UNIVERSITÉ PARIS 1 – PANTHÉON - SORBONNE –

R. O. S. E. S.

RESEARCH CENTRE
ON TRANSITION AND
DEVELOPMENT ECONOMICS
UMR 8055

Cahiers de la MSE

A new look at the Feldstein-Horioka puzzle : an « European-Regional » perspective

Jérôme HERICOURT, TEAM

Mathilde MAUREL, ROSES

2005.70

CENTRE NATIONAL
DE LA RECHERCHE
SCIENTIFIQUE

Maison des Sciences Économiques, 106-112 boulevard de L'Hôpital, 75647 Paris Cedex 13
http://mse.univ-paris1.fr/Publicat.htm

ISSN : 1624-0340

A New Look at the Feldstein-Horioka Puzzle: An "European-Regional" Perspective*

Jérôme Hericourt† Mathilde Maurel‡

October 2005

*The authors thank the participants of the 20th Congress of the European Economic Association, 10th Spring Meeting of Young Economists, 22nd Symposium on Banking and Monetary Economics and TEAM and ROSES seminars for highly profitable discussions and comments. Special thanks to Anne-Célia Disdier, Keith Head and Casper de Vries for very useful suggestions on previous versions of the paper. Of course, the usual disclaimer applies and all remaining errors are ours.

†TEAM, Université de Paris I Panthéon Sorbonne, 106-112 Bd de l'hôpital, 75647 Paris CEDEX 13, France. Tel/Fax: (33) 1 44 07 82 71/47, Email: jerome.hericourt@univ-paris1.fr

‡Corresponding author, ROSES, Université de Paris I Panthéon Sorbonne, 106-112 Bd de l'hôpital, 75647 Paris CEDEX 13, France; WIlliam Davidson Institute. Tel/Fax: (33) 1 44 07 81 87, Email: maurelm@univ-paris1.fr

Abstract

The purpose of this paper consists in assessing the extent of financial integration in the European Union using the Feldstein-Horioka criterion. More precisely, we test the cross-correlation of savings and investment rates across the regions of the European Union, using regional data from *Regio* and national statistical offices, over the period 1995-2000. Several important outcomes are reported by our article. First, we find that the financial integration seems to be realized inside each country, and we are able to rationalize the few puzzles we face. Second, we find that overall financial integration between EU regions is almost complete. After performing additional investigations on consistent sub-groups of regions, however, our analysis discards the illusion that the sole suppression of institutional barriers to capital mobility would be sufficient to achieve a perfect financial integration. In that spirit, our main finding is that History, language, borders and distance as a proxy for transaction and information costs, still matter.

JEL classification: E22, F21, G15
Keywords: Feldstein-Horioka puzzle, regional savings, investment, capital market, capital flows.

Résumé

Cet article s'intéresse au degré d'intégration financière au sein de l'Union Économique et Monétaire (UEM) selon le critère défini par Feldstein et Horioka (1980). Plus précisément, nous estimons la corrélation entre taux d'épargne et taux d'investissement en utilisant des données régionales NUTS 2, issues de la base de données REGIO fournie par Eurostat. Nous parvenons alors à plusieurs résultats importants. Tout d'abord, nos estimations soutiennent que l'intégration financière au sens de Feldstein-Horioka semble réalisée à l'intérieur de chaque pays de l'UEM, et nous sommes en mesure d'expliquer les quelques énigmes auxquelles nous faisons face. Un second résultat important renvoie à l'intégration financière entre toutes les régions européennes, qui semble en moyenne réalisée. Après avoir réalisé une série supplémentaire d'estimations sur des sous-groupes de régions (construits selon des critères historiques, géographiques ou économiques), notre analyse souligne cependant que la seule suppression des barrières institutionnelles à la mobilité du capital est insuffisante pour atteindre une intégration financière parfaite. Dans cette perspective, nous mettons en avant que l'Histoire, la langue, les frontières et la distance comme proxy des coûts de transaction conservent une certaine importance.

Classification JEL : E22, F21, G15
Mots-clés : énigme de Feldstein-Horioka, épargne et investissement régionaux, marchés de capitaux, flux financiers.

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 (figures from van Wincoop, 2001).

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 pointed to a quite low degree of financial integration, however: despite a large volume of international capital movements, domestic savings 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 analyses of the relationships between national savings and domestic investment, which focused either on the econometric and statistical caveats, responsible for a bias towards a significant, positive and 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 empirical approaches, by correlating regional savings and investment to be compared with similar results but using international data. Indeed, regional investigation has recently retained a growing attention, essentially because it allows to study the Feldstein-Horioka relationship in a monetary integrated area, free from a number of barriers and transaction costs. In that spirit, this paper wants to examine if a study of the savings-investment relationship on a regional basis, combined with a historical/geographical perspective, can bring *results* which would support the*interpretation* of the Feldstein-Horioka criterion as a relevant indicator of the degree of financial integration[1]. This

[1]The distinction has been first introduced by Coakley et al. (1996), and recently reminded by Caporale et

is done in a panel data context, relying on recent estimations methods accounting for problems of fixed effects, endogeneity and serial correlation altogether.

Until now, research dealt mainly with countries able to provide the necessary regional dataset, such as the big federations of North America or Japan. Regarding European Union (EU) however, the United Kingdom was the only one to be the subject of an intranational study by Bayoumi and Rose (1993). For all other EU countries, the lack of required regional data made any intranational study impossible. Nevertheless, the recent development of harmonized regional data, both by Eurostat and some national statistical offices, allows now to fill this gap. Therefore, this article is the first to provide an extensive regional analysis of the Feldstein-Horioka criterion for EU countries wherever it is possible and over a time span for which harmonized regional data are available - that is, the period 1995-2000. Consequently, our first point is to study the correlation between investment and savings at the national level (i.e. between the regions forming a nation or a State). Furthermore, we will also try to emphasize some specific links between some specific cross-border regional groups, which could lead to a weaker correlation. Here, we want to explore the potential influence of historical or geographical particularities, such as the presence of a common border or language. Last but not least, we want of course to assess the impact of the economic integration in Western Europe, on its way for several decades by now.

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 dataset. 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:

al. (2005).

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

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 is not exogenous and determines 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. Much more recently, Caporale et al. (2005) performed a Monte-Carlo study supporting the high correlation case, while emphasizing a significant heterogeneity across the 23 considered OECD countries, however. Relying on a very similar set of countries (19 from OECD), Kim (2001) uses cointegrated panel techniques to control the potential influence of various factors on the savings/investment relationship, such as aggregate shocks (productivity, fiscal and terms of trade), global shocks and country specificities, for example in size. On the whole, his analysis confirms the persistence of a high, positive correlation between savings and investment.

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 integration 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 (...)" (p.198-199). The contrary is emphasized

in Flandreau and Rivière (1999), who report that the coefficient is generally lower after 1973, with two exceptions (see table 1): 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[2].

Insert table 1 here

From Feldstein and Bacchetta (1991) one can already notices 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, p. 200)". 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

[2] Close arguments can be found in Lothian (2002), who focuses on real stock returns and real interest rates convergence. Using a database covering several centuries, the paper concludes that periods such as interwar appear as temporary disruptions in the historical process of financial markets globalization.

regional basis and the results are summarized in the table 2 next page which reproduces and completes the survey table of van Wincoop (2001). Before presenting the main studies, 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 : $(\frac{I}{Y})_{it} = \alpha_i + \beta(\frac{S}{Y})_{it} + \varepsilon_{it}$. 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.

Insert table 2 here

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 variables (*cf. supra*). 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 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:

$$\left(\frac{I_{jt}}{Y_{jt}}\right) = \alpha_j + \beta \left(\frac{S_{jt}}{Y_{jt}}\right) + \varepsilon_{jt} \tag{2}$$

where the letter j stands this time for regions, and not for 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

Before getting into the details of our methodological choices, it seems useful to highlight that the series required in such a regional investigation of the savings/investment relationship are much more difficult to get than their national counterparts. Indeed, the heterogeneity of savings and investment definitions used in the few aforementioned studies comes mainly from the lack of easily accessible regional data, which leads to choices for different proxies and partial definitions according to the considered country. For instance, Bayoumi and Rose (1993) do not have complete data on regional investment. They use data for specific industries, which

exclude between 25 and 50% of private sector investment. Besides, they rely alternatively on an evaluation for households savings and on a more comprehensive other one, including government consumption, however. By contrast, Iwamoto and van Wincoop (2000) could access much more complete data for their study on the Japan. Therefore, regional saving is the sum of saving by all residents and institutions of a region. Similarly, regional investment is the sum of physical investment by firms, households and the local government in a region. In the context of our research, an additional problem arises from the need for homogenous macroeconomic accountancy definitions across countries.

Turning to our dataset, we could therefore retrieve homogeneous 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, Regio does not provide any harmonized savings data at the regional level. Additional investigations in publicly available national databases showed that this absence could be explained for most countries by a lack of accessibility of such data, which are either non-existent, or too partial to be exploitable, and/or confidential. However, a complete regional database of GFCF and savings is available for Germany, from the Statistic national office of Baden-Württemberg (*Statistisches Landesamt Baden-Württemberg*). For Italy, we could rebuild series of savings, using the difference between regional GDP data provided by Regio database and the total regional consumption, available from a regional database provided by the Italian research center CRENOS (*Centro Ricerche Economiche Nord Sud*, Center for North South Economic Research). For these two countries, a direct regional study of the Feldstein-Horioka criterion according to equation 2 could therefore be proceeded.

For the other EU countries, we decided to proxy regional savings using disposable income[3] data, the closer aggregate to savings we had. For this purpose, 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. Formally, denoting disposable income as INC, this leads to assume that $\Delta\left(\frac{S_{jt}}{Y_{jt}}\right) = \Delta\left(\frac{INC_{jt}}{Y_{jt}}\right)$, and to estimate:

[3]This aggregate is accountably equal to the sum of households consumption and savings. It is therefore different from GDP Y, which is roughly equal to the sum of gross values added created in the economy

$$\Delta\left(\frac{I_{jt}}{Y_{jt}}\right) = \gamma + \beta \times \Delta\left(\frac{INC_{jt}}{Y_{jt}}\right) + \upsilon_{jt} \tag{3}$$

This method relies on two distinct hypothesis which can be immediately checked for Germany and Italy. The first one postulates that households savings are sufficiently well correlated to total (that is households plus firms plus government) savings, so that the variations of the former mimic correctly the variations of the latter. The second one asks that the variations of the households savings rate and the ones of the ratio of disposable income over GDP ($\frac{INC}{Y}$) move proportionally.

In our case, the first requirement is easily met for both Germany and Italy, since the correlations of households savings with total savings reach respectively 90.7% and 88.3%. Regarding the second requirement, it is easily confirmed for Italy, with a 96.9% correlation between households savings rate and the ratio $\frac{INC}{Y}$; for Germany, the picture is somewhat less clear, with a correlation reaching "only" 52%. But on the whole, our assumptions seem to be validated. Besides, we will be able to check directly the empirical virtues of our proxying method for Germany and Italy in the next section, where will be compared the estimations deduced from the real savings data and the ones coming from disposable income. Eventually, it is useful to highlight that our dataset stands halfway between the one of Bayoumi and Rose (1993), constrained to rely on partial and heterogenous definitions for variables, and Iwamoto and van Wincoop (2000), who could access a complete and homogenous database. Consequently, we can consider that our estimations will be reasonably reliable in terms of national accountancy definitions.

Turning to estimations concerns, our overall panel consists of 108 European Union regions, i.e. a 557 observations sample in levels (436 in first differences) 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 special cases of Germany and Italy, the national databases amount respectively to 96 and 114 observations. For all countries, the short time span prevents us *de facto* to use the recent cointegration panel methods (Kim, 2001; Banerjee and Zanghieri, 2003). Besides, this period includes the official launch of scriptural (written) euro: it could therefore legitimately be argued that such an event is likely to have created a structural modification of the

relationship between savings and investment. From a statistical point of view, however, the very short time span does not allow the implementation of standard structural breakdown tests (like the ones proposed by Chow, 1960, or Bai and Perron, 2003) for checking this intuition[4]. At the economic level, one can highlight, nonetheless, that scriptural euro launch did not fundamentally modify the process of financial integration, on its own track since the Single European Act of 1986 and the total liberalization in 1993.

Besides, the time dimension of our study asks to check for the possibility of serial correlation in the residuals. To do so, we implement a Wooldridge (2002) test for temporal autocorrelation in panel data. On the whole[5], the test highlights the presence of highly serially correlated residuals for Germany, but not for Italy, when estimating equation 2. For equation 3, the presence of serial correlation is confirmed for most countries. Furthermore, the exogeneity of right-hand side variables, namely the savings rate or the first difference of the ratio $\frac{INC}{GDP}$ must be tested, in order to check for an endogeneity bias. For that purpose, we use Hausman (1978) and Nakamura Nakamura (1981) tests. The table 3 presents the results of these tests for Germany and Italy, and for equations 2 et 3 respectively. Regarding the savings rate, two alternative sets of instruments have been selected[6]: in a first specification, the savings rate is instrumented using two of its own lags and in a second one, using the contemporaneous value of the ratio $\frac{INC}{GDP}$. Concerning regressions in first differences, the two first lags of $\frac{INC}{GDP}$ are used as instruments.

Insert table 3 here

Regarding equation 2, both tests fully agree to reject the hypothesis of exogeneity for Germany, whereas evidence is more mixed for Italy. Turning to equation 3, the exogeneity of INC/Y first difference is widely accepted, even if a small uncertainty remains for Germany. Concerning all other countries, for which are only available disposable income data, endogeneity tests, available upon request to the authors, confirm that $\Delta\left(\frac{INC_{jt}}{Y_{jt}}\right)$ can be considered as

[4]The obstacle could be partly overcome using time dummies, however. Subsequent additional investigation emphasized that dummies for 1998 and 1999 were not significant most of the time, comforting our intuition of no significant breakdown.

[5]The full set of results is available upon request to the authors.

[6]The choice for instruments is often a complex matter, especially when estimations are performed over a short time period, like in our case. The ones used in this article have been selected after a preliminary analysis which have tested several possibilities the number of lags for the savings rate and the ratio $\frac{INC}{GDP}$. All results from this preliminary investigation are available upon request to the authors.

exogenous.

The estimation strategy we set up accounts for the results of these tests for serial correlation and endogeneity. For Germany and Italy, next section will present two sets of estimation for equation 2, the first one coming from a panel regression with fixed effects, the second one produced by a *two-stage least squares* (2SLS) regression with fixed effects[7]. However, the panel regression for Germany will postulate first-order autoregressive residuals, while the Italian one will use conventional identically and independently distributed errors. Concerning equation 3, the use of a panel regression is not relevant for a specification based on first differences. In the context of the widespread serial correlation of residuals and the exogeneity of right-hand side variable, all estimations based on equation 3 were processed using Ordinary Least Squares with Newey-West standard errors for coefficients - that is, corrected for heteroskedasticity and first-order autocorrelation.

More precisely, 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[8] 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 historical, geographical or economic links on the financial integration of regions. Accounting for the constraints arising from data availability, we are able to study seven consistent transnational groups, represented on the maps located at the end of the section.

For clarity, transnational groups are indexed from 1 to 7 on the maps presented at the end of the section. 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, Lombar-

[7] Actually, all regressions, whether they were performed with instrumental variables or not, have been performed twice, first in a model with fixed effects, then in a model with random effects. A Hausman test has subsequently been run in order to discriminate which estimation is efficient, giving then a clear preference for fixed effects.

[8] 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 do not have more than two regions with observations.

dia, 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[9]. Regarding intranational specificities, we will focus our attention on North/South Italy, Flanders/Wallonia (Belgium), and West Germany/East Germany. Beyond the constraint of the number of observations, these cuttings seem relevant both from historical and economic point of views.

Insert Figure 1 here

4 Results: a double look at the EMU

4.1 The intranational look

The results for Germany and Italy are based upon a complete dataset including investment and savings, while for other European countries having the latter but not the former we will have to use a proxy for savings. The availability of the complete dataset for two countries allows testing the quality of the subsequent proxy, simply by comparing the estimates of the Feldstein Horioka model (equation 2) and those of equation 3. Tables 4 and 5 report also the results for the decomposition of Germany according to a West-East separation, and for Italy according to a North-South axis.

Insert table 4 here

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

Insert table 5 here

Finally, table 6 presents the results of Sargan (1958) overidentification test, necessary for validating estimations deduced by the *2SLS* relying on the set of instruments 1:

Insert table 6 here

From a statistical perspective, two main features arise. First of all, the Sargan test strongly rejects lagged savings rates as a valid instrument for contemporary savings rate. This rejection seems to be due to the inclusion of the poorest sub-regions, namely South Italy and East Germany. If we restrict the sample to West Germany and North Italy indeed, the null assumption is validated[10]. Unlike for the richest regions, saving rate in less advanced regions is likely to be determined by other variables than its lagged values, like disposable income. Whatever the exact reasons, the results are not robust and therefore they are excluded from subsequent analysis. Thereafter, we will focus instead on *2SLS(2)*, based upon disposable income.

The second result concerns the validity of proxying savings by disposable income that is of estimating equation 3 instead of equation 2. Comparing the estimates obtained for Italy and Germany, for which both datasets are available, confirms the intuition we had by simply correlating savings and disposable income. The signs are the same and the absolute values of the coefficients are of the same order of magnitude. For Italy, -0.12 obtained for equation 2 is not far from -0.07 which corresponds to equation 3. The estimate obtained with lagged savings (*2SLS(1)*) is significantly different, -0.42, but the Sargan test indicates that this estimate is not statistically valid. Besides, equations 2 and 3 deliver very close and not significantly different from zero estimates for East Germany and the whole country. Estimations for West Germany are the only ones to diverge a bit since the *2SLS(2)* estimate for equation 2 is significantly negative on the one hand, while all other estimates support a non-significantly different from zero β. Apart from this single exception, results in tables 4 and 5 confirm that disposable income can be used for proxying regional saving.

Turning back to economic concerns, our results for Germany and Italy corroborate the conclusions in Bayoumi and Rose (1993) regarding the United Kingdom. The estimates are never significantly positive and Germany as a whole exhibits a β coefficient not significantly

[10]It is worth noting that the conclusions of the test remains identical when increasing the number of lags, either for savings rate or disposable income.

different from zero, while estimates for Italy lie between 0 and -0.1. This suggests that both countries exhibit an high degree of financial integration according to the Feldstein-Horioka definition. If this result is totally confirmed for North and South Italy, and East Germany, there is a slight divergence for West Germany, *2SLS(2)* estimates supporting a significant negative coefficient a bit below -0.2. However, all other estimates, from panel least squares with AR(1) disturbance, *2SLS(1)* (statistically valid for West Germany) and from equation 3 agree to find a nil β, which is more conform to economic intuition, since West Germany is an old integrated monetary area.

Until now, German and Italian examples confirm the idea of Frankel (1992) that the exchange premium would explain the biggest part of the Feldstein-Horioka puzzle. Furthermore, another important lesson from the analysis is that equation 3 can be estimated instead of equation 2. The subsequent step is therefore to estimate it for all European countries, including those for whom real saving data are missing. This is done in the table 7[11] below:

Insert table 7 here

Some striking features emerge from a first reading of the table. First, the coefficient for the whole Europe is positive and non-significant. It stands just below 0.1, which according to the criteria proposed by Feldstein and Horioka validates the hypothesis of a high degree of capital market integration. This result is different from that reported in Armstrong and al. (1996), where β tended to be most of the time negative, with significance depending upon the period of time under consideration.

Two patterns of countries emerge. The first one includes the geographic, historical, and economic core of Europe. For this group of countries - Germany, France, Italy, Belgium, Netherlands - the Feldstein Horioka coefficients are close to zero and not significantly different from nil. Those countries are rich, the three largest are members of the G7, they are all provided with a large international financial market. The second group of countries is constituted of smaller countries belonging to the European periphery, namely Portugal, Greece and Sweden. For them the correlation between savings and investment is significantly different from zero, either positive or negative. As mentioned previously, negative β coefficients are

[11] For the sake of consistency, estimates for Germany and Italy presented in this table and in table 8 are estimated using Eurostat data, in order to avoid confusion of data from different sources.

widespread in the Feldstein-Horioka literature studying intranational data. If they are hard to explain in most cases, the case of Portugal is pretty clear. Since 1975, the country benefits from a high level of FDI, and from 1986 from a high level of Structural Funds. Over 1995-2000 the inflows of FDI increased by 38.7%[12] but real GDP by only 21.7%, while the saving rate proxied by the ratio of disposable income over GDP decreased. As a consequence the β coefficient turns out to be negative in emerging countries like Portugal where investment exceeds for structural reasons the country saving capacity. This finding echoes a recent conclusion of Bayoumi and Park (2004), namely that one key determinant of financial integration is the level of economic development. The implication is that the ending process of Portuguese convergence should be accompanied by a decrease of the absolute value of the beta coefficient towards zero[13]. Although Greece is like Portugal a catching-up country, it has not been able to attract the same amount of FDI. Between 1995 and 2000 instead, FDI decreased by 2%, while real GDP increased by 18.4%. As a result and not surprisingly the correlation between disposable income and investment turns out to be (not very) significantly different from zero but unlike Portugal it is positive: no foreign inflows has come to push the investment rate up, while the variation of the ratio $\frac{INC}{Y}$ is close to zero on overage over the period. Lastly, the Swedish case is *a priori* more puzzling. Indeed, the Swedish GDP per head is amongst the highest in the world; hence the rational behind a β equal to 0.53 cannot be that the financing of the economic development requires a high investment rate compared with a low saving rate. The explanation is rather that the distribution of the population is concentrated in the south, with a density of 253 inhabitants per km^2 in the urban triangle (Malmö, Göteborg, Stockholm) but only 3 in the region of Norrbotten. As a consequence, most of the economic activity is likely to be concentrated in the three corresponding regions from NUTS 2 classification - that is Stockholm, Sydsverige, Västsverige. Conversely, the savings and investment rate of the northern regions should be characterized by a huge inertia, due to the lack of investment opportunities and the underdevelopment of financial intermediation. This intuition is tested by running two additional estimations of the Feldstein-Horioka equation on two separate subsamples. The first one consists of the three regions forming the urban triangle, and leads to a

[12] See the *World Bank (2004)*, by the World Bank.

[13] According to OECD, FDI decreased by 27.1% in 2002, and by 56% in 2003, because of the strong competition between EU members to attract FDI. In 2003, public investments have also been cut by 26%, reaching their lowest level since 1999.

β coefficient equal to 0.29, but really far from being significantly different from zero - not even at the 25% level. Consequently, capital seems to move freely across the three main economic centers of the country, which seems quite natural. The second one is made of all Sweden excluding these specific three regions; unsurprisingly, the regression gives an estimate of 0.77 (significant at the 5% level) for the coefficient β, confirming the aforementioned argument.

4.2 Regions crossing borders

Table 8 contains the estimates of equation 3 for the subsets of regions previously described. Most of them are not significantly different from zero, with three exceptions: G7 and the two Flanders estimates are positive, and the order of magnitude is similar to that found in Iwamoto and van Wincoop (2000) for Japan.

Insert table 8 here

The Swedish puzzle vanishes when one considers a larger group of Scandinavian countries. The coefficient characterizing the degree of financial integration for this group is close to zero. Furthermore, they are related by close commercial links, echoing another result by Bayoumi and Park (2004) who highlight that "finance follows trade" (p.3 and p.19), i.e. that financial integration is superior in areas where the intra-regional trade is highly developed. It is also worth noticing that G1 group is mainly made of regions (those of Sweden more Denmark) which are excluded from the European process of monetary integration. In the same spirit, the groups based upon historical links, like G3 and G6, are financially integrated, with coefficients not significantly different from zero. Groups 2, 4 and 5 exhibit negative coefficients, none of them being statistically significant. Nevertheless, the extent of theses negative coefficients remains puzzling. The composition of the group excludes of course to rely on the same kind of explanation than the one used for Portugal. It seems therefore plausible that we face an accountancy problem similar to the one analyzed by van Wincoop (2001), for whom the negative β are related to a problem of regional public savings definitions. Anyhow, all these six groups are characterized by a high degree of financial integration, which emphasizes the importance of sharing a common border and/or a common language in promoting capital mobility, as emphasized in Bayoumi and Park (2004).

The positive coefficient for G7 (capitals) or the relatively low degree of financial integration between capitals, which by definition do not share a common border and do not speak the same language[14], strengthens *a contrario* the result about borders and languages. Our regions crossing borders are also characterized by short internal distances. Portes and Rey (2005) use distance as a proxy for information costs and for asymmetry of information between domestic and foreign investors. They use a gravity approach and show that distance exerts a negative influence on international capital flows. Our regions crossing borders are characterized by short distances within them, which suggest the same link between geography (distance) and finance. Consequently, European financial integration, while being strongly supported by the process of EMU, remains somewhat imperfect by phenomena related to distance and to a kind of home market bias and for close, or at least frontier, regions. This is illustrated by the positive and significant coefficient for the capitals and main economic centers.

Results for intranational sub-groups do not bring any big innovation relatively to our previous findings: for Germany and Italy, estimates on Eurostat data are very close to the ones deduced from national statistical offices, and keeps emphasizing that these "sub-national groups" are well integrated according to Feldstein-Horioka criterion. A noticeable exception is Flanders however, which is featured by a positive and significant coefficient around 0.4, whether Brussels is included in the estimation or not. This relatively low capital mobility can be explained by a combination of a language barrier (French and English remain the main language spoken by Belgian businessmen, Flemish remaining fairly isolated), and the lack of a large financial center. The case empirically illustrates a recent argument of Martin and Rey (2004), who stress the importance of the market size in explaining the volume of financial transactions. Indeed, the result for Flanders suggests that the narrowness of the capital market jointly with the existence of a linguistic and cultural fracture blocking the access to the great local market (Brussels), are likely to explain the low degree of financial integration.

[14]English language is of course often used, but still remain the problems of commercial habits and negotiation cultures, which can constitute real barriers to trade. On that ground, Mélitz (2005) emphasizes that the practice of English does not foster the trade of goods more than French or Spanish.

5 Conclusion

To conclude, our major original contribution in this paper consists in applying the Feldstein-Horioka criterion to European regional data for a large number of EU members. This dataset allowed us to estimate the comovement coefficient between savings and investment not only inside each individual country but also, between transnational groups our inside intranational sub-groups. Several important outcomes are reported by our article.

First of all, financial integration seems to be realized inside most of the considered countries, which corroborates *a contrario* Frankel (1992)'s hypothesis of a currency premium impeding the realization of a perfect financial world. Moreover, we propose an explanation for some puzzles already highlighted in the literature, like the negative coefficient in the Portuguese case, already stressed in Armstrong et al. (1996), and new ones like the Swedish positive coefficient. As in Bayoumi and Park (2004), we especially argue that the process of economic development does influence the extent of financial integration.

Furthermore, we found a coefficient of 0.09 across all the regions forming European Union. This figure indicates that overall financial integration seems to be completed with the euro launch. In order to shed a new light on the latter result, we have tested the relationships between saving and investment in consistent sub-groups of regions (designed according to geographical, economic or historical criteria). Following a recent strand of research applying the analytical frameworks of international trade to financial transactions, our finding is that History, language, borders and distance as a proxy for transaction and information costs, matter. Especially, we show that financial integration is not impeded by the existence of borders, but by distance and by linguistic diversity, interpreted as proxies for transaction and information costs. Consequently, if monetary integration is a necessary step in the process of financial integration, it is not sufficient, in as much as other barriers, including information and transaction costs, are still important.

Finally, our analysis discards the illusion that the sole suppression of institutional barriers to capital mobility would be sufficient to achieve a perfect financial integration everywhere and at any moment. As in Flandreau and Rivière (1999), Bayoumi (1990), Eichengreen (1992), Zevin (1992), Taylor (1998), and others, we emphasize that history, geography, culture and policy altogether matter. All these factors keep contributing today to financial markets

incompleteness, preventing therefore a perfect capital mobility.

References

Armstrong, H., Balasubramanyam, V., Salisu, M., 1996. Domestic Savings, Intra-national and Intra-European Capital Flows, 1971-1991. European Economic Review 40, 1229-1235.

Bai J., Perron P., 2003. Computation and analysis of multiple structural change models. Journal of Applied Econometrics 18, 1-22.

Banerjee, A., Zanghieri P., 2003. A New Look at the Feldstein-Horioka Puzzle using an Integrated Panel. CEPII Working Paper No. 2003-22.

Bayoumi,T., 1990. Saving-Investment Correlations, Immobile Capital, Government Policy, or Endogenous Behavior. IMF Staff papers 37(2), 360-387.

Bayoumi,T., 1997. Financial Integration and Real Activity. University of Michigan Press, Ann Arbor, MI.

Bayoumi, T., Park, Y.C., 2004. Why Has there Been less Financial Integration in Asia than in Europe? Monetary Authority of Singapore Staff Papers No. 28.

Bayoumi, T., Rose, A., 1993. Domestic Savings and Intra-national Capital Flows. European Economic Review 37, 1197-1202.

Caporale, G., Panopoulou, E., Pittis, N., 2005. The Feldstein-Horioka Puzzle Revisited: A Monte-Carlo-Study. Journal of International Money and Finance, forthcoming.

Chow, G., 1960. Tests of Equality between Sets of Coefficients in Two Linear Regressions. Econometrica 28, 591-605.

Coakley, J., Kulasi F., Smith R., 1994. The Savings-Investment Association. Birbeck College: University of London, Discussion Paper in Economics No. 10-1994.

Coakley, J., Kulasi F., Smith R., 1996. Current account Solvency and the Feldstein-Horioka Puzzle. The Economic Journal 106, 620-627.

Dekle, R., 1996. Savings-Investment Associations and Capital Mobility: on the Evidence from regional Data. Journal of International Economics 41, 53-72.

Dooley M., Frankel J., Mathieson, D., 1987. International Capital Mobility: What Do Saving-Investment Correlations Tell US? IMF Staff Papers 3, 503-530.

Eichengreen, B., 1992. Trends and Cycles in Foreign Lendings. In H. Siebert (Ed.), Capital Flows in the World Economy. J.C.B. Mohr, Tübingen, pp. 255-281.

Feldstein, M., Bachetta, P., 1991. National Saving and International Investment. In Bernheim D., Shoven J. (Eds.), National Saving and Economic Performance. University of Chicago, Chicago, Il.

Feldstein, M., Horioka, C., 1980. Domestic Saving and International Capital Flows. Economic Journal 90, 314-329.

Fieleke, N., 1982. National Saving and International Investment. Federal Reserve Bank of Boston, Saving and Government Policy, Conference Series No. 25.

Flandreau M., Rivière, C., 1999. La Grande Retransformation ? Contrôle de Capitaux et Intégration Financière Internationale (1880-1996). Économie Internationale 78, 11-55.

Frankel, J., 1986. International Capital Mobility and Crowding-Out in the US Economy: Imperfect Integration of Financial Markets or of Goods Markets? In Hafer R. (Ed.), How Open is the US Economy? Lexington Books, Lexington, MA, 33-67.

Frankel, J., 1992. Measuring International Capital Mobility: a Review. American Economic Review 82(2), 197-202.

Hausman, J., 1978. Specification Tests in Econometrics. Econometrica 46, 1251-1271.

Iwamoto, Y., van Wincoop, E., 2000. Do Borders Matter? Evidence from Japanese Intranational Capital Flows. International Economic Review 41(1), 241-269.

Kim, S., 2001. The Saving-Investment Correlation Puzzle is still a Puzzle. Journal of International Money and Finance 20(7), 1017-1034.

Lothian, J., 2002. The Internationalization of Money and Finance and the Globalization of Financial Markets. Journal of International Money and Finance 21(6), 699-724.

Martin, P., Rey, H., 2004. Financial Super-Markets: Size Matters for Asset Trade. Journal of International Economics 64, 335-361.

McCloskey, D., Zecher, R., 1976. How the Gold Standard Worked, 1880-1913. In Frenkel J., Johnson H. (Eds.), The Monetary Approach to the Balance of Payments. Allen and Unwin, London, pp. 57-75.

McCloskey, D., Zecher, R., 1984. The Success of Purchasing Power Parity. In Bordo, M., Schwartz, A. (Eds.), A Retrospective on the International Gold Standard. Chicago University Press, Chicago, Il, pp. 121-162.

Mélitz, J., 2005. Language and Foreign Trade. University of Strathclyde, *mimeo*.

Murphy, R., 1984. Capital Mobility and the Relationship between Saving and Investment Rates in OECD Countries. Journal of International Money and Finance 3, 327-342.

Nakamura, A., Nakamura, M., 1981. On the relationships among several specification error tests presented by Durbin, Wu, and Hausman. Econometrica 49(6), 1583-1588.

Obstfeld, M., 1986. Capital Mobility in the World Economy: Theory and Measurement,. Carnegie Rochester Conference Series on Public Policy 24, 55-104.

Obstfeld, M., Rogoff, K., 2000. The Six Major Puzzles in International Macroeconomics: Is There a Common Cause? NBER Working Paper No 7777.

Penati, A., Dooley, M., 1984. Current Account Imbalances and Capital Formation in Industrial Countries, 1949-81. IMF Staff papers No. 31: 1-24

Portes, R., Rey, H., 2005. The Determinants of Cross-border Equity Flows. Journal of International Economics 65, 269-296.

Sargan, J., 1958. The Estimation of Economic Relationships Using Instrumental Variables. Econometrica 26, 329-338.

Sinn, S., 1992. Saving-Investment Correlations and Capital Mobility: On the Evidence from Annual Data. Economic Journal 102, 1162-1170.

Summers, L., 1988. Tax-policy and International Competitiveness. In Frenkel, J. (ed.), International Aspects of Fiscal Policy. University of Chicago Press, Chicago, Il, pp. 349-375.

Taylor, A., 1998. Argentina and the World Capital Market: Saving, Investment, and International Capital Mobility in the Twentieth Century. Journal of Development Economics 57(1), 147-184.

Tesar, L., 1991. Savings, Investment and International Capital Flows. Journal of International Economics 31, 55-78.

Thomas, A., 1993. Saving, Investment and the Regional Current Account: an Analysis of Canadian, British and German regions. International Monetary Fund, Working Paper No. 93-62.

Tobin, J., 1983. Discussion on "Domestic saving and international capital movements in the long run and the short run" by M. Feldstein. European Economic Review 21(2), 153-156.

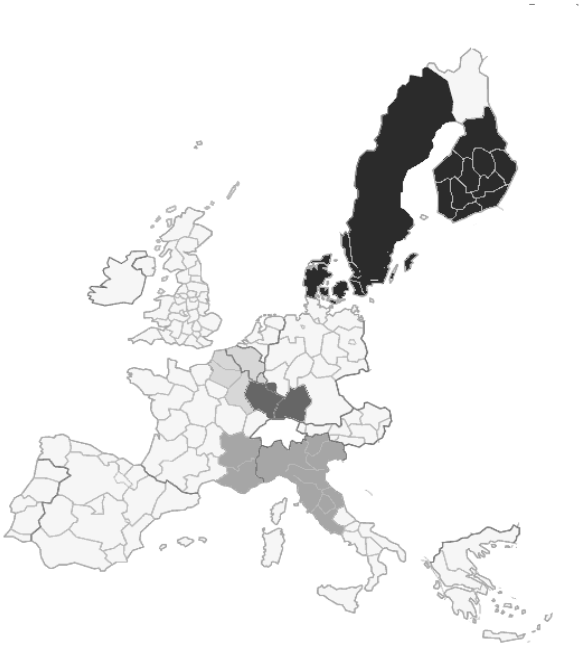
van Wincoop, E., 2001. Intranational versus International Saving-Investment Comovements. In Hess, G., van Wincoop, E. (Eds.), Intranational Macroeconomics. Cambridge University Press, Cambridge, MA, pp. 1-43.

World Bank, 2004. World Development Report. Washington, DC.

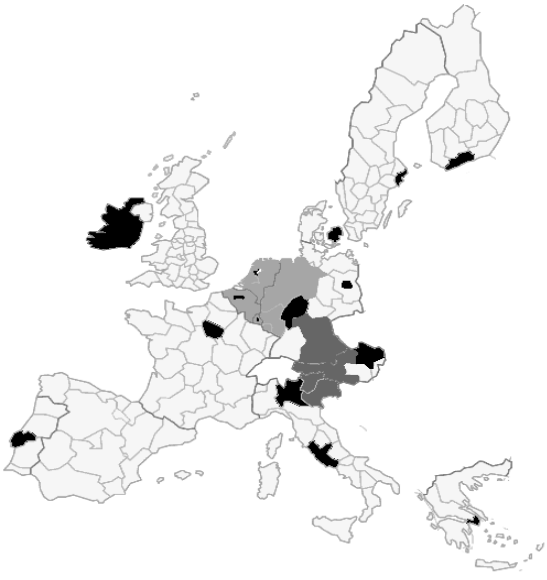
Wooldridge, J., 2002. Econometric Analysis of Cross Section and Panel Data. MIT Press, Cambridge, MA.

Zevin, R., 1992. Are World Financial Markets More Open? If so, Why and With What Effects? In Banuri, T., Schor, J. (Eds.), Financial Openness and National Autonomy. Oxford Clarendon Press, Oxford, pp.43-82.

Figure 1: Transnational groups



Map 1: first set of groups



Map 2: second set of groups

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

Authors	Gold Standard	Interwar	Bretton Woods	Floating rates
Flandreau and Rivière (1999)	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 (OECD)	23 (OECD)
			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)
Caporale et al. (2005)				1948-1998
Various estimators/MC simulations				*close to 1*
				for 3/5 countries
Number of countries				23 (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: *Endogeneity tests of right-hand side variables*

	Germany		Italy	
	Equation 2			
Test	Instruments 1	Instrument 2	Instruments 1	Instrument 2
Hausman : $Prob > chi2 =$	0.00	0.00	0.05	0.61
Nakamura-Nakamura : $t =$	-8.17	-4.33	0.81	-1.82
	Equation 3			
Hausman : $Prob > chi2 =$	0.02	N.R.	0.30	N.R.
Nakamura-Nakamura : $t =$	0.23	N.R.	.,48	N.R.

Notes: N.R.: Non Relevant. For equation 2, Instruments 1 = two lags of S/Y, Instrument 2: INC/Y. For equation 3, Instruments 1 = two lags of $\Delta\left(\frac{INC}{Y}\right)$

Table 4: *Germany*

	Equation 2				Equation 3	
	N	LS($AR1$)	2SLS (1)	2SLS (2)	N	OLS *Newey-West*
				All Germany		
1995-2000	96	0.08 (0.23)	-0.64 (0.70)	0.79 (0.62)	96	0.02 (0.28)
				West		
1995-2000	66	-0.10 (0.28)	-0.37 (0.26)	-0.23[a] (0.08)	66	0.31 (0.23)
				East		
1995-2000	30	0.26 (0.46)	-0.63 (3.09)	0.21 (0.29)	30	0.14 (0.38)

Notes: (1) and (2) refer respectively to instruments sets 1 and 2 described in the previous section. [a], [b]and [c]denote significance, respectively at the 1, 5 and 10% levels. Standard errors in parentheses.

Table 5: *Italy*

		Equation 2			Equation 3
	N	LS	2SLS (1)	2SLS (2)	N	OLS *Newey-West*
				All Italy		
1995-2000	114	-0.12^c(0.07)	-0.42^b(0.17)	1.43 (3.03)	95	-0.07^c(0.04)
				North		
1995-2000	66	-0.08 (0.06)	-0.21 (0.14)	1.03 (1.02)	55	-0.06 (0.06)
				South		
1995-2000	48	-0.27 (0.18)	-0.73 (0.47)	0.61 (1.15)	40	-0.09^c(0.05)

Notes: (1) and (2) refer respectively to instruments sets 1 and 2 described in the previous section. ^{a}, ^{b}and ^{c}denoting respectively significance at the 1, 5% and 10% levels. Standard errors in parentheses.

Table 6: *Overidentification test*

	$\chi^2(1)$	Significance level
Germany	43.02	0.00
West Germany	1.34	0.25
East Germany	20.71	0.00
Italy	3.42	0.08
North Italy	0.39	0.53
South Italy	3.94	0.05

Table 7: *Intranational comovement savings/investment*

Country	number of observations	estimation of β coefficient
NUTS2	**436**	**0.09** (0.08)
Belgium	55	0.17 (0.16)
Germany	80	0.24 (0.27)
Greece	65	0.14^{c}(0.10)
France	63	0.09 (0.09)
Italy	95	0.02 (0.11)
Netherlands	48	-0.29 (0.28)
Austria	27	0.34 (0.27)
Portugal	16	-1.24^{a}(0.34)
Sweden	40	0.53^{b}(0.26)

Notes: ^{a}, ^{b}and ^{c}denoting respectively significance at the 1, 5 and 15% levels. Standard errors in parentheses.

Table 8: *Comovement between savings and investment in transnational/intranational groups*

Regional Group	number of observations	estimate of coefficient β
G1: Scandinavia	55	0.32 (0.59)
G2: East France/West Ger.	16	-0.53 (0.47)
G3: North Italy/South France	59	0.04 (0.15)
G4: North France/Belg./Lux.	32	-0.23 (0.27)
G5: Germany/Benelux	44	-0.52 (0.37)
G6: Austria/Germany/Italy	27	-0.04 (0.21)
G7: Capitals	58	0.25^{b}(0.13)
North Italy	55	0.07 (0.16)
South Italy	40	- 0.11 (0.16)
Flanders(Bruss. incl.)	30	0.39^{b}(0.17)
Flanders (Bruss. excl.)	25	0.41^{b}(0.18)
Wallonia (Bruss. incl.)	30	-0.25 (0.29)
Wallonia (Bruss. excl.)	25	-0.28 (0.34)
West Germany	55	0.15 (0.26)
East Germany	25	0.45 (0.46)

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