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The Feldstein-Horioka Puzzle Revisited: An "European-Regional" Perspective

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The Feldstein-Horioka Puzzle Revisited: An "European-Regional" Perspective *

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Abstract

The purpose of this paper consists in assessing the extent of financial integration in European Union using the Feldstein-Horioka criterion. More precisely, we test the cross-correlation of savings and investment rates across European Union regions, using NUTS 2 data coming from Eurostat regional database, over the period 1995-2000. Several important outcomes are reported by our article: if financial integration seems to be realized across all the regions forming European Union, the Feldstein-Horioka criterion keeps emphasizing differences between small and big countries, the later being less integrated at the regional level. Furthermore, the testing of the relationship between savings and investment in consistent sub-groups of regions (designed according to geographical, historical or economic criteria) emphasize that financial integration can be higher at the regional level.

JEL classification: E22, F21, G15
Keywords: regional savings, investment, capital market, capital flows.

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1 Introduction

Conventional wisdom holds that international capital markets are now highly integrated. Almost non-existent at the beginning of the seventies, cross-border transactions in equity and bonds, were more than 150% of United States GDP in the mid-nineties. In France, this ratio turns from 3% in 1975 to 106 % in 1996, and exceeds 400% in Italy at the same era. In United Kingdom, international transactions on bonds and equities amount to more than ten times GDP at the end of the nineties.

In their seminal paper of 1980, however, Feldstein and Horioka initiated a well-known quarrel by supporting the idea that international financial markets were actually poorly integrated. They were driven to that conclusion by examining the cross-sectional correlation between savings and investment across OECD countries during the 1960s and 1970s. The intuition is straightforward: if capital is perfectly mobile, domestic saving and capital should not be correlated, and capital should move freely where the rate of return is the highest. The result however pointed to a quite low degree of financial integration: despite a large volume of international capital movements, domestic saving and investment across OECD countries were found to be highly correlated, with estimated coefficients close to one.

The resulting Feldstein Horioka puzzle paved the way to an impressive number of subsequent analyzes of the relationships between national saving and domestic investment, which focused either on the econometric and statistical caveats, responsible for a bias towards a significant, positive, close to one, coefficient, or on the economic and historical circumstances akin to explain the discrepancy between an expected coefficient close to zero and its effective value. This paper belongs to the latter category of approaches, by focusing on the process of both political and economic integration of the European Union in the last twenty years, and by correlating regional savings and investment to be compared with similar results but using international data. Another, more original, contribution of the paper is to highlight that the process of regional financial integration can be driven by regions themselves instead of nations. Statistical analysis is based indeed on units which do not overlap national frontiers, but where financial integration is effective and can be higher than within political borders.

The paper is structured as follows: section 2 provides an overview of theoretical underpinning and related literature. Afterwards, section 3 describes the methodology and the data set. In section 4, we present and discuss two sets of results. The first group of estimations details the correlations of saving and investment rates across the regions inside each country, while the second one tests the Feldstein-Horioka criterion on consistent transnational or intranational groups of regions. Here, we assess the possible influence of geographical, historical or economic links on regions financial integration. Section 5 provides concluding remarks.

2 Pieces in the Feldstein-Horioka puzzle

In their pioneering study, Feldstein and Horioka (1980) examined the cross-sectional correlation between savings and investment by testing this very simple equation:

$$\left(\frac{I}{Y}\right)_{it} = \alpha + \beta \left(\frac{S}{Y}\right)_{it} + \varepsilon_{it} \tag{1}$$

where $\left(\frac{I}{Y}\right)$ represents the ratio of investment over Gross Domestic Product (GDP), that is the investment rate. Similarly, the ratio of savings over GDP, $\left(\frac{S}{Y}\right)$, can be interpreted as the savings rate of the economy. Indexes i and t respectively stand for the considered country and year. Consequently, it is the value of the β parameter which focused until today the interest of a substantial literature. Indeed, the apparent Feldstein-Horioka mystery has been constantly fuelled by new studies, a lot of them emphasizing the significance and robustness of this β parameter, whatever the time span considered.

Explaining this so-called Feldstein Horioka puzzle is a matter of either econometrics or of economic analysis. Let us start with a brief review of the former (statistical drawbacks responsible for the bias of the correlation between savings and investment). Feldstein and Horioka (1980), Bayoumi (1990), and Tesar (1991) consider that net instead of gross savings and investment should be used. Others emphasize that savings and investment are procyclical, and that a common economic cycle determines simultaneously the former and the latter. Therefore, savings is endogenous and correlated with the residual. For addressing the resulting bias, one has to find an instrument.

Feldstein and Horioka (1980) computed averages over a long enough period of time, and they used demographic variables to handle sources of endogeneity. One of them may occur if there is a policy reaction to incipient current account imbalances to reduce it. The policy reaction argument has been made by Fieleke (1982), Tobin (1983), Summers (1988), or Bayoumi (1990). It is also made in a recent paper (Coakley et al., 1996) which emphasizes a cointegration relationship between savings and investment, due to the fact that in the long run, policy must react to imbalance by equalling saving and investment. The resulting constraint explains both why the correlation between savings and investment is biased towards one, and why it is lower for developing countries. Not because their degree of financial integration is higher than for developed countries, but because they are less capable of respecting the long run capital constraint equilibrium. In a time-series context, Obstfeld (1986) argues that the world interest rate will not be exogenous and will determine both domestic savings and investment. A shortfall in domestic savings will drive up the world interest rate and thus crowed out investment in the country. This problem can be corrected by expressing saving and investment rates as deviations from their averages. But even with this adjustment, Frankel (1986) finds that the correlation does persist.

Another way of understanding the Feldstein-Horioka result is to put it in historical perspective. According to the latter, capital controls would have been the rule rather than the exception up to a very recent period. Only the latest period from 1989 up to now can be compared to the Gold Standard in terms of financial liberalization and break-up of financial controls. In that process, international institutions have played a crucial role. One can distinguish several of them: OECD which issues regularly Code of Liberalization of Capital Movements, WTO, which negotiates the liberalization of banking and financial services, attempts unsuccessfully to extend the liberalization of capital flows to Foreign Direct Investment. For developing countries, exposed to crisis of balance of payments and vulnerable to speculative attacks, IMF has recently been the proponent of dismantling regulations and capital controls, although in a less unambiguous manner than in the case of industrialized countries. Regionalism is also the locus of financial liberalization, as emphasized in Flandreau and Rivière (1999): as soon as 1990, the Maastricht Treaty included explicitly the dismantling of all capital controls across European countries. Alongside with the monetary inte-

gration and the introduction of the euro, the very last obstacles to a complete financial integration have been progressively eliminated. As a result, the prediction of a coefficient close to nil should be validated either for the period prior to the First World War or to the period from the beginning of the nineties up to now. Frankel (1992) argues that "if the saving-investment regressions were a good test for barriers to financial-market integration, one would expect to see the coefficient falling over time. Until recently, this prediction has not been supported by the evidence, whether from cross section studies, which typically report pre- and post-1973 results (...) or from pure time series studies (...)". The contrary is emphasized in Flandreau and Rivière (1999), who report that the coefficient is generally lower after 1973, with two exceptions (see table below): Murphy (1984), and Penati and Dooley (1984). More importantly, the coefficient is significantly lower during the only period which is known to correspond to a period of deeper financial integration, that is the Gold Standard.

Insert Table 1 here

From Feldstein and Bacchetta (1991) one can already notice that the degree of capital mobility is higher across European countries. The coefficient falls from respectively 0.73 to 0.46 when the equation is run before and after 1973 on a sample of nine EEC countries, and from 0.91 to 0.67 when it is run on a sample of 23 OECD countries.

The latter remark points to the last possible explanation for the lack of international financial integration over more recent periods of time. Following Frankel (1992), the real interest differential is made of three components. One can think first of the covered interest differential, which captures all barriers to integration of financial markets across national boundaries, namely transactions costs, information costs, capital controls, tax laws (discriminating by country of residence). A similar argument is made in Obstfeld and Rogoff (2000) who argue that the Feldstein Horioka puzzle can be solved by introducing costs of international trade in the form of iceberg costs. The exchange risk premium and expected real depreciation are the two other components. These two ones together constitute the currency premium, "because they pertain to differences in assets according to the currency in which they are denominated, rather than in terms of the jurisdiction in which they are

issued (Frankel, 1992)". The currency premium is driven by a substantial exchange rate variability vis-à-vis the dollar since 1973 for European countries, which can explain in the above-mentioned Feldstein and Bacchetta (1991), the higher saving-investment coefficient when estimated using a sample of OECD countries than that found with a sample restricted to European countries.

A more radical way of eliminating the currency premium problem is to rely on intra-national data, that is to correlate regional savings and regional investment across regions of a single country, as originally suggested by McCloskey and Zecher (1976, 1984). This has been done more recently in a few papers investigating the Feldstein-Horioka relationship on a regional basis and the results are summarized in the table below which reproduces and completes the survey table of van Wincoop (2001):

Insert Table 2 here

It is worth noting that two methods are mainly used in the literature. On the one hand, the panel regression induces β from the estimation of : $(\frac{I}{Y})_{it} = \alpha + \beta(\frac{S}{Y})_{it} + \varepsilon_{it}$. On the other hand, the cross-sectional regression estimates β from: $(\frac{I}{Y})_i = \alpha + \beta(\frac{S}{Y})_i + \varepsilon_i$. Here, it is important to understand that the index i stands for regions of the considered country or currency area.

The very first study is due to Sinn (1992), which finds a comovement coefficient not significantly different from zero for the United States. Even if these results seem natural in the context of an old integrated monetary union, they are to be taken cautiously, since they have been computed on only two years, more than a half-century ago. Using UK intra-national data, Bayoumi and Rose (1993) find that investment and saving rates are poorly correlated for the eleven administrative regions of the UK, a diagnosis more or less confirmed by Thomas (1993). The study he provides involves also Canada, and the main result he finds is almost the same that the one achieved by Bayoumi (1997), that is a coefficient really close to zero. For Japan, while Dekle (1996) finds significant negative coefficients whatever the period considered, Iwamoto and van Wincoop (2000) and van Wincoop (2001) exhibit systematically significant and positive coefficients between 0.3 and 0.4, no matter the period studied or the econometric methodology used. Those coefficients are higher than for the U.S. or the U.K., but more importantly lower than the coefficients obtained using international variance

(cf. infra). Besides, the two latter studies are basically the only ones to find a positive relationship, all the other ones supporting evidence of a negative comovement between savings and investment. As emphasized by van Wincoop (2001), this negative comovement cannot be attributed only to a measurement bias, but also to possible disagreements regarding the definition of regional saving and investment rates.

Among this overview, the paper by Armstrong et al. (1996) offers an original perspective. Following explicitly the path of Bayoumi and Rose (1993), they tested the correlation saving/investment for the mid-1990s twelve EU members. Relying on national data, their study considered EMU as an area on the way of integration, that is presumably in an intermediary situation between the United Kingdom (an already integrated capital market) and OECD countries (with a high correlation between savings and investment rates). Their empirical work supports the idea that the EU capital markets exhibited levels of integration on the whole close to the UK intra-national one. However, the puzzle of negative coefficients remain, with a downward bias seemingly due to the inclusion of Portugal in the sample. Besides, the authors emphasized, without explaining it, a possible business cycle bias, according to which the correlation would be stronger (sometimes around 0.5-0.6) during period of recessions. Finally, their study do not perform any kind of intranational analysis inside European Union countries, considered explicitly as homogenous regions of a wider area.

Consequently, beyond the updating of Armstrong et al. (1996)'s results using *regional* more recent data, the present paper has two main purposes. First, it aims at generalizing Bayoumi's and Rose (1993)'s results for the United Kingdom to all other European countries, by testing the Feldstein-Horioka criterion on a regional basis for *each* of them. Second, the use of a regional basis will help to investigate the possibility of transnational/cross-border strengthened financial integration between some specific regions, which could arise from geographic or historical reasons. In that spirit, we are going to work on the following variant of equation 1:

$$\left(\frac{I_{it}^{j}}{Y_{it}^{j}}\right) = \alpha + \beta \left(\frac{S_{it}^{j}}{Y_{it}^{j}}\right) + \varepsilon_{it}^{j} \tag{2}$$

where the letter j and i respectively stand for regions and countries, at a period of time t. This

will allow for a double study, *intra*national on the one hand (how integrated can be all regions from the same country?), *trans*national on the other hand (how may be integrated some regions from different countries?).

3 Data and methodology: from regions to countries

Regarding our data set, we use annual series for investment (gross fixed capital formation, GFCF) and gross domestic product coming from Eurostat harmonized regional accounts, available over the 1995-2000 period (Regio NUTS 2, European System of Accounts, ESA 95. For Germany, only NUTS 1 data of GFCF were available). Unfortunately, no savings data exist for the moment at the regional level. However, the Regio database provides disposable income data for households. Harmonized at the European level, this aggregate is accountably equal to the sum of consumption and gross savings[1]. Using this information, we decided to proxy regional savings using two methodologies. First, we assume that the ratio of regional disposable incomes on total national income and the ratio of regional savings on total national saving are identical, which allows to rebuild complete series of regional savings in level (Method 1). Formally, denoting income as INC, this leads to assume that $\frac{S_{it}^j}{S_{it}} = \frac{INC_{it}^j}{INC_{it}}$, where S_{it}^j is non-observable, and to estimate:

$$\left(\frac{I_{it}^j}{Y_{it}^j}\right) = \alpha + \beta \left(\frac{INC_{it}^j}{INC_{it}} \times \frac{S_{it}}{Y_{it}^j}\right) + \mu_{it}^j \tag{3}$$

Second, we postulate that disposable income and savings rates grow identically, and consequently, the Feldstein-Horioka model can be estimated using differentiated variables instead of levels (Method 2). Formally, this leads to assume that $\Delta\left(\frac{S_{it}^j}{Y_{it}^j}\right) = \Delta\left(\frac{INC_{it}^j}{Y_{it}^j}\right)$, and to estimate:

$$\Delta\left(\frac{I_{it}^j}{Y_{it}^j}\right) = \gamma + \beta \times \Delta\left(\frac{INC_{it}^j}{Y_{it}^j}\right) + \upsilon_{it}^j \tag{4}$$

Both methods have their advantages and drawbacks. The first one allows performing estimations in level, close to the pioneering ones of Feldstein and Horioka (1980) and directly comparable to the

[1] This indicator is therefore different from GDP Y, which is roughly equal to the sum of gross values added created in the economy

outcomes of the aforementioned studies. Nevertheless, it leads to consider that regions are provided with similar propensities of consuming and saving, while savings are likely to be relatively lower in poor regions than in wealthy ones. The method using differentiated series relies on the more suitable hypothesis that income and savings move proportionally; however, information is lost compared to the estimations in level, and the number of observations is reduced. Consequently, estimations will be made alternatively with each series, for checking the robustness of our results.

Turning to estimations concerns, we rely on a panel of 108 European Union regions, i.e. a 557 observations sample including Belgium, Denmark, Germany, Greece, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland and Sweden -unfortunately, required NUTS 2 data were not available for Spain. Regarding the econometric methodology, the short time span prevents us to use the recent cointegration panel methods (Kim, 2001; Banerjee and Zanghieri, 2003). Thus, we choose to estimate the Feldstein-Horioka relationships using both panel and cross-sectional regressions. Concerning the first option, generalized least squares are used first in a random-effects model, then in a fixed-effects one, before using a Hausman's (1978) specification test in order to discriminate which estimation is efficient. Only coefficients from the efficient estimation are reported, in order to ease comparisons with the second option. Regarding the latter, the estimation is proceeded using Ordinary Least Squares, relying on robust to heteroskedasticity White standard errors.

The subsequent analysis will divide in two parts, each of them relying on a different panel. The first one follows explicitly the path opened by Bayoumi and Rose (1993) on the United Kingdom, and wants to check if each country of our European sample can be considered as a highly integrated capital market[2] according to the Feldstein-Horioka equation. The second one comes from the testing of Feldstein-Horioka criterion on consistent transnational and/or *intra*national groups of regions. Here, we assess the possible influence of geographical, historical or economic links on regions financial integration. Accounting for the constrains arising from data availability, we are able to study seven

[2] An*intra*national study cannot be provided for Denmark, Luxembourg, Ireland and Finland: the two firsts are two small countries which are considered as single regions at the NUTS 2 level, while third and fourth ones lack observations.

consistent transnational groups, represented on the maps below:

Insert Figure 1 here

For clarity, transnational groups are indexed from 1 to 7 on the maps above. Scandinavian group involves Denmark, Finland and all the regions of Sweden (Group 1 on the map). A second association is made of East of France (Alsace, Lorraine) and regions from West of Germany, that is Baden-Württemberg and Rheinland-Pfalz (Group 2). Rhônes-Alpes, Provence-Alpes-Côtes d'Azur for France, and Piemonte, Lombardia, Valle d'Aosta, Liguria, Veneto, Friuli-Venezia Giulia, Emilia Romagna, Toscana, Umbria, Marche, Lazio for Italy, jointly form a consistent area covering Southeast of France and North of Italy (Group 3). Another pool includes Northern French regions (Nord-Pas de Calais, Champagne-Ardenne, Picardie, Lorraine), the bordering Belgian regions (Luxembourg, Namur, Hainaut, Vlaanderen, that is Flanders) and Luxembourg (Group 4). We examine also the relevance of an area involving all regions from the Benelux association and neighboring German regions, that is Nordrhein-Westfalen, Rheinland-Pfalz and Niedersachsen (Group 5). Encompassing Veneto, Salzburg, Tirol and Oberösterreich, group 6 tests the likelihood of an Austrian-German-Italian mix. Finally, the capital group (7 on the map) comprises all the capital regions or main economic centers of the studied countries: Paris, Berlin, Bonn (as the former West Germany capital), Brussels, Wien, Roma, Milano, Copenhagen, Luxembourg, Dublin, Stockholm, Amsterdam, Athens, Lisboa[3]. Regarding intranational specificities, we will focus our attention on North/South Italy, Flanders/Wallonia (Belgium), and West germany/Germany as a whole[4]. Beyond the constraint of the number of observations, these cuttings seem relevant both from historical and economic point of views.

4 Results: a double look at the EMU

Comparing results from both methods leads us to prefer method 2 for different reasons. First cross-sectional and panel regressions converge remarkably well when relying on differentiated series

[3]No data at the NUTS 2 level was available for the region of Lisboa, so we substituted data from the wider cutting NUTS 1.

[4]Due to an insufficient number of observations, we could not provide meaningful estimations for East Germany.

(method 2), but disagree strongly on the method 1, revealing a likely problem of misspecification in the latter case, probably induced by overestimating savings of the poorest regions. Secondly method 1 leads to numerous estimates beyond the 0-1 theoretical interval (table 3: Germany, Greece, Netherlands and table 4: Germany again), and even to negative estimates (table 3: Portugal and table 4: France, Italy, and Portugal), while method 2 produces results between zero and one, which are more conform to the theoretical expectations of the Feldstein-Horioka model. Consider the case of Germany for instance. Method 1 coefficient is equal to 2.40 (level estimate) or 2.37 (within estimate), and more realistically it is equal to 0.08 (level estimate) or 0.38 (within estimate) according to method 2. By "extracting" in table 6 West Germany from the whole set of observations, that is by keeping only regions with similar level of wealth and consequently ratio of savings on total regional income, method 1 produces a more acceptable coefficient equal to -0,65 but not significantly different from zero. More specifically regarding big countries, the two ways for rebuilding savings lead to clearly different results. Ignoring the regional disparities in terms of savings behavior as in method 1 is more likely to generate a bias for big countries than for small ones. This is because a bigger country is more likely to include both wealthy regions tending to save relatively more (as a share of income), and poor regions tending to save relatively less (as a share of savings). Consequently, the bigger the country is, more important is going to be the bias. This argument is reinforced by the lack of major contradiction arising from the small countries analysis. That is why it seems to make more economic sense to privilege estimations coming from the second method. In as much within and level estimates converge, we will essentially comment in what follows on within estimates from tables 4 and 6.

Striking features emerges from the analysis. Firstly, the β coefficient computed over all the regions at the European level is remarkably weak but significant, between 0.15 and 0.20, which would tend to support the idea of a strong integration of capital markets in the European Union. This result comes to moderate a bit the ones from Armstrong et al. (1996), which tended to find a negative non-significant coefficient. Secondly, the Feldstein-Horioka criterion highlights undeniable heterogeneity between European countries. Small countries constitute an homogenous sub-group of countries with estimated coefficients not significantly different from zero (Belgium, Netherlands,

Austria, Portugal); then countries with low estimated coefficients but significantly different from zero (Greece and Italy). There seems to be a strong financial integration inside these small euro area members. Finally a third set of medium-large countries with coefficients higher than the European average (Germany, France, Sweden). For those countries estimations are significant, ranging between 0.35 and 0.63, an interval close to the figures encountered by Iwamoto and van Wincoop (2000) and van Wincoop (2001) for Japan.

Insert Table 5 here

Insert Table 6 here

Focusing now on regional groups, we begin by testing the Feldstein-Horioka criterion on sets of frontier regions (Scandinavia, West Germany and Benelux, North of Italy and South of France), which emphasize on the whole a very low correlation of saving and investment rates inside these groups, lower than at the country level. The Scandinavian group coefficient is 0.17 not significantly different from zero, while the Swedish one was 0.35. Grouping North of Italy and South of France succeeds in lowering the French estimate, which falls from 0.63 in table 4 to 0.15 in table 6. North of France (Nord-Pas de Calais, Champagne, Picardie, Lorraine), the Belgian region of Luxembourg, Namur, Hainaut, Flanders and Luxembourg constitute also an area of complete capital mobility. Combined with Germany, Belgium, Netherlands and Luxembourg are as integrated as each country taken separately. Only two groups of regions do not exhibit any dynamics of supra-national financial integration: the Austrian-German-Italian association whose coefficient is 0.31, and group 2, made off Alsace, Lorraine, Baden-Württemberg and Rheinland-Pfalz.

Moreover, we examine the Feldstein-Horioka relationship across regions where the capital cities or main economic centers of the countries are located. Surprisingly, the estimated coefficients are significantly positive, between 0.2 and 0.3, despite the growing integration of stock and assets markets that euro should accelerate. Our intuition is that some kind of border effects remains in the allocation of saving and investment, which a favorable legislation and monetary integration could not remove completely until today.

Then, we carry on the examination with the analysis of possible regional specificities inside European countries. To do so, we estimate the coefficient of comovement between saving and investment in Consistent sub-groups of regions, like North Italy/South Italy, Flanders, Wallonia, West Germany. The latter displays an estimated coefficient not significantly different from zero, which tends to support the idea that the former Federal Republic of Germany forms a financially integrated area. While Wallonia show beta coefficient fall to zero, Flanders exhibit a significant positive value of 0.37. Eventually, the ones of both North and South Italy remain at the country level of 0.15.

5 Conclusion

To conclude, our major original contribution in this paper consists in applying the Feldstein-Horioka criterion to European regional data. Several important outcomes are reported by our article. First, financial integration seems to be realized across all the regions forming European Union, which corroborates Frankel (1992)'s hypothesis that the existence of different monies can explain the existence of a currency premium impeding the realization of a "perfect" financial world. Second, as in Flandreau and Rivière (1999), Bayoumi (1990), Eichengreen (1992), Zevin (1992), Taylor (1998), and others, we emphasize that history, geography and policy altogether matter. What is puzzling in the Feldstein-Horioka result is not the refutation of the assumption of a "perfect financial" integration, but rather the expectation that this assumption could have been validated, given the institutional and political features of the periods and country samples on which the Feldstein-Horioka test was run. Our paper shows that capital mobility becomes higher across countries of an area in the way of political, geographical and economic integration. The third important outcome consist in testing the relationships between saving and investment in consistent sub-groups of regions (designed according to geographical, economic or historical criteria). While historical approaches emphasize the absence of any mechanical link between saving and investment and the fact that the regulation of financial flows through political action is an efficient instrument for making possible the current process of world integration and globalization, here we highlight that regional forces can

drive the process of financial integration, found to be higher across regions than within countries. This conclusion echoes a Fatas (1997) paper where the symmetry of business cycles was found to be higher at a regional level.

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Table 1: *Correlation between savings and investment: the historical perspective*

Authors	Gold Standard	Interwar	Bretton Woods	Floating rates
Flandreau and Rivière (1993)	1880-1913	1918-1939	1945-1973	1974-1996
Pooling	0.46 (0.03)	0.77 (0.03)	0.86 (0.02)	0.34 (0.03)
Within	0.44 (0.03)	0.64 (0.03)	0.78 (0.02)	0.68 (0.11)
Between	0.48 (0.18)	0.97(0.082)	0.94 (0.09)	0.22 (0.04)
Number of countries	16	15	24	24
Murphy (1984)			1960-1974	1975-1980
Between			0.89 (0.08)	0.95(0.10)
Number of countries			17	17
Penati and Dooley (1984)			1949-1959	1974-1981
Between			0.69 (0.10)	0.88 (0.16)
Number of countries			19	19
Dooley et al. (1987)			1960-1973	1974-1984
Between			0.75 (0.10)	0.74 (0.17)
Number of countries			14	14
Feldstein and Bachetta (1991)			1960-1973	1974-1986
Between			0.91 (0.07)	0.67 (0.15)
Number of countries			23 (OCDE)	23 (OCDE)
			1960-1973	1974-1986
Between			0.73 (0.15)	0.46 (0.38)
Number of countries			9 (EEC)	9 (EEC)
Bayoumi (1990)	1880-1913		1966-1970	1981-1985
Between	0.29 (0.46)		0.96 (0.10)	0.72(0.12)
Number of countries	8		10	10
Tesar (1991)			1960-1974	1975-1986
Between			0.89 (0.10)	0.81 (0.18)
Coakley et al. (1994)			1960-1974	1975-1992
Between			0.88(0.06)	0.65 (0.10)
Number of countries			23	23
Bayoumi (1997)	1885-1913		1960-1971	1975-1993
Between	0.53 (0.29)		0.84 (0.07)	0.65 (0.10)
Number of countries	9		22	22
Kim (2001)				1960-1992
Cointegrated panel				0.69 (0.25)
Number of countries				19 (OECD)

Notes: adapted from Flandreau and Rivière (1999). Standard errors in parentheses.

Table 2: *Correlation between savings and investment: the intranational look*

Authors	Country	Statistical Method	Sample	Estimate of comovement
Sinn(1992)	United States	Cross-Sectional	1957	-0.12 (0.08)
		regression	1953	-0.06 (0.08)
Bayoumi	United Kingdom	Panel regression	1971-1975	-0.48(0.16)
and Rose (1993)			1976-1980	0.24 (0.21)
			1981-1985	0.01 (0.14)
	United Kingdom	Cross-sectional	1971-1975	-0.99 (0.53)
		regression	1976-1980	0.54 (0.80)
			1981-1985	0.03 (0.33)
Thomas (1993)	United Kingdom	Panel regression	1971-1987	-0.56 (0.13)
	Canada	Panel regression	1961-1989	-0.10 (0.02)
Armstrong	European Union	Cross-sectional regression	1971-1975	0.17 (0.09)
et al. (1996)			1976-1980	-0.55 (0.59)
			1981-1985	-0.36 (0.29)
			1986-1991	-0.23 (0.13)
		Cross-sectional	1971-1975	-0.03 (0.14)
		regression	1976-1980	-0.35 (0.13)
			1981-1985	-0.31 (0.21)
			1986-1991	-0.24 (0.21)
Dekle (1996)	Japan	Cross-sectional	1975-1988	-0.36 (0.08)
		regression	1975-1979	-0.44 (0.11)
			1980-1984	-0.32 (0.09)
			1985-1988	-0.24 (0.05)
Bayoumi (1997)	Canada	Cross-sectional	1961-1993	-0.07 (0.08)
		regression		
Iwamoto and	Japan	Cross-sectional	1975-1980	0.30 (0.15)
van Wincoop (2000)		correlation	1980-1985	0.47 (0.10)
			1985-1990	0.43 (0.10)
		Time-series	1975-1990	0.31 (0.04)
		correlation		
van Wincoop (2001)	Japan	Panel regression	1970-1990	0.31 (0.03)
		Cross-sectional	1975-1980	0.21 (0.13)
		regression	1980-1985	0.32 (0.11)
			1985-1990	0.21 (0.08)
		Cross-sectional	1975-1980	0.26 (0.15)
		correlation	1980-1985	0.43 (0.10)
			1985-1990	0.40 (0.11)
		Average time-series	1975-1990	0.31 (0.04)
		correlation		

Notes: adapted from van Wincoop (2001). Standard errors in parentheses.

Table 3: *Intranational comovement savings/investment: cross-sectional estimations*

	Method 1		Method 2	
Country	number of observations	estimate of comovement (β)	number of observations	estimate of comovement (β)
NUTS2	**557**	**0,20**^{a}	**436**	**0.20**^{a}
Belgium	66	0.14^a	55	0.17^b
Germany	96	2.40^a	80	0.08
Greece	78	1.25^a	65	0.16
France	96	0.20^a	63	0.58^a
Italy	114	0.59^a	95	0.15^a
Netherlands	60	1.03^a	48	-0.08
Austria	45	0.35^a	27	0.08
Portugal	20	-1.93^a	16	-0.98^c
Sweden	48	0.39^b	40	0.35^a

Notes: ^{a},^{b}, and ^{c}respectively denoting significance at the 1%, 5% and 10% levels.

Table 4: *Intranational comovement savings/investment: panel estimations*

	Method 1		Method 2	
Country	number of observations	estimate of comovement (β)	number of observations	estimate of comovement (β)
NUTS2	**557**	**0,19**^{a}	**436**	**0.15**^{a}
Belgium	66	0.66^b	55	0.16
Germany	96	2.37^a	80	0.38^b
Greece	78	0.11	65	0.16^b
France	96	-0.17^a	63	0.63^a
Italy	114	-0.67^a	95	0.15^a
Netherlands	60	-0.04	48	-0.31
Austria	45	0.49	27	0.58
Portugal	20	-2.52^a	16	-0.82
Sweden	48	0.57^a	40	0.35^a

Notes: ^{a}and ^{b}respectively denoting significance at the 1% and 5% levels.

Table 5: *Comovement between savings and investment in transnational/intranational groups: cross-sectional estimations*

	Method 1		Method 2	
Regional group	number of observations	estimate of comovement (β)	number of observations	estimate of comovement (β)
G1: Scandinavia	66	0.56^{b}	55	0.15
G2: East France/West Ger.	20	0.06	16	0.70^{a}
G3: North Italy/South France	72	0.52^{a}	59	0.15^{a}
G4: North France/Belg./Lux.	46	0.43^{b}	32	0.02
G5: Germany/Benelux	66	-0.17	47	0.15
G6: Austria/Germany/Italy	37	0.81^{a}	27	0.39^{b}
G7: Capitals	78	0.87^{a}	58	0.30^{a}
North Italy	66	0.41^{c}	55	0.14^{a}
South Italy	48	-0.36	40	0.15^{a}
Flanders	30	0.15^{c}	25	0.37^{a}
Wallonia (Brux. incl.)	36	0.15^{a}	30	-0.01
Wallonia (Brux. excl.)	30	-0.12	25	-0.05
Germany	96	2.40^{a}	80	0.08
West Germany	66	0.69^{a}	55	0.28

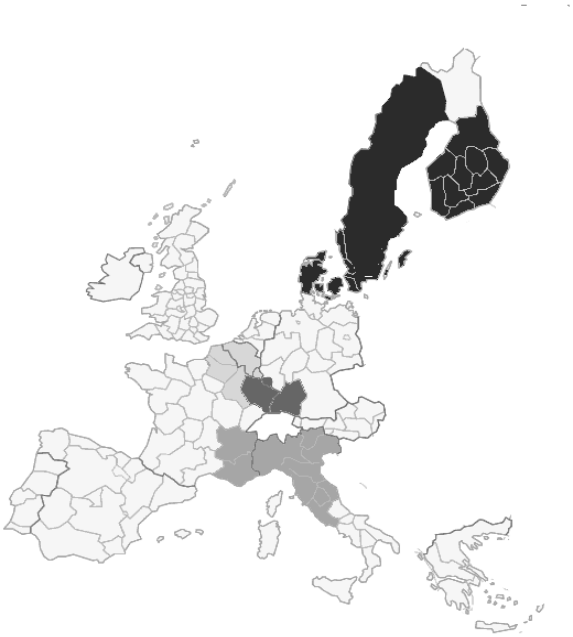
Notes: ^{a},^{b}, and ^{c}respectively denoting significance at the 1%, 5% and 10% levels.

Table 6: *Comovement between savings and investment in transnational/intranational groups: panel estimations*

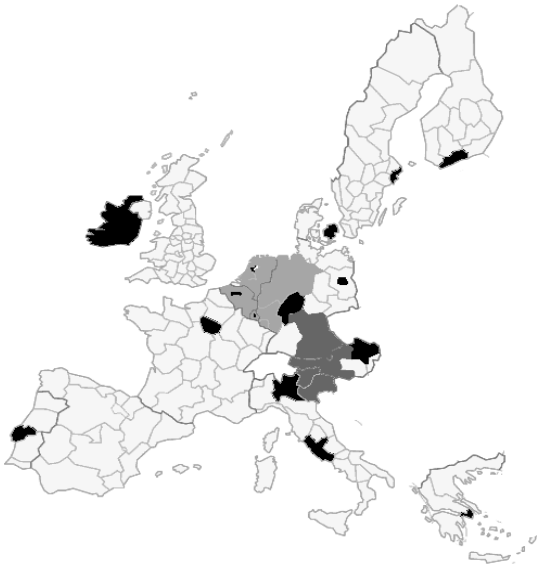
	Method 1		Method 2	
Regional group	number of observations	estimate of comovement (β)	number of observations	estimate of comovement (β)
G1: Scandinavia	66	0.60^{b}	55	0.17
G2: East France/West Ger.	20	-0.03	16	0.7^{a}
G3: North Italy/South France	72	-0.45^{a}	59	0.15^{a}
G4: North France/Belg./Lux.	46	0.39	32	0.02
G5: Germany/Benelux	66	0.19	47	0.34
G6: Austria/Germany/Italy	37	-0.5	27	0.31^{a}
G7: Capitals	78	0.58^{a}	58	0.16^{c}
North Italy	66	-0.62^{a}	55	0.14^{a}
South Italy	48	-0.89^{c}	40	0.15^{b}
Flanders	30	0.32	25	0.37^{a}
Wallonia (Brux. incl.)	36	0.82^{b}	30	-0.02
Wallonia (Brux. excl.)	30	0.82^{b}	25	-0.04
Germany	96	2.37^{a}	80	0.38^{b}
West Germany	66	-0.65	55	0.26

Notes: ^{a},^{b}, and ^{c}respectively denoting significance at the 1%, 5% and 10% levels.

Figure 1: Transnational groups



Map 1: first set of groups



Map 2: second set of groups

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