets have significantly strengthened after its accession to the European Union. Furthermore, the empirical results add another piece of evidence –albeit small- to the literature on the Feldstein-Horioka puzzle, indicating that the Feldstein-Horioka puzzle does not hold for the Greek economy.

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1. Introduction

International capital mobility has been the subject of extensive empirical and theoretical research for academic and economic policy reasons. Academically, the issue is of interest for the empirical validity of the assumption of perfect capital mobility --despite its importance to many open-economy macroeconomic and financial models-- is still a moot point. Economic policy makers are also concerned with the degree of capital mobility. A country's ability to smooth its time profile of national consumption, the efficacy of fiscal, monetary and current account policies and the choice between targeting national savings or domestic capital formation are all affected by the degree to which a country is linked to international capital markets.

In their well known paper, Feldstein and Horioka (1980) used the correlation between national savings and domestic investment as an indicator of international capital mobility. They interpreted high (low) correlation values as evidence of low (high) capital mobility. Their argument is the following. In a closed economy, savings remains necessarily home and finances domestic investment; an increase in domestic investment requires and equal increase in savings. Thus, under conditions of capital immobility savings and investment should be highly correlated. In contrast, under conditions of international capital mobility national savings is channeled to the country that offers the highest return on physical capital, and domestic investment is financed "by the worldwide pool of capital". In this case, an increase in domestic investment does not require an analogous change in savings. Thus, under conditions of capital mobility national savings and domestic investment should be uncorrelated.

Despite the widespread perception of increased capital mobility during the last decades, Feldstein and Horioka, using cross section analysis, found values of correlation between national savings and domestic investment close to one. Extensive subsequent empirical literature confirmed their findings, and high correlations values between savings and investment are considered by many researchers an empirical regularity. As Tesar (1991) notes, "(T)he correlation is not an artifact of a particular sample of countries or of a particular time period, but it is pervasive characteristic of saving and investment behavior of the OECD countries".

The contradiction between empirical evidence and conventional wisdom - referred to as the Feldstein-Horioka puzzle- has been the subject of a plethora of articles attempting to explain it. The literature can be classified in two categories. On the one hand, many researchers attribute the puzzle to factors that are unrelated to capital mobility, and they argue that the Feldstein-Horioka methodology is inappropriate for measuring capital mobility. For example, current account solvency constraints (Coakley *et al.*, 1998), the growth rate of income (Obstfeld, 1985), government policies targeting sustainable current account (Summers, 1985), non-traded goods and immobile factors (Engel and Kletzer (1987), productivity shocks (Obstfeld, 1985) country-size effects (Tsung-Wu Ho, 2003) can generate co-movements between savings and investment, even if capital is mobile. (Tesar 1991, Coakley *et al*, 1998 and Obstfeld and Rogoff 2000, provide an excellent literature review).

On the other hand, another line of research supports the validity of the Feldstein and Horioka's methodology in measuring capital mobility, and they explain the puzzle on methodological and econometric grounds. Within this framework, a number of researchers focus on the role of policy regime changes. (Gundlach and Sinn 1992, Jansen 1996, Jansen and Schulze 1996, Sarno and Taylor 1998, Bajo-Rubio 1998, Ozmen and Parmaksiz, 2003, 2005, and Coakley *et al.* 2004). Their findings suggest that policy regime changes introduce structural breaks which significantly bias the empirical results towards rejecting the hypothesis of capital mobility. Such evidence calls for a "country by country" approach –as opposed to cross section analysis- in order to ensure that the particular characteristics of the economy under examination are incorporated explicitly into the empirical analysis (Corbin 2001, Coakley *et al.* 2004, Taylor 2002, Jansen 1996, Mark 2003, Giannone and Lenza 2004, provide an analysis of the effects of country heterogeneity on the estimation methodology). We follow this line of research and investigate the role of policy regime changes in applying the Feldstein and Horioka methodology in the case of the Greek economy.

The objective of this paper is to examine the strength of the links of the Greek economy with international capital markets using the Feldstein-Horioka methodology. We examine the behavior of the Greek current account balance within a time series framework. Possible structural breaks are taken into account on the basis of the historical evolution of the institutional framework that governs international transactions. The paper is motivated by the observation that none of the existing studies --pertinent to the Greek economy-- take into account that Greece's accession to EU was accompanied by a significant process of external liberalization which resulted to a full removal of all current and capital account restrictions. Such institutional change strongly suggests the existence of structural breaks in the data.

The analysis of the Greek economy's integration into international capital markets is of interest for a number of reasons. First, as already mentioned, capital mobility affects the efficacy of economic policies; for example, if capital is immobile (domestic investment is primarily financed by national savings), policies aimed at increasing national savings will best serve the goal of economic growth. On the other hand, if capital is mobile, policies aimed directly at increasing domestic capital formation are more efficient in achieving growth. Second, analysis of the experience of the Greek economy may provide useful lessons to the new EU countries of similar size as well as to the EU accession countries with respect to the challenges they will face in dealing with the issue of capital mobility. Last, the significant changes that took place in the institutional framework that governs Greek international transactions allow us to examine whether structural breaks can provide an explanation to the Feldstein-Horioka puzzle.

The empirical results indicate that, from 1992 onwards, the links of the Greek economy with international capital markets have significantly strengthened. With respect to the Feldstein-Horioka puzzle the evidence suggests that the existence of structural breaks, if ignored, biases the results towards accepting the hypothesis of capital immobility. In particular, examining the whole sample-period, all tests indicate a loose link of Greece's economy to international capital markets. If the structural break is taken into account, all tests indicate low capital mobility for the 1960-1992 sample-period. In contrast, from 1992 onwards all tests show an increase of the Greek economy's integration into international capital markets.

2. Empirical Analysis

Feldstein and Horioka, using cross-sectional data on 16 countries, estimated the following model:

$$1. \qquad (I/Y)_i = \alpha + \beta (S/Y)_i + u_i$$

where I denotes domestic investment, S denotes national savings, Y denotes GDP, and u_i is a random disturbance. The coefficient β -referred to as the "savings retention coefficient"- measures the "proportion of the incremental savings that is invested domestically" (Feldstein and Bacchetta, 1989). Feldstein and Horioka's findings indicate that about 90% of national savings finances domestic investment.

Cross-section analysis was used widely in subsequent research[2]; however, advances in time series theory have rendered time series estimates advantageous over cross section estimates for a number of reasons. First, differences across countries are ignored when a cross-section approach is employed. Empirical evidence as well as macroeconomic theory suggests that savings-investment dynamics may be different for each country due to differences in economic structure, government policies, institutional frameworks and so on. Second, the results of time series analysis can be better understood for macroeconomic theory describes the relationship of a country's savings and investment over time. Third, (possible) cointegration between savings and investment rates biases upwards the estimate of the "savings retention coefficient". Last, time series analysis allows for a "country by country" approach which takes into account the particular characteristics of each country. This approach addresses the question of international capital mobility from

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[2] Feldstein and Bachetta, 1991; Artis and Bayoumi, 1992; Sinn, 1992; Obstfeld, 1996 among others.

a different perspective. As Jansen (1996) points out if a significant number of countries are found to be linked with international capital markets, this may be significant evidence of international capital mobility (see Jansen 1994 and Gundlach and Sinn 1992 for a complete analysis).

In the present paper we use time series analysis to examine the dynamic behavior of Greece's current account balance. Apart from reflecting the nature of exports and imports and international trade policies, the dynamic behavior of the current account balance also reflects the decisions of economic agents regarding savings and investment. From national income and balance of payments accounting emanates that the current account balance equals the savings-investment gap, and equation 1 can be rewritten in terms of the current account balance. In particular, according to the national accounts identity –presented in the following equation- the gross domestic product is equal to total spending and is also equal to the uses of total income earned in the economy.

$$2. \qquad Y = C + I + \Delta inv + G + X - M = C + S^{pr} + T + NTP$$

that is: Gross Domestic Product (Y) is equal to total spending on final product (the sum of: consumption (C), domestic investment (I), changes in inventories (Δinv), government expenditure (G) and net exports (X-M)); furthermore, Y is equal to the uses of total income earned in the economy (the sum of: C, private sector savings (S^{pr}), net tax revenue (T) and net transfer payments (NTP)).

From equation 1 can be derived[3] that:

$$3. \qquad S - I = CAB$$

where CAB denotes the current account balance.

Expressing equation 3 in percentage terms in relation to Y and substituting equation 3 in equation 1, equation 1 can be rewritten as:

$$4. \qquad (CAB/Y)_i = -\alpha + (1-\beta)(S/Y)_i + u_i$$

where u_i is an error term assumed to be stationary. Equation 4 provides a simple way of testing the proposition of Feldstein and Horioka (Feldstein 1983, Gundlach and Sinn1992). If CAB/Y is a stationary series and the national savings rate (S/Y) is a non-stationary series then the saving retention coefficient (β) must be equal to one[4]. A unit savings retention coefficient implies no relationship between changes of the national savings rate and changes in the country's international transactions which, in turn, indicates that domestic investment is primarily financed

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[3] $C + I + \Delta inv + G + X - M = C + S^{pr} + T + NTP \Rightarrow C + S^{pr} + T + NTP = C + I + \Delta inv + G + X - M \Rightarrow S^{pr} + T - G = I + \Delta inv + X - M - NTP \Rightarrow$ (using the definition $S^{pub} = T - G$) $S^{pr} + S^{pub} = I + \Delta inv + X - M - NTP \Rightarrow S - I = X - M + NTR \Rightarrow S - I = CAB$ (using the definition $X - M + NTR = CAB$).

where S^{pub}: public sector savings, NTR: net transfer receives, CAB: current account balance.

[4] The argument is based on a property of time series according to which: if k and m are constants, m≠0, and if $x_t ~ I(d)$, then $k + m x_t$ is also I(d) (Engle and Granger 1987).

by national savings; therefore, evidence that the CAB/Y is a stationary series and the national savings rate (S/Y) is a non-stationary series indicates that the economy does not participate in international capital markets.

In contrast, if both the current account balance and the national savings rate are non -stationary series then the savings retention coefficient is different than one. In this case there is no long run stable relationship between saving and investment rates and, consequently, the country is linked to international capital markets.

The following parameterization is used to model the data generating process of the current account balance:

$$5. \qquad y_i \ = \ c \ + \ \beta \ y_{i-1} \ + \ e_i$$

a constant term is included since Greece's current account exhibits a permanent negative balance; a time trend is not included since the current account balance is not expected to exhibit a trend.

The empirical analysis is based on annual data on current account balance and national savings, both expressed as a share of gross domestic product. The source of the data is the Ministry of National Economy (The Ministry of National Economy, Hellenic Democracy, "The Greek Economy 1960-01", Athens, 2001 and "Semi-annual Report", May 2004.).

First, we examine the time series properties of CAB/Y and S/Y using three tests: the Dickey Fuller (DF) test (Dickey and Fuller 1979), the Augmented Dickey Fuller (ADF) test (Said and Dickey 1984) and the Philips-Perron's Z (PP) test (Phillips and Perron 1988). The results are presented in Table 1. Using the full sample period the hypothesis that S/Y is a realization of a stochastic series containing a unit root could not be rejected. In contrast, the null hypothesis of non-stationarity for CAB/Y is rejected at a 10% level of significance. The results indicate that the Greek economy has not been integrated adequately into international capital markets. However, an inspection of the time profile of the institutional framework suggests that a structural break exists in the data which leads to biased estimates.

Examination of the time profile of the institutional framework governing current account and capital account transactions reveals that significant changes have taken place after Greece's accession to the European Union (EU) on 1981. The extensive network of controls on international transactions which has been developed from 1960 up to 1981 was gradually dismantled after Greece's accession to EU. By 1986, capital flows for non-residents were liberalized, and residents were allowed to invest in European Economic Community and European Investment Bank bonds. By 1988, residents could invest directly to EU member states. By 1991, repatriation of profits from direct investments by non-EU residents were fully liberalized; residents were allowed to buy shares, mutual funds and bonds (with a maturity of at least two years) issued by EU resident companies. By 1992, all remaining current account restrictions were lifted, and Greece accepted the obligations of Art. VII of the IMF's Articles of Agreement (Tsaveas, 2001).

Based on the time profile of the institutional framework, we apply the aforementioned tests using two subperiods: 1960-1992 and 1993-2003. The results are presented in the last four columns of Table 1. For the first subperiod, all tests reject the null hypothesis that the CAB/Y contains a unit root; in contrast, the hypothesis is rejected for the second subperiod. For both subperiods the null hypothesis that S/Y is a non-stationary series could not be rejected. In other words,

the tests indicate a long run stable relationship between savings and investment rates only during the period 1960-1992. However, from 1992 onwards the tests indicate that savings and investment react differently to shocks which in turn imply that the links of the Greek economy to international capital markets have strengthened significantly after 1992. Furthermore, the results support the hypothesis that the existence of structural breaks, if ignored, biases the results towards accepting the hypothesis of capital immobility.

3. Conclusions

The paper examines the links of the Greek economy with international capital markets and investigates the role of policy regime changes in explaining the Feldstein-Horioka puzzle. The issue of capital mobility and the case of the Greek economy are of interest for a number of reasons. First, the effectiveness of economic policies crucially depends on the degree of capital mobility. Second, the case of the Greek economy is useful in drawing lessons on the process the new EU countries as well as the new accession countries of similar size will face regarding their participation to international capital markets. Third, the significant changes that took place in the institutional framework that governs Greek international transactions allow us to examine whether structural breaks in the data can provide an answer to the Feldstein-Horioka puzzle.

We examine the time series properties of the current account balance and the national savings both expressed as a share of GDP. Our results for the whole period from 1960 to 2003 indicate that Greece is not a part of the international capital market. However, considering the subperiods before and after Greece's accession to EU, the tests show a significant increase in the degree of integration of the Greek economy into the international capital market after 1992.

The results –together with similar results for the economies of Italy, Norway, UK and France- point out a possible explanation for the Feldstein-Horioka puzzle. Policy regime changes in the financial environment introduce structural breaks in the data which, if ignored, biases the results of econometric analysis towards accepting the hypothesis capital immobility.

The conclusions are subject to two qualifications. First, the test results may be fragile due to the low number of observations, especially in the second subperiod. Second, an important question relates to the effect on the results of EU structural funds that Greece has received since its accession to EU. Further study is warranted.

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TABLE 1

Series Period Test	CAB/Y 1960- 2003	S/Y 1960- 2003	CAB/Y 1960- 1992	CAB/Y 1993- 2003	S/Y 1960- 1992	S/Y 1993- 2003
DF	-2,69*** (0)	-1,4 (0)	-2,75*** (0)	-0,95 (0)	-1,36 (0)	-2,01 (0)
ADF	-2,63*** (1)	-1,49 (1)	-3,11** (1)	-0,74 (1)	-1,44 (1)	-1,7 (1)
PP	-2,67*** (3)	-1,57 (1)	-2,71*** (1)	-0,92 (2)	-1,57 (2)	-2,18 (2)

MacKinnon (1991) critical values for rejection of the null of unit root are used. *, **, *** denote significance levels at 1%, 5%, 10% correspondingly.

The numbers in parenthesis represent the number of lags used. The choice of the number of lags is chosen on the basis of the formula reported in Schwert (1989). The results do not change significantly if different numbers of lags are used.