Meta-analysis of the Feldstein and Horioka literature

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Summary

This quantitative review of the literature on the Feldstein and Horioka (1980) paradox adopts an original methodology still not very frequent in international economics: meta-analysis. This systematic analysis makes it possible to build a sample of 97 studies which were published between 1980 and December 2007 and which concentrates on the evaluation of the correlation between national savings and investment rates. Thus, 1399 different values from the saving retention coefficient are used. Over long period, a reduction of the saving-retention coefficient is observed. But once the statistical data, the samples of countries and the type of publication are given, present study shows that econometric methodologies lead to different levels of saving-investment correlation. It is thus necessary to adopt various econometric strategies in order to have a broad outline of the spectrum of saving-retention coefficient and to take into account the bias induced by the choice of econometric methodologies. This kind of methodology is not very frequent since it relates to only one third of the listed articles while at the same time, this article shows that studies on the Feldstein and Horioka literature do not undergo publication bias.

Classification JEL: C15, C49, C82, F21, F32.
Key words: Feldstein-Horioka paradox, international capital mobility, meta-analysis, empirical methods, Publication bias

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I. INTRODUCTION

At the beginning of the Seventies, the significant international capital mobility seemed consensual assumption in international economics. It has made it possible to consider that current accounts deficit can be financed by foreign saving since the latter can easily circulate between countries if national saving is insufficient compared to domestic investment. This international capital mobility constitutes ways to validate current accounts imbalances and there should be a fundamental separation between saving and investment implying an even non-existent weak correlation between those two values. Feldstein and Horioka (1980), (henceforth FH) in their well-known empirical study about saving and investment correlation are not able to confirm the assumption of significant integration of financial markets. The results of their regressions between five-years averages of national saving and investment rates within a cross-section sample of sixteen OECD countries between 1960 and 1974 show that the investment rates are highly dependant of saving rates. Feldstein (2005, pp.2-3) recalls that at that time, many economists considered that capital markets were strongly integrated, whereas they actually appeared highly segmented.

Since 1980, saving and investment correlation was the subject of recurring studies. The results of this important stock of studies do not call into question the robustness of the initial observations, but the differentiation of the samples of countries, the time periods, the frequencies of data as econometric methodologies make delicate the direct comparisons. Several reviews of the literature (Bordes 1988; Coakley and al. 1998; Frankel 1992; Moosa 1992; Obstfeld 1994) synthesize theoretical information as well as empirical. Still, it remains difficult to determine a common threshold satisfying econometrician methodology and economist understanding who definitively can allow to raise the veil on this paradox and to reach a powerful consensus.

A more rigorous synthesis of existing literature can be still carried out by adopting a statistical technique little attends in economics: meta-analysis. According to Stanley, Doucouliagas and Jarrell (2008), meta-analysis makes it possible to explain the differences in the obtained results at the time of multiple researches. According to Florax, de Groot and Mooij (2002), the finality of this quantitative synthesis is to reach broad conclusions starting from numerous results of a whole set of the literature which was published on a specific subject. Meta-analysis is a significant instrument of understanding of main reasons of the diversity of the results obtained since it combines the results of other studies to provide an explanatory power larger than simple linear review of the literature. It is thus an “analysis of analyzes” according to Hunter and Schmidt quoted by Florax and al. (2002, p.2) which is less subjective than a narrative review of the literature. Even Weichelbaumer and al. (2003, p.10) qualify it as “more democratic the even agnostic one”.

Meta-analyzis is the subject of a particularly frequent use in medicine and in behavioural sciences as education and psychology. In economics, first meta-analysis were applied to environmental economics or labour economics[2]. *Journal of Economic Surveys* (2005, 19, 3, pp.295-533) comes to devote a special issue on this theme. This set of topics arouses a increasing interest but among the most recent studies applied to the international economics, some relate on the multinational firms (Görg and Strobl, 2001), on the real exchange rate of main Central Eastern European Countries and the business cycles correlation (Egert and Halpern 2005; Fidrmuc and Korhonen 2006), on the effects of a single currency on the

[2]Stanley (2001, table 1); Florax and al. (2002) for a presentation and a list of recent studies like Abreu, Groot and Florax (2005); Dalhuisen and al. (2003); Jarrell and Jarrell (2004).

international trade or of the distance on bilateral trade (Rose 2004; Disdier and Head 2008), on the monetary policy (de Grauwe and Costi Storti, 2004), on the analysis of the effects of the fiscal policies on the long term growth (Nijkamp and Proot 2005), on the exports growth (Mookerjee, 2006), or on the link between inflation and central bank independence (Klomp and de Haan, 2008).

To our knowledge, application of meta-analysis to saving-investment correlation literature has never been made before. Then, the objective of this paper is to synthesize information since the application of those meta-analysis techniques makes it possible to detect the systematic influence of the characteristics of each studies, like the composition of samples, the specifications of data, the econometric methods, and other characteristics on estimated values of the saving-investment correlation coefficients.

The article is thus articulated in the following way. The next section presents the initial model of FH and proceeds to a selective review of this literature. Section 3 details the methodology adopted for the control of this meta-analysis. A statistical analysis of the meta-variables is carried out in the third section. The analysis of the results of meta-analysis is carried out in the fourth section. Section 6 checks if the literature on saving and investment correlation is subjected to a publication bias. The last section concludes.

II. THE LINEAR MODEL OF FELDSTEIN AND HORIOKA

In a completely small opened economy, the investment is conditioned by the return of capital and economic agent's preferences, but not by the domestic demand. Saving depends on structural differences between economies. In this case, the correlation between saving and investment should be reduced reflecting small degree of capital mobility between countries and strong financial integration. If assumption of high degree of financial integration is accepted, FH try to show, in their seminal article in *Economic Journal* (1980, 90, pp.129-151), that it should be characterized by a disconnection between savings and investment rates. Their linear relation which reflects the long term behaviour without short term feedback effects is written as follows:

$$\left(\frac{I}{Y}\right)_j = \alpha + \beta\left(\frac{S}{Y}\right)_j + \varepsilon_j^{'} \qquad (1)$$

Letters S, I are national saving and domestic investment respectively. Investment and saving series are divided by GDP, defined by letter Y to limit influence of business cycles and to favour comparison between countries. Letter $\varepsilon^{'}$ is a white noise (i.i.d. with (0, σ_ε^2)) and letter *j* refers to country. By definition $0 < \beta < 1$. Degree on international capital mobility is defined from the value taken by the saving-retention coefficient: β.[3] Null hypothesis is the situation where β=0. Then, international capital mobility is high, and this could describe an important financial integration. There is no significant link between saving and investment because, in a small opened economy, investment depends more on world interest rate and technology than saving. Alternative hypothesis, where β=1, implies an important correlation between both macroeconomic indicators because supplementary saving will be used to

[3] To avoid unnecessary descriptions, "beta", "β and "saving-investment correlation coefficient" will be alternatively used for "saving-retention coefficient".

finance domestic investment. Capital will not flow between countries and financial integration is low.

To test relation (1), FH make a regression between a five-year average of investment rate and saving rate for a sample of sixteen OECD countries between 1960 and 1974. Their first results show that the international capital mobility between countries is reduced since the estimated saving-retention coefficient is 0.889. This figure is not significantly different from unity. On average, domestic investment finds its origin in a financing via the domestic saving to a total value of 89%. Authors reject alternative hypothesis and conclude that capital mobility is lacking. These results quickly led to a substantial development of studies which call for various theoretical arguments. Obstfeld (1986) recalls that if saving and investment have common determinants, the description of high saving-retention coefficient is not necessarily the sign of a low capital international mobility, whereas if saving-investment correlation is indeed low, capital mobility is important. Tesar (1991) insists on macroeconomic life cycle. Tobin (1983), Westphal (1983) and Bayoumi (1990) think that current account targets policies raise the correlation coefficient, whereas on several situations, the countries' size, even of regions is discussed. This is the case for Wong (1990), Harberger (1980), Bayoumi and Rose (1993) as well as Baxter and Crucini (1993). In their model where the total size between two countries is given, Baxter and Crucini (1993) show, when they modify the relative size of the countries, the correlation coefficients between the saving and the investment remain high. Bordes (1988) puts forth the assumption of significant habitat preferences from economic agents, which initially leads them to direct their investment projects towards actions located on the territory where they have their own economic activity.

Then, on line with accumulation of statistical data on many countries and with progress of econometric methods, recent researches quickly concentrate on methodological interrogations by using various econometric techniques using regressions on cross section, time series or even panel data, over various periods for industrialized countries or developing countries. The significant number of articles which was published leads to a significant stock of estimates of saving-retention coefficients and a great diversity of figures. In the absence of real consensus on what should be the value of the β-coefficient, meta-analysis seems a relevant instrument to synthesise this high diversity of information.

III. METHODOLOGY OF A META-ANALYSIS.

Stanley (2001) described three steps to conduct a meta-analysis. First, the data base is initially built up. During the second step, the data is coded. Then, meta-regressions are carried out during the last step.

The first step is to constitute the data base which gathers the maximum theoretical and empirical studies on the covered subject. Three principal sources are mobilized. Initially, the data base EconLit was the subject of several requests in December 2007.[4] A stock of articles published in the academic reviews is thus collected. These interrogations reflect the summary of the published results, rather than the synthesis of reality. There is a risk of publication bias. This initial collection is supplemented by an examination of the bibliographical references at the end of each article in order to obtain additional data, in particular chapters of books or of Phd and working papers. This is why a last interrogation is finally carried out on standards databases and internet websites of universities or research institutes known to work on these

[4] The requests are: Feldstein and Horioka; Saving-retention coefficient, Capital Mobility; Puzzle, Saving-Investment; Correlation.

topics (CEPII, CEPR, the IMF, NBER among other) as well as *Social Science Research Network* (SSRN). That makes it possible to ensure some balance between the stock of articles published in the academic literature and studies which are extracted from this research literature.

During the second step, meta-regression makes it possible to synthesize the results. The expression of the meta-regression is identical to that proposed by Stanley and Jarrell (1989):

$$\beta_j = \beta_0 + \sum_{k=1}^{K} \gamma_k Z_{jk} + \nu_j \qquad (2)$$

Letter β_j is the estimation of saving-retention coefficient of the study j (j = 1, 2,…, N). The constant of the meta-regression β_0 reflects the real observed effect on the entire sample. The control variables are the terms described by Z_{jk} (k = 1, 2, …, K). They describe a specific characteristic of the study for which the parameter is obtained and make it possible to explain the β_j variation between studies. They describe methods, periods and data and all other relevant information used by various studies. The symbol γ_k estimates the impact of each characteristic on the value of the saving-retention coefficient. The term ν_j is an error term.

Following the examination of all selected articles, the last step supposes the definition of the variables and the coding of the explanatory variables. This coding is carried out by using dummy variables. The application of statistics I^2 of Higgins and al. (2003)[5] is worth 99.50%. It shows a high level of heterogeneity between estimates of saving-retention coefficients. Then, this heterogeneity will be taken into account via a high number of meta-variables. Their definition supposes to distinguish between various criteria which appear important and the rigorous examination of all articles results in defining four main categories of Z_{jk} explanatory meta-variables which are likely to explain the β_j variations between studies. Table 1 shows the coding of all variables.

The first category of meta-analysis variables characterize the frequency and the structure of the data which are used. Those meta-variables concern quarterly data (Q_D) and annual (A_D). Another meta-variable details the structure of the data: cross-section data (CS_D); time series (TS_D) and panel data (PD_D). The second group specifies the composition of the sample of countries. Six meta-variables are highlighted: sample of OECD countries (OECD); developing countries[6] (DEC); only one developing country (DEC_1) or OECD country (OCDE_1) and a sample of regions from OECD countries (OECD_R) or the combination of OECD countries and developing countries (OECD_DEC). Then, the third category of meta-variables describes the quality of the publication. The most frequently accepted way refers to the support of publication of the results (academic journal, working papers, chapters of books

[5]Statistics I^2 are a correction made to the standard heterogeneity test of Cochran, Q because of the excessive power of this test when the number of studies is important (Higgins and al. 2003). In many cases, standard error of the estimator is not presented. Then, this test is led on 1259 observations.

[6] A country is known as developing country if it does not form part of OECD. This definition, although arbitrary, makes it possible to avoid creating sub-categories according to whether the country results from the Asian, African or Latin-American continent. The objective is to avoid a significant number of meta-variables, which could incorporate somehow reduced quantity of observations.

and PhD thesis, conferences proceedings,…). Two dummy variables are implemented starting from the classification of Kalaitzidakis and al. (2003). Latter, which was exploited by Nijkamp and Proot (2005) and Knell and Stix (2005), refers to 159 academic reviews. A dummy variable (Q1) considers reviews which are included in the Kalaitzidakis'. Other reviews, working papers, the chapters of books of PhD thesis as well as conferences' proceedings are included in the second list (Q2).

= = = Insert Table 1 = = =

The last group details econometric methods. There are many estimation methods, sometimes for a reduced number of observations. Some econometric techniques are included in similar groups because they are close or asymptotically similar for large samples. Thirteen econometric techniques are retained. One can classify them in four sub-groups. The standard ordinary least squares methods, (OLS, GLS, DOLS, FMOLS, OLS_FE and OLS_RE)[7], instrumental variables techniques (IV, IV_FE and IV_RE), cointegration techniques on time series (EG, ECM, JJ) and those gathering the recent progress of cointegration techniques to panel data (CI_P).

IV. META-DATA

A. The sample

Graph 1 indicates that the available stock of coefficients increases regularly between 1980 and December 2007 whereas the annual quantity of published articles appears fluctuating. Graph 1 makes it possible to highlight 114 articles for a total of 1688 estimates of the saving retention coefficient.

Some articles are excluded because information is first extracted from other studies carried out in other articles. It is in particular the case for reviews of literature which present information but which appears insufficiently detailed then to be exploited within the framework of this meta-analysis[8]. They are also values of the saving-retention coefficients resulting from models with simulated data[9] or which introduce threshold effects. It induces several values of the coefficient β within the same relation[10]. Other studies are published at least twice in different academic journals[11]. Some adopts econometric methods which estimate saving-retention coefficients starting from the variations of saving rate and investment rate[12] whereas the selected specification is level defined. Then seventeen studies associating 284 saving-retention coefficients are eliminated because used specifications do not allow a direct comparison with the linear model of relation (1). The sample includes 1404 values of the saving-retention coefficients. Five articles bring only one estimate of the coefficient β.

[7] Refer to Table 1 for details on acronyms

[8] See Coakley et al. (1998)

[9] Obstfeld (1986), Alexakis and Apergis (1994)

[10] Ho and Chiu (2001), Ho (2003).

[11] Sarno and Taylor (1998a, 1998b)

[12] See Corbin (2001), Narayan (2005).

= = = Insert graph 1 = = =

Values of the saving-retention coefficients are included within the following interval [- 1.7, 4.5]. This interval suggests the existence of outliers which can affect the quality of the results. The Grubbs test of detection of atypical variables is implemented. Recently used by Disdier and Head (2008), this test calculates the existence of outliers' observations systematically, by initializing the procedure of outliers' detection during exclusion of each outlier. Five observations are eliminated[13] leading to a sample of 1399 observations from 97 articles.

B. Descriptive meta-statistics

The graph 2 associates all the saving-retention coefficients with the mean year of each sample. The first year observed is 1850 (Hoffman 2004). It refers to Great Britain. From this graph, one can confirm the assumption of recent economic history studies. International capital market integration and international mobility of capital has being increasing since the middle of the 19th century. If one carries out a regression between each β_i and the mean year observed for the estimate of latter, corrected by the oldest year (ie. 1850), then the constant of this linear regression is interpreted as the theoretical saving-retention coefficient level in 1850.[14] The constant is interpreted as the initial state of saving and investment correlation in force in the first year. Then, the slope is interpreted like the speed trend of international capital mobility. The implicit assumption is that if the international capital mobility intensifies over a very long period, in spite of intense liberalization periods and restriction periods since 1850[15], the slope's sign should be negative. Results of regression are as follows, with t Student statistics in brackets:

β =	0.801	- 0.001 (Mean year of sample i - 1850)
	(10.961)	(-2.650)

$R^2 = 0.005$ F = 7.613***

Estimation shows that the constant value which is 0,801 (t = 10,961) is significant at 1% significance level. The implementation of restriction test where the null hypothesis is that the constant of the regression is unity indicates that $\chi^2(1) = 7{,}334$ (probability=0.0068). Result is not significant at a 5% significance level and the constant is not different from the unit. The saving rate and the investment rate are overall similar at the beginning of period. The estimate of the coefficient of the mean year corrected by the initial year is -0.001 (t =-2.650). This negative slope is significant at 1% significance level. Those results show a long term trend in favour of a reduction of the saving-retention coefficient since 1850.

This linearity assumption appears too powerful as it implicitly supposed that an increase in capital flows occurred according to identical characteristics for all periods and all countries. A fitted curve application on data suggests an unequal financial integration since 1850 and

[13] The observations are +4,7; +2,44; -1,7; -1,34; -0,99 at 10% significance level.

[14] Some of the listed studies concern periods starting in 1850 (Hoffman 2004; Bayoumi 1990; Corbin 2004; Obsfeld and Taylor 2004) and ends in 2003 (Nell and Santos 2007). In order to precisely locate each study in one of the periods, since some are likely to cover some several simultaneously, the assignment is carried out according to the value taken by the year which is in the centre of the total period.

[15] See on this subject graph p.28 in Obstfeld and Taylor (2004)

strongly covers the four significant periods of financial integration advanced by latest studies on monetary and financial history (Flandreau and Rivière 1999, Obstfeld and Taylor 2004):

- The first covers Gold Standard Era to the end of the First World War: 1850-1918.
- The second period refers to monetary chaos and lack of monetary convertibility during the inter-war period: 1919-1944.
- The third time corresponds to Bretton-Woods regime (1945-1973).
- The last period relates to the currency floating, monetary instability and financial crises in emerging countries: 1974-2003.

= = = **Graph 2 = = =**

According to table 2, the mean and the median values of ß for complete sample are 0.610 and 0.66 respectively. Thus, investment rate is not independent of saving rate, since an increase of 10% of saving rate should induce a 6.6% increase of investment rate. However, according to periods strong differences might appear. Same table shows that nations finance on average from 54% to 75% of their investment by domestic saving. The mean of the saving-retention coefficient over the period 1974-2002 is definitely weaker than observed figures for the three other periods suggesting than the financial level of integration of the economies reached an unequalled level in spite of the recurrence of the financial and banking crises of the Nineties, including in comparison with the Gold Standard Era. Most of estimations of ß refer to post Second World War period, because they represent almost 93.07% of complete sample estimates. Few estimates are available for periods prior to the Bretton-Woods Era. Firstly, the weakness of the estimates over the years 1850 to 1944 is explained by the relatively restricted number of good quality data which can be used for a limited number of countries. In practice, thirteen studies[16] adopt data former to 1945, but they increase number of estimates of the saving-retention coefficient by cutting out the sample period in many sub periods and using increasingly recent econometric methods, even by carrying out estimates on various data.

Table 3 presents the distribution of each meta-variable of our sample according time period according and the mean frequency of the meta-variables for the complete sample. Most of the empirical studies were carried out with annual data. The quarterly data account for only 5.93% of the total. In the same time, most of studies refer to periods after the Second World War. Research publications in academic journals from Kalaitzidakis' list are preferred by authors since they account for 54.32% of the complete sample. In the same time, the mean coefficient β is significantly weaker than that of the articles from the Q2 category.

In 1980, FH use cross-section data (CS_D) which represent, nowadays no more than 25.45% of the observations. Since 1983, many authors use means over complete period or over sub periods. But in practice, the most used data sets are the time-series data (D_ST) since such data accounts for 65.26% of complete sample. Since 1974, almost three-quarter of the estimates refer to latest period. The studies with panel data represent only 9.29% of the sample.

[16] See Frankel (1989), Bayoumi (1990), De Haan and Siermann (1994), Taylor (1996, 1996), Pomfret (1997), Hogendorn (1998), Levy (1999), Flandreau and Rivière (1999), Corbin (2001, 2004), Hoffman (2004) and Obsfeld and Taylor (2004).

= = = Table 3 = = =

Examination of articles highlights 13 econometric techniques. Most estimates of the saving-retention coefficient were carried out with the OLS method. This represents close to 50% of cross-section estimates and nearly a quarter of the time-series estimates. The number of articles, which explicitly are taking into account the violation of the assumptions of the OLS model in the estimate of the saving-retention coefficients, is very low. Only 48 estimates starting from cross-section data and three with panel data respectively use the of GLS method and feasible generalized least squares in order to correct consequences of the violation of the errors assumptions of standard econometric model. Over the recent period, cointegration framework and dynamic methods are continuously popular because they induce an increasing number of estimates of saving-retention coefficients. This evolution goes hand in hand with the increasing use of the time-series. But econometrics implementation to panel data shows that cointegration techniques on such data give also more and more good quality results.

Almost 67.99% of the estimates refer to OECD member state (OECD, OECD_1 and OECD_R) with a clear preference for studies with only one country (OECD_1: 41.03%), rather than on groups of country (OECD: 24.23%) whereas studies having as object an OECD region are reduced, in comparison with the sample size (OECD_R: 2,72%). Studies which refer to a group of countries (DEC) or to one developing country only (DEC_1), concern 30.02% of the sample. This is no more than the studies on groups of the OECD countries (OECD). Studies which combines groups of OECD countries and developing countries is far from numerous (OECD_DEC: 2.00%). The question arises about the adopted data for those developing countries because it is not ensured that implemented econometric methods for the OECD countries are easily transferable to developing countries. Significant difficulties can appear to obtain reliable data over long periods.

The meta-regression with many dummy variables makes it possible to consider the data heterogeneity's. It is then possible to explain the evolution of correlation between saving and investment rates since 1850.

V. META-RESULTS

When all dummy variables are included in the estimate of the relation (2), the linear relation between the variables is perfect. It becomes impossible to estimate the coefficients of the relation, since estimation fell in the dummy variables trap (Greene, 2003). Then a dummy variable included in each category is excluded from regressions. These omitted variables which then, will be synthesises in the constant of the regression, are those whose frequency is most important in each of their own category. They are the following variables: A_F, TS_D, Q1, OECD_1, and OLS. The interpretation of each dummy parameter is carried out compared to excluded variables. This represents reference framework.

Errors of relation (2) do not necessarily respect standard assumptions of OLS models. Indeed, 92 articles repeat their estimates with different econometric methods whereas the data are similar, and only 5 articles give one observation[17]. The saving-retention coefficient is an estimated parameter according to different econometric methods. They can relate to country

[17] Those articles are following: Jansen and al. (1996), Rossini and Zanghieri (2003); Pelagidis and al. (2003); Narayan, (2005); Payne, (2005).

samples, periods, and frequencies of data often closely linked. It is particularly the case when the articles repeat estimates with similar data but different econometric methods. Strong redundancy of the adopted statistical sources might appear since statistical data is provided, in most of the cases by IMF or UN statistical office. In this case, the standard error of the estimator in the same article is sometimes dependant since estimates are reproduced within the same study. The errors term of the equation (2) are probably strongly dependant. The use of OLS method which is a standard statistical technique produced estimators who do not have any longer the minimal variance property, since it can be uneasy to accept the hypothesis of heteroscedasticity of errors of the meta-regression appears significant. The standard White (1980) correction method is adopted because it is robust with any kind of error heteroscedasticity.

Table 4 shows results of the meta-regression when the OLS method is adopted. Column (4-1) presents complete model whereas columns (4-2) to (4-7) detail alternative specifications including some limited groups of variables in order to evaluate the relevance of the meta-regression (2). Column (4-8) is a reduced form where the non significant meta-variables are excluded.

The constant of the regression (4-1) corresponds to the reference framework. This reference framework is the situation where estimation is made using OLS method, with annual time-series data (A_T, TS_D) and only one OECD countries (OECD_1) covering 1974-2002 period. The results are published in an academic journal included in the Kalaitzidakis list's (Q1). Implicitly, the comparison between the column (4-1) and columns (4-2) to (4-7) shows that so some results are robust to variables included in the regression, others vary substantially.

The use of quarterly data (Q_D) is suitable to induce coefficient β values higher than if estimation is made with annual data (A_D). However, this effect does not exert a systematic influence on the estimates of the saving-retention coefficient, since estimated parameter does not appear statistically significant. It can be more profitable to adopt annual data for β estimates. In most of the case, they are available for broader ranges of countries and periods which are sometimes relatively ancient whereas this is not the case for quarterly data. Studies which start their estimations in 1850 use annual and rather than quarterly data. The choice of the referenced period has a significant influence on results since the values of the coefficients associated to the constant of this regression make it possible to find long term financial integration cycle. Although the influence is not statistically significant, the value of β associated with 1850-1918 period is negative. It indicates that on average the saving-investment correlation is weaker than the actual value during the 1974-2003 period. On the opposite, inter-war period reveals a strong saving-investment correlation. It appears on line with the lesson from latest economic history research according to which international mobility of the capital was low. Since 1945, the saving-retention coefficient has being reducing. Over the recent period, saving becomes less and less important to finance domestic investment. OECD economies, or even other country groups, more and more often call upon foreign saving to finance domestic investments projects.

The choice of the kind of publication has an influence on estimates of β coefficients since the coefficient of the dummy variable Q2 is significant and positive. The authors who publish research elsewhere than in academic journals which are not included in the Q1 list will have estimates of the saving-retention coefficient slightly more important than in the opposite case. This result makes it possible to think that the accumulation of observations extracted from

working papers, proceedings of conferences, books and PhD thesis which has not already come through the academic reviews qualitative filters' results in modifying the estimated effect induced by the exclusive use of observations coming from articles of academic journals. This result is in favour of the absence of publication bias. Latter will be advisable however to validate later on.

= = = Table 4 : Meta-regressions of saving retention coefficient = = =

Dummy variables from equations (4-1), (4-5) and (4-6) show a systematic influence of the composition of the sample on the saving-retention coefficients. However, when a study includes a group of OECD countries (OECD), the systematic effect not always appears significant. In all other cases (OECD_R, DEC, DEC_1 and OECD_DEC), that led systematically to decrease the value of the saving-retention coefficient, even if the final effect of each of those dummy variable is unequal. Saving is definitely more mobile between regions of same countries than between countries, even if the differences of GPD per capita between countries appear rather low. When regional data are adopted, the coefficients of these dummy variables (OECD_R) are all significant and more important than the constant of each regression. Implicitly, this kind of studies concerns their attention to geographical regions where the exchange rates are fixed. Exchange rate depreciation expectations are absent which release impact of solvency constraint. Domestic authorities' incentive to intervene is reduced since they do not have any more to be concerned with regional financial imbalances. A country is the aggregation of regional areas, supposed to form an optimal monetary area. Each area is more intensely specialized than is to it the nation on average. In order to face asymmetrical dynamics, they more easily open their financial markets in order to face gaps between outputs and income. These financial transfers between regions are a way to ensure regional financial solvency and might explain low saving-investment correlation. International capital mobility appears significant and the saving-retention coefficient is reduced, even negative.

Thus, regions seem to be opened, whereas the countries appear closed to international capital mobility. The European Union is also likely to be assimilated more and more to a group of regions where the within capital mobility increases while at the same time, international capital mobility might increase, as a result of common currency area (Bhandari and Mayer, 1990). On the other hand, the sensitivity of the estimated parameter β to the evolution of the economic situation increases (Armstrong and al., 1996). Such results on regional data are on line with the conclusions of most of the studies implemented to eleven British regions, (Bayoumi and Rose, 1993), than for Italian regions (Decressin and Disyatat, 2000), Canadian (Helliwell and McKitrick, 1999; Decressin and Disyatat, 2000), Japanese regions (Yamori, 1995; Dekle, 1996) or even North-American regions (Sinn, 1992). Most of those studies highlighted low and negative convergent results for saving-investment correlation. Those results appear robust even if the calculation method of the saving is different.

In all cases, meta-variables about developing countries are significant. This is the case for DEC, DEC_1 and OECD_DEC dummy variables. The sign of parameters is negative. The illusion of a substantial international mobility of the capital between these countries is strong. Some studies like those of Wong (1990) and Dooley and al. (1987), had stressed saving-retention coefficients where lower for those countries than for the OECD countries whereas capital mobility controls still persist in many developing countries. These countries are

opened to the rest of the world in order to ensure their economic development and are implicitly more favourable to external debt. They favour capital import, even if it does not reflect a thorough financial integration.

A possible explanation of low estimated β parameter lies in the low efficiency of statistical system of developing countries. Collecting good statistical data might appear uneasy in some of those countries. Although actually done, some international capital movements are even not included in the national statistics. The saving-investment correlation coefficient might be under-estimated, whereas significant capital mobility actually exists within those countries. In addition to this, the persistent gaps of some financial and banking networks in the saving collection can under-consider the actual value of national saving. In front of the low performances of the banking structure to collect saving and to finance investment, some informal financial networks, therefore little listed, are set up. Also, foreign development aid granted to finance balance of payments imbalances can exert a broad influence. Indeed, a substantial share of the saving net imports comes from the development grant given by public or private financial organizations. This kind of grant which is a nontrade flow does not reflect exactly financial integration situation, according to an endogenous' market response, since it goes through the selective filter of these public and private financial organizations. In this case, it is connected with a national excess consumption, whose objective is to favour capital accumulation to contribute to economic development. Difference between saving and investment is modified without capital mobility being the primary cause.

Coefficient of meta-variable OECD_DEC is significant. It encourages reconsidering firstly the argument developed by Harberger (1980), Murphy (1984) and by Wong (1990) on the countries' size. Latter can result in indicating an international capital mobility different from that which actually exists. By size effect, although the distinction does not appear clearly in the FH literature, it is possible to distinguish on one side the size effect strictly speaking and on the other side of the effect linked to the unequal levels of development between countries, often looked like small taking into consideration elasticity-prices. Initially, the country size affects the estimated results because of its productive structures, then of its weight into the world economy. Tobin (1983), and Harberger (1980) show that the small countries will undergo a more important capital mobility than the bigger sized countries. The latter will have a more diversified productive structure, where a more significant number of manufacturing sectors with saving surplus makes it possible to satisfy investment needs from saving's deficit sectors. That makes it possible to finance an increasing part of domestic investment, without requiring an important external financing. An estimation of the saving-investment correlation between countries should give higher results for large countries, than for smaller countries. Moreover Murphy (1984), with a sample of the 17 OECD countries between 1960 and 1980, shows that the saving-retention coefficient improves when one excludes small countries having a weak part in total saving.

These results are opposite to the assumption about the financial markets of large countries as USA, Great Britain or Japan are more integrated than of other industrialized countries. What should be concluded in the field of international capital mobility if the β coefficient is reduced if large countries are excluded from a sample? Does β coefficient reduce because large countries are more financially integrated than smaller countries, or because remaining countries have only reduced influence on the respective tendencies of saving-investment correlation, or because common determinants can explain dynamics of saving and investment? In this case, it is not the absolute country size which must be taken into consideration, but the relative size between countries of the sample Tesar (1991). Tesar

(1991), in an initial sample of the 24 OECD countries excludes Luxembourg because of its atypical character. Estimated saving-retention coefficients are significantly reduced when the sample includes Luxembourg[18]. In addition, if the correlation were a good instrument of measure of strong international capital mobility, the exclusion of any country should not significantly affect the successive values of the saving-investment correlation.

The OLS method is frequently adopted. However, in the same time, the choice of the econometric technique is conditioned by the data used by the researcher on one side and by significant technical progress in applied econometrics on the other side. This technical progress dynamics can explain why some econometrics methods are no longer adopted, like instrument variables method. Latest is adopted in 112 cases. In 82%, it refers to the 1974-2002 period. Other techniques has being lately developed and are widely adopted in contemporary literature. It is the case for the cointegration techniques. Panel cointegration techniques recently appeared in the literature following the articles of Pesaran and al. (2001), Kao (1999) for instance.

The used econometric method exerts a significant influence in the value of β. However, the static form of this relation (1) is still present, even if this linear equation is tested by OLS or with alternative methods. It is not possible to make distinction between the long term trend that links saving rate level to investment rate level with short term dynamics, and to set up the common hypothesis that the link between saving and investment rates is constant and similar between all countries. Using Feldstein-Horioka's methodology to evaluate international capital mobility does not differentiate long term trend to short term dynamics, otherwise than by reducing the total period in various sub-periods, then by comparing the values of the estimated saving-retention coefficients between them and their own dependence to each other. The economics structural modifications are supposed to be non-existent when data's mean is carried out over long periods or, they are estimated by averages on smaller periods. The structural modifications, if they exist, are carried out according to a perfect homogeneity for all the countries, since the available data undergo the same treatment. However this is not very likely to happen. It is reasonably conceivable that financial integration was not carried out at same speed and in similar ways for all countries, because incomes' level might be heterogeneous and lead to significantly unequal values of the saving-investment correlation. Then many studies with only time series data moderate such conclusions. Using cointegration theories, Coakley, Kulasi and Smith (1996), Jansen and Schulze (1996), Jansen (1996, 1997) call into question the initial interpretation of the relation (1). They use an error correction representation which supports the distinction between the short term dynamics and long term equilibrium representation. Consequently, a high estimate of β is not longer the sign of low international capital mobility. It should be considered as a sign of respect of the intertemporal budgetary constraint of an open economy since the following cointegration vector implicitly is searched: $(1, -\hat{\beta})$ = (1,-1). Using cointegration methods (EG, ECM JJ) will systematically increase the β coefficient compared to other econometric methods (GLS, IV).

When studies use time series, the β parameter does nothing more than describing the link between savings and investment behaviours within each nation, without trying to appreciate measures that are undertaken to reduce short and medium term imbalance that reflects a β parameter different from one. Time series methodologies do not consider the incidence of the other economies on saving-investment correlation and their possible complementarities on the

[18] The exclusion of Luxembourg for its "atypical character" is a constant in the saving and the investment correlation literature

financing of imbalances. Increase of estimates of the saving-retention coefficient for similar countries lead finally to numerous empirical results. Their originality lies in the implemented econometric methodology. However, neither studies on cross-section data, nor those on time series data makes it possible to show the fixed effects related to localization (country, regions) and to time, whereas they can exert a significance influence in the value of the saving-retention coefficient. Rather than to concentrate on each country, it could be more useful to consider the relations simultaneously within a countries panel in order to better incorporate heterogeneity between the countries and time. Krol (1996), Jansen (2000), Corbin (2001) as well as Coakley, Fuentes and Spagnolo (2001) while raising the problem involved in data heterogeneity when one adopts panel data, make estimations of saving-retention coefficient definitely different from those deduced by FH. The estimated parameters from OLS method with fixed and random effects are positive, but effects are not systematic because the coefficients are not significant at the 1% and 5% significance levels. The sign of the parameter describing the use of the panel data cointegration techniques (CI_P) is large and significant compared to other coefficients (Eng and Habibullah 2006; Kim, Oh and Jeong 2005; Pelgrin and Schich 2008). The DOLS and FMOLS methods also lead to significant values of the saving-retention coefficient even if such result might be considered as reflecting the real degree of capital mobility. These last methods which account for 17.08% of the total of the observations indicate in all the cases a significant increase of the saving-retention coefficient compared to those than can be estimated from standard OLS method.

Consequently, when data used and its frequency, countries included in the sample, and the type of publication are given, it is easily noticed that econometric methodology led to estimated saving-retention coefficient that are significantly different from each other. It is thus necessary to adopt various econometric strategies in order to have a broad outline of the spectrum of saving-retention coefficients. This methodology is not so often implemented since it concern only one third of all articles.

VI. PUBLICATION BIAS

Studies which one includes in the sample reflect editors' community practices to publish articles which generally reject the null assumption, in order to obtain significant results. Academic journals' editors might frequently tend to disallow article's proposals which do not bring a real and original contribution to current literature. Some editors can tend not to be sensitive to studies whose results are not significant, which are the situations where the null assumption is too strongly accepted, since the articles which are accepted for publication are those which show their originality, their technical quality and the convincing character of the tested hypothesis. A publication bias might appear.

One way to reduce the probability of occurrence of publication bias is to consider the maximum of β observations coming from different sources, in particular those from conferences proceeding, working papers as well as the chapters of books of PhD. This research literature can be difficult to collect. Several causes can explain this situation. Authors do not wish to publish their research too quickly, or because it was the subject of publication rejection or because authors do not communicate on their unfinished studies. Card and Krueger (1995), Doucouliagos (2005) as well as Disdier and Head (2008) suggest to take into consideration only one observation per article. This choice of only one observation per article makes it possible to reinforce the independence hypothesis of the observations. Indeed, one takes into account only one author simultaneously and one supposes as well that articles which are published were on the basis of econometric methodology, statistical data and on an

original sample of countries. However, the use of a restricted sample is not easy insofar as the authors do not provide necessarily their "preferred linear specification […] in their study" (Card and Krueger 1995, p.240). That does not support necessarily the study's reproducibility constraint. Then it is not possible to extract from it a single value which is presented by the authors (Stanley and Jarell 1998, p.955). This is why the use of the maximum of observations constitutes a relevant way of evaluation of the existence of publication bias. The observations which come from samples, econometric techniques, data frequencies which are different and which can directly use for the analysis all are retained. They constitute different observations, even if they proceed of studies of the same author. The discrimination of the saving-retention coefficient is carried out via coding all meta-variables. It allows for a better control of the sample heterogeneity.

Initial studies of medical sciences and the behaviour science (Egger and al. 1997; Sutton 1997) frequently carry out a regression between the estimated effect β_j and its standard error SE_j. Objective is to evaluate the publication bias.

$$\beta_j = \eta_1 + \eta_0 SE_j + \varsigma_j \tag{3}$$

Letter ς describes an error term. Empirical test are focused on the parameter η_0. If publication bias is not present, no relation should exist between the estimated effect β_j and its standard error SE_j. Estimated effect should evolve as a random effect, around real value, whatever should be its respective standard error. If publication bias is present, influence of specification, models, samples and econometric techniques allow to associate more important estimated effects to compensate the low precision measure effect induce by larger standard error, when it concern small sized samples.

Stanley (2005) shows that detection tests of publication bias, which is focused on parameter η_0, is quite robust. Meanwhile, heteroscedasticity of error term might be important in meta-analysis. Then, Stanley (2005, p.321), Stanley et al. (2008) suggest that one way to measure publication bias is to estimate a meta-regression between each t -Student statistics on respective precision estimate. Latter is define as $(1/Se_j)$. To avoid appearance of heteroscedasticity, relation, which is estimated with OLS method, is as follows :

$$\left(\frac{\beta_j}{Se_j}\right)_j = \eta_0 + \eta_1\left(\frac{1}{Se_j}\right) + \sum_{k=1}^{K}\frac{\gamma_k Z_{jk}}{Se_j} + \nu_j \tag{4}$$

Evaluation of publication bias of this literature is implemented from a significance test of the constant η_0. Publication bias is present in this literature if this constant is significant. Then, precision of estimator $1/Se_j$ become the central parameter of this relation and the respective parameter, which is η_1, become the real effect of financial integration within a specific period of time, correct by publication bias.

It is not possible to have from the 1399 observations included in the 97 articles all values of the standard error of the estimator. When it is the case, it is not always ensured that the

standard error of the estimator is robust. In some cases, some simple calculation are done, if t-Student statistics is available. After, those calculations, 89 articles which produce 1259 different observations are still available.

Results from publication bias tests are presented in table (5). Column (5-1) presents the estimate of the relation (4) without control variables. The regression shows that the constant $\eta_0 = 7.127$ is not significant at 1% significance level but becomes significant at 5% level. Result appears unclear. Then, slope of this meta-regression is positive and significant with an estimated figure of η_1=0.013. Meanwhile, those first results must be carefully taken onto consideration because R^2 coefficient is very low. Estimated value is R^2 = 0.06. Fisher test is also very low and appears non significant.

= = = Table 5: Publication bias = = =

If control variables are included in the relation, it should be one way to assess publication bias in this saving-investment correlation literature. Results are given in column (5-2) which presents relation (4) when all control variables are included in estimation. Column (5-3) details the results when control variables whose t-Student statistics are strictly lower than one are excluded from the estimate. Constant of the regression (5-2), whose estimate is 0.731 is not significant. The real effect of saving-investment correlation corrected by publication bias remains positive and significant. Estimated coefficient is η_1 = 0.512.

Regression (5-3) describes the situation where the dummy variables, whose t-Student statistics associated with each parameter are lower than one, are isolated. This last column confirms the assumption of no publication bias in this literature. One can conclude that the estimated constant is 0.590, and is not significant. These last two estimates show that the saving-investment correlation literature which was included in this study is not subjected to publication bias. The comparison of these two real effects of financial integration η_1 with the arithmetic mean described by table 2 and which is calculated starting from the raw data obtained on all sample and all the period $\overline{\beta}_i$ is likely to confirm the assumption of no publication bias. A Wald test where the assumption is $\eta_1 = \overline{\beta}_i$ = 0.610 reveal that this difference is not significant at a significance level of 5%. The values of the statistics are respectively 1.01 (probability = 0.314) and the 0.21 (probability = 0.644) for regressions (5-2) and (5-3).

The null hypothesis of no publication bias in the sample which is built is adopted. This result reinforces the choice firstly carried out to build a data base as broad as possible to collect most available articles about saving-investment correlation in order to include at the same time the articles having made the proof of their quality via the publication in academic journals include in the list of Kalaitzidakis and al. (2003) or articles excluded from the first list. That makes it possible to conclude that variations obtained in the estimated values of the coefficient β according to whether publications fit in the list Q1 or Q2 are firstly the result of qualitative differences between the articles rather than the product of publication constraint.

VII. CONCLUSION

This article is a quantitative review of the saving-investment correlation literature. Following the seminal article of Feldstein and Horioka (1980), many studies were published. The weakness of the rigorous theoretical bases on which is based their relation and the initial results which cancel the advanced assumptions lead to a substantial development of empirical studies and to the initialization of important controversies based on the dissimilarity of the countries' samples, the referenced periods, the data coming from different statistical institutes, as well as the quality of the results obtained, which is affected by econometric methodologies which are implemented. The stock of estimates of the saving-retention coefficient currently available in the literature is important and appears highly heterogeneous.

In the absence of real consensus on what should be the true value of saving-retention coefficient, this research adopts meta-analysis methodology to carry out a quantitative review of this literature. Meta-analyzes has the advantage to be less subjective since it concentrates, within a unified framework, on the reference models, on estimated methods and adopted data. A data base is built which includes 1399 empirical estimations of saving-retention coefficient. The data base included 97 different articles.

This research shows that the long term reduction of saving-retention coefficient values is inescapable since 1850. The choice of adopted data exerts a significant influence since when one adopts regional data of OECD countries, the result will lead to values of saving-retention coefficient definitely weaker than if they were data from only one country or even groups of country. The research dissemination process affects the empirical estimates of saving-retention coefficient. But once statistical data, samples of countries and the place to publish the research's results are set, different econometric methodologies lead to saving-retention coefficient values clearly differentiated. Thus, when the study is implemented with GLS methods or IV methods, the saving-retention coefficient estimate values will be, in most of the cases, larger than if it OLS method is adopted. Most recent techniques produce intermediate results. The saving-retention coefficient estimate values systematically will be weaker if the study adopted latest cointegration techniques. Consequently, it can be more useful to adopt an econometric strategy associating various methodologies in order to have a broad outline of the spectrum of the saving-retention coefficient. This kind of methodology does not appear very frequent since it relates to only one third of the total of the included articles in the data base.

In addition, the whole of published research papers on the Feldstein and Horioka (1980) paradox do not appear to be subjected to publication bias.

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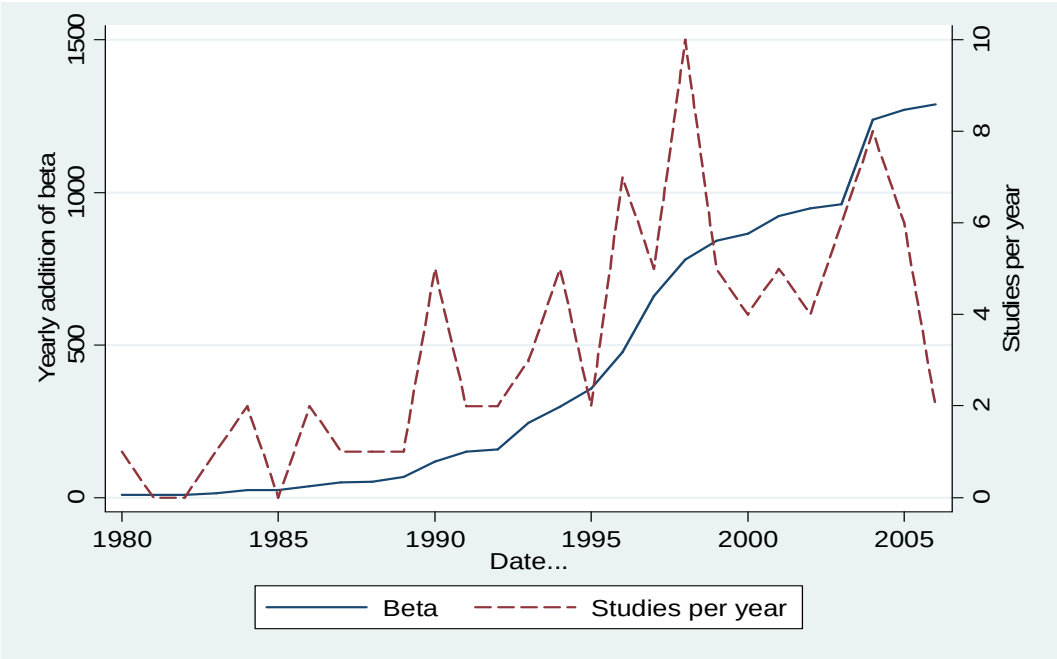
List of graph

Graph 1 : Published articles on « Feldstein et Horioka » paradox



Yearly addiction of saving-retention coefficients published between 1980 and December 2007

Graphique 2 : Saving-retention coefficients

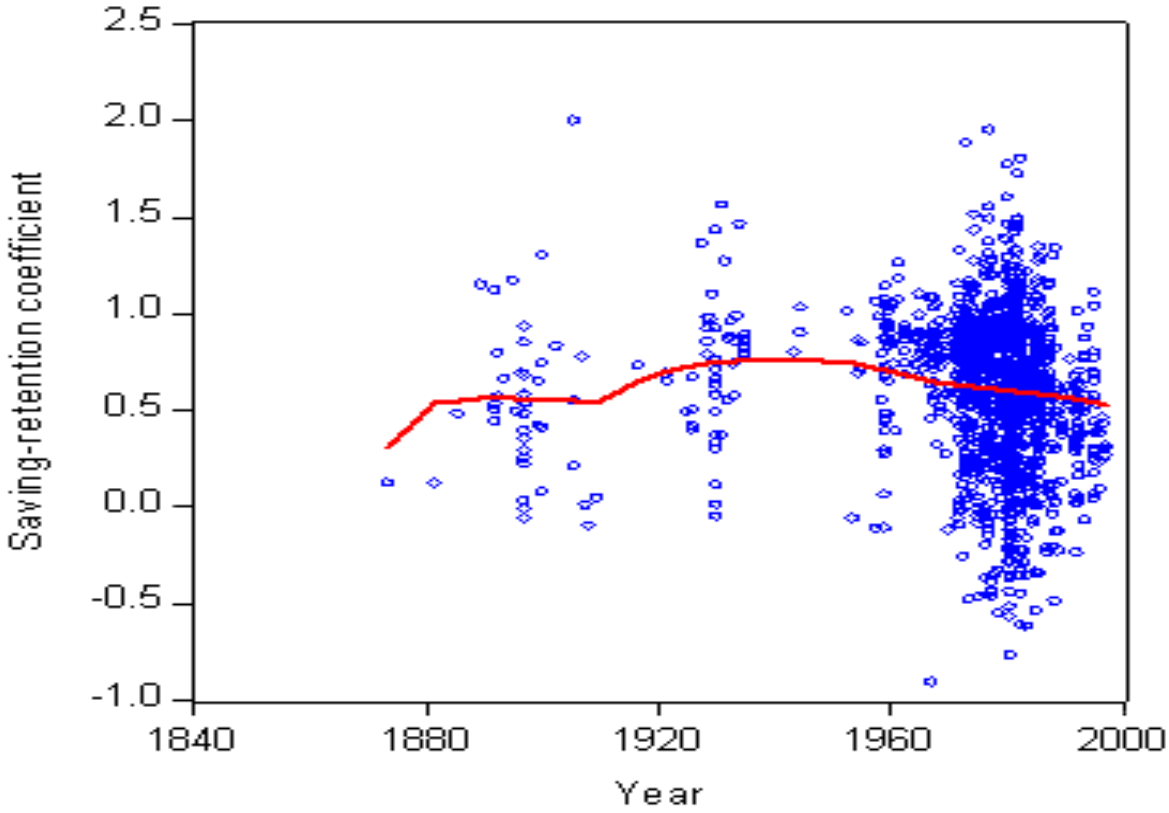


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Tableau 1 : Explanatory Variables in Meta-Analysis

Variable	Description
A. Dependent Variable	
β_i	Saving-retention coefficient from relation (1)
B. Structure and frequency of data	
A_F	= 1, if the study uses annual data
Q_F	= 1, if the study uses quarterly data
CS_D	= 1, if the study uses cross-section data
TS_D	= 1, if study uses time-series data
PD_D	= 1, if study uses panel data
C. Econometric method	
OLS	= 1, if study uses Ordinary Least Square method
DOLS	= 1, if study uses Dynamic OLS
FMOLS	= 1, if study uses Fully Modified OLS
GLS	= 1, if study uses Generalizes Least Square
OLS_FE	= 1, if study uses OLS with fixed effects
OLS_RE	= 1, if study uses OLS with random effects
IV	= 1, if study uses instrumental variables
IV_FE	= 1, if study uses instrumental variables with fixed effects
IV_RE	= 1, if study uses instrumental variables with random effects
EG	= 1, if study uses Engle-Granger procedure of cointegration analysis
ECM	= 1, if study uses an error correction model
JJ	=1, if study uses the Johansen-Juselius procedure of cointegration analysis
CI_P	= 1, if study uses a panel estimator
D. Sample composition	
OECD	= 1, if study uses a group of OECD countries
OECD_1	= 1, if study uses only one country from OECD
OECD_R	= 1, if study uses a group of regions from OECD
DEC	= 1, if study uses a group of developing countries
DEC_1	= 1, if study uses only one developing country
OECD_DEC	= 1, if study associate OECD and developing countries
E. Quality of publication	
Q1	= 1, if study is published in an academic review includes in the list of Kalaitzidakis and al. (2003)
Q2	= 1, if study is published in an academic review not included in the list of Kalaitzidakis and al. (2003), if it is a working paper, a chapter of book, in a communication in a conference or a study available in a website.

Table 2 : Descriptive β meta-statistics

	1850-2003	1850-1918	1919-1944	1945-1973	1974-2003
# β estimated (%)	1399 (100)	48 (3,43)	49 (3,50)	270 (19,30)	1032 (73,77)
Mean (t -Student)	0.610 (58,357)***	0,542 (9,519)***	0,753 (15,435)***	0,705 (34,247)***	0,581 (48,218)***
Standard-Error	0.386	0,398	0,344	0,338	0,395
Median	0.660	0,531	0,790	0,798	0,623
Minimum	-0,909	-0,100	-0,050	-0,909	-0,77
Maximum	1,998	1,998	1,56	1,883	1,950
Mean year of sample	1974,294	1897,250	1931,51	1968,511	1981,444
Standard value	18,478	7,031	4,594	5,306	5,228

Mean over four periods are taken from a regression of β on dichotomic variables of four periods, without constant. R^2=0,719; Fisher F = 932.81; N = 1399.
*** 1% Level of significance.

Tableau 3 : Sub-periods caracteristics of saving-retention coefficients

		1850-1918	1919-1944	1945-1973	1974-2003	1850-2003	1850-2003				
							$\overline{\beta}_i$	σ_{β_i}	Min β_i	Max β_i	% [(a)]
Econometric Techniques	OLS	31	22	92	383	**528**	0,563	0,392	-0,62	1,998	37,74
	GLS	0	0	18	33	**51**	0,682	0,133	0,350	0,899	3,65
	OLS_FE	1	2	4	28	**35**	0,593	0,239	0,082	1,16	2,50
	OLS_RE	2	3	3	34	**42**	0,680	0,195	0,125	0,433	3,00
	IV	0	4	16	58	**78**	0,515	0,429	-0,909	1,192	5,58
	IV_FE	0	0	0	9	**9**	0,594	0,421	0,141	1,345	0,64
	IV_RE	0	0	0	25	**25**	0,718	0,211	0,239	1,272	1,79
	ECM	13	13	36	147	**209**	0,610	0,412	-0,37	1,46	14,94
	EG	1	3	61	37	**102**	0,686	0,309	-0,04	1,883	7,29
	JJ	0	2	20	59	**81**	0,721	0,367	-0,54	1,51	5,79
	DOLS	0	0	4	53	**57**	0,842	0,457	-0,28	1,95	4,07
	FMOLS	0	0	16	104	**120**	0,483	0,410	-0,77	1,18	8,58
	CI_P	0	0	0	62	**62**	0,743	0,406	-0,344	1,77	4,43
Data	CS_D	11	6	92	247	**356**	0,542	0,371	-0,909	1,345	25,45
	PD_D	6	9	18	97	**130**	0,629	0,246	+0,03	1,16	9,29
	TS_D	31	34	160	688	**913**	0,633	0,406	-0,77	1,998	65,26
Frequency	A_F	48	49	254	965	**1316**	0,607	0,388	-0,909	1,998	94,07
	Q_F	0	0	16	67	**83**	0,657	0,361	-0,488	1,282	5,93
Publications	Q1	10	8	131	611	**760**	0,566	0,416	-0,909	1,95	54,32
	Q2	38	41	139	421	**639**	0,661	0,342	-0,614	1,998	45,68
Sample	OECD	17	15	94	213	**339**	0,678	0,253	-0,62	1,192	24,23
	OECD_1	25	30	145	374	**574**	0,721	0,382	-0,614	1,998	41,03
	OECD_R	0	0	7	31	**38**	-0,049	0,287	-0,48	0,54	2,72
	DEC	0	0	7	114	**121**	0,445	0,304	-0,909	1,345	8,65
	DEC_1	6	4	15	274	**299**	0,484	0,419	-0,77	1,39	21,37
	OECD_DEC	0	0	2	26	**28**	0,425	0,236	-0,909	0,-068	2,00

Refer to table 1 for definition of acronyms

(a): Percentage of observations of each dummy variable in term of complete sample (N=1399).

Tableau 4 : Meta-régressions analysis of saving-retention coefficients

	(4-1)	(4-2)	(4-3)	(4-4)	(4-5)	(4-6)	(4-7)	(4-8)
Constant	0,623 (0,02)***	0,577 (0,041)***	0,605 (0,048)***	0,562 (0,046)***	0,695 (0,021)***	0,710 (0,018)***	0,532 (0,018)***	0,620 (0,023)***
1850-1918	-0,096 (0,057)	-0,035 (0,060)	-0,039 (0,058)	-0,033 (0,055)	-0,124 (0,055)***	-0,124 (0,055)***	-0,008 (0,059)	
1919-1944	0,097 (0,050)**	0,175 (0,072)***	0,161 (0,073)**	0,168 (0,061)***	0,067 (0,048)	0,074 (0,048)	0,194 (0,052)***	0,089 (0,050)*
1945-1973	0,059 (0,025)**	0,123 (0,044)***	0,133 (0,044)***	0,118 (0,043)***	0,048 (0,023)**	0,0514 (0,023)**	0,134 (0,025)***	0,078 (0,023)***
A_F	0,010 (0,043)	0,055 (0,094)			0,002 (0,041)			
CS_D	0,150 (0,049)***		-0,099 (0,059)*		0,070 (0,047)			0,121 (0,046)**
PD_D	0,138 (0,050)***		-0,003 (0,067)		0,116 (0,048)**			0,125 (0,0479)***
Q2	0,059 (0,022)***			0,075 (0,046)*	0,047 (0,020)**			0,049 (0,020)**
OECD	-0,132 (0,048)***				-0,118 (0,047)**	-0,042 (0,020)**		-0,120 (0,047)**
OECD_R	-0,823 (0,070)***				-0,827 (0,067)***	-0,769 (0,049)***		-0,814 (0,070)***
DEC	-0,388 (0,049)***				-0,340 (0,047)***	-0,262 (0,033)***		-0,348 (0,047)***
DEC_1	-0,188 (0,033)***				-0,213 (0,031)***	-0,221 (0,029)***		-0,169 (0,031)***
OECD_DEC	-0,423 (0,082)***				-0,432 (0,081)***	-0,335 (0,067)***		-0,410 (0,083)***
GLS	0,035 (0,024)						0,101 (0,022)***	
OLS_FE	0,027 (0,045)						0,034 (0,043)	
OLS_RE	0,059 (0,035)*						0,124 (0,035)***	
IV	-0,046 (0,042)						-0,055 (0,051)	
IV_FE	0,148 (0,121)						0,061 (0,134)	
IV_RE	0,102 (0,049)**						0,185 (0,045)***	0,112 (0,046)**
EG	0,057 (0,039)						0,067 (0,035)*	
ECM	0,070 (0,037)*						0,043 (0,033)	0,044 (0,033)

JJ,	0,081 (0,049)*						0,150 (0,044)***	0,081 (0,045)*
DOLS	0,239 (0,063)***						0,301 (0,061)***	0,238 (0,060)***
FMOLS	0,013 (0,044)						-0,067 (0,040)*	
CI_P	0,226 (0,054)***						0,211 (0,054)***	0,198 (0,050)***
Observations =	1399	1399	1399	1399	1399	1399	1399	1399
Fisher Statistics =	18,32	7,26***	12,67***	8,77***	33,28***	47,45***	8,28***	27,51***
R^2 =	0,202	0,022	0,033	0,028	0,176	0,171	0,072	0,194

Refer to table 1 for definition of acronyms

OLS method is used, but standard errors, which are in brackets, are corrected with the White (1980) Heteroscedasticity-Consistent Covariance Matrix Estimator. ***, (**) et [*] mean the estimators are significant at 1%, 5% and 10% levels.

Tableau 5 : Publication bias

Control variables	Dependant variable : t Student		
	(5-1)	**(5-2)**	**(5-3**
Constant	7,095 (3,540)**	0,731 (0,731)	0,590 (0,737)
1/SEE	0,013 (0,290)	0,512 (0,096)***	0,572 (0,081)***
1850-1918		-0,261 (0,118)**	-0,263 (0,103)**
1919-1944		-0,020 (0,114)	
1945-1973		0,117 (0,050)**	0,125 (0,035)***
A_F		-0,500 (0,216)**	-0,560 (0,218)**
CS_D		0,173 (0,173)	0,092 (0,054)*
PD_D		0,116 (0,175)	
Q2		0,108 (0,077)	0,136 (0,083)*
OECD		0,001 (0,181)	
OECD_R		-0,736 (0,208)***	-0,713 (0,131)***
DEC		-0,300 (0,186)	-0,274 (0,092)***
DEC_1		-0,487 (0,121)***	-0,536 (0,126)***
OECD_DEC		-0,282 (0,217)	-0,255 (0,150)*
GLS		0,005 (0,098)	
GLS_FE		-0,031 (0,069)	
GLS_RE		0,109 (0,055)**	0,136 (0,044)***
IV		-0,265 (0,137)**	-0,315 (0,148)**
IV_FE		-0,049 (0,126)	
IV_RE		0,067 (0,075)	
CI_EG		0,161 (0,090)*	0,085 (0,079)
ECM		0,174 (0,144)	0,152 (0,137)
JJ		0,781 (0,358)**	0,772 (0,357)**
DOLS		0,191 (0,154)	0,147 (0,140)
FMOLS		0,108 (0,101)	0,108 (0,096)
CI_P		0,325 (0,163)**	0,326 (0,155)**
R^2 =	0,060	0,854	0,852
Observations =	1259	1259	1259
Fisher Statistics =		343,76***	325,86***

Refer to table 1 for definition of acronyms

OLS method is used, but standard errors, which are in brackets, are estimated with bootstrap method (1000 replications)

***, (**) and [*]: estimators are significant at 1%, 5% and 10% levels.