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Capital Mobility within EMU

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Abstract:

Capital mobility is helpful to cope with the loss of adjustment instruments in EMU. High capital mobility in the sense of Feldstein and Horioka (FH) can limit the negative consequences of shocks affecting the saving capacity of an economy in the Euro zone. It is the aim of this paper to assess the likely degree of capital mobility in the FH sense within EMU. For this purpose, the FH approach is extended and updated. In particular, the role of current account targeting, exchange rate volatility and tax differentials as potential obstacles to capital mobility is analyzed. The empirical findings support the view that both current account targeting and exchange rate volatility were relevant for limiting the free flow of capital in the past. The conclusion is that within EMU domestic saving and investment will be less correlated than they were before the advent of the Euro.

Keywords: Capital Mobility, European Monetary Union, Investment-Saving-Relation

JEL classification: F 36, F 21

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I. Introduction

How mobile is capital internationally? Since Feldstein and Horioka ("FH") (1980) found the degree of capital mobility among industrial countries in the period from 1960 to 1974 to be surprisingly low, this question has attracted a lot of interest. Inspite of an obviously fast proceeding integration of financial markets the incomplete mobility according to the FH criterion was a result inspiring further research. At the end of the nineties, there is a constellation which makes this question particularly important. The introduction of a common currency in Europe changes the economic environment for policy making. The adjustable nominal exchange rate is lost as an economic degree of freedom. Under the assumption that the nominal exchange rate can play a role as a helpful shock absorber, EMU makes the availability of other adjustment instruments desirable. Capital mobility is one of these potential adjustment instruments (Ingram, 1959).

In a world with perfect capital mobility in the FH sense, domestic investment does not depend on domestic saving: National savings feed a global saving pool out of which global investment is financed. For a small country, changes in domestic saving are irrelevant for the level of domestic investment. The case is different with imperfect capital mobility which implies a direct link between domestic saving and investment. In this situation the degree of national investment depends on the saving capacity of the domestic households, enterprises and government. Thus the degree of capital mobility is relevant for the question how member countries of EMU will manage shocks affecting saving capacities asymmetrically. With perfect capital mobility the level of investment can be stabilized in a country with a negative development of saving capacity. The reduction of domestic saving is simply replaced by an increase of foreign capital inflow. On the other hand with imperfect capital mobility a decreasing domestic saving rate leads to a decrease of investment activity which negatively affects the growth and employment perspective of that country.

It is obvious that EMU and increasing monetary integration in Europe will have an impact on capital mobility. The end of nominal exchange rate risks eliminates one reason that often has been used to tell a story behind the „FH puzzle". In order to draw conclusions for the availability of an important adjustment instrument it would therefore be helpful to identify more clearly the role exchange rate variability played in the past as an obstacle to capital mobility. If it proves to be a major reason for the FH result, it would be justified to be optimistic concerning capital mobility in EMU.

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The degree of capital mobility in EMU might also be indirectly affected through taxation. EMU is expected to lead to increasing pressure on either politically negotiated or market induced tax harmonization. Steps to harmonize company taxation could possibly affect capital mobility and it would be helpful to learn something about the direction of this relation.

Finally, EMU will also change the objectives of economic policy. Politicians in Euroland which has a far lower degree of openness than the small European countries before will lose interest in exchange rate and current account developments. Particularly the latter is an important change in the context of the FH debate. One explanation for the FH result is the idea that governments follow a strategy of current account targeting. Through the use of fiscal or other instruments governments try to balance the current account in the medium term (Bayoumi, 1990; Summers, 1988). If this is the case this would explain a low degree of capital mobility in the FH sense. Because EMU makes current account balancing a largely senseless strategy for a single Eurozone member country this would also hint of an increasing degree of capital mobility from 1999 onwards.

With this in mind, it is the aim of this paper to assess capital mobility within EMU by analyzing the importance of current account targeting, tax burden differentials and exchange rate variability for the FH results. If it can be shown that current account targeting and exchange rate volatility have some explanatory power for a low degree of capital mobility in the past, the emerging conclusion is that EMU will indeed increase capital mobility in the FH sense.

The structure of the paper is as follows. In section 2 there is a short survey on the original FH approach and the literature emanating from the FH discussion. A particular focus will be on the main criticism that has come up in the discussion of the "FH puzzle" and on the impact of economic integration and exchange rate fluctuations. Section 3 includes an update of the original FH approach for the OECD countries until the latest available year (1996). Section 4 changes the focus from aggregate to private saving and investment ratios: This modification is to supply evidence on the role of current account targeting. In section 5, the impact of tax differentials and nominal exchange rate variability on capital mobility is analyzed. In the final section, the conclusions for the likely degree of capital mobility under EMU are drawn.

II. Survey and Main Criticism on Feldstein and Horioka

The FH approach is based on a simple relation. In a closed economy domestic investment is equal to domestic saving by definition. In an open economy a deviation from this identity is possible as domestic investments can be financed by foreign savings to the extent capital is mobile. Therefore, FH interprete the correlation of domestic saving and domestic investment as an indicator for the degree of capital mobility.

FH are aware about the fact that simultaneous capital ex- and imports can exist because of strategic reasons such as international diversification. They focus, however, on net flows.

Capital mobility in their sense is the international mobility of the world's supply of capital. This means that in the case of perfect mobility each additional unit of savings is invested worldwide at the place with the highest return. International capital flows should then respond to country differences in saving rates. Under perfect capital mobility the correlation of domestic saving rates and investment rates should be zero since additional domestic savings do not increase domestic investment but go to a global saving pool out of which investment is financed worldwide. If instead capital is totally immobile, the correlation is one, because each additional unit of saving is invested at home.[1]

In the original study, FH took data from the OECD National Accounts for 16 industrialized countries and ran their regressions for the time period from 1960 to 1974.[2] The saving-investment correlation is analyzed in the context of the following cross section equation by the use of three five-year-averages as well as the total period average of the ratio of gross domestic saving to gross domestic product (GDP) and gross domestic investment to GDP:

$$(I/Y)_i = \alpha + \beta\,(S/Y)_i$$

with *i* being the country index.

β can be interpreted as the saving retention coefficient as it represents the share of the saving ratio invested at home. This coefficient is the indicator for capital mobility in the FH sense. A β of zero (of one) indicates perfect (the absence of any) capital mobility.

FH find β equal to 0.89 (s.e. = 0.0.7) for the 15-year period while this coefficient falls from 0.909 (s.e. = 0.06) to 0.871 (s.e. = 0.09) in the 5-years-subperiods. The saving retention coefficient is in no case significantly different from 1. An increase in domestic saving does not seem to be invested internationally but domestically. The conclusion is that capital mobility is surprisingly low.

These results are a provocation to the widespread view that global financial integration has been proceeding fast since the sixties. This sense of provocation is more vivid at the end of the nineties when terms like "internationalization" and "globalization" have advanced to something like a creed for economic policy makers. The finding of a relatively low degree of capital mobility stands in a striking contrast to the fact that financial markets due to the improvement of communication technology, the development of new products and the abolition of capital controls are integrating at a fast pace.

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[1] Nevertheless, a correlation of one is only a necessary but not a sufficient condition for perfect capital immobility. In the case of simultaneous capital in- and outflows, the correlation can for example be one though international capital flows exist. A correlation below one, however, clearly indicates some degree of capital mobility.

[2] FH make use of the ratio of gross domestic investment to gross domestic product as well as of the ratio of gross domestic saving to gross domestic product.

The results might not be that surprising, however, if one considers the obstacles to the mobility of short-run financial capital on the one hand and of long-run portfolio capital or direct investment on the other hand. In the short run, the regulatory framework concerning capital restrictions or differential tax treatments can be regarded as stable. Furthermore, markets for the hedging of exchange rate risks exist and are highly liquid. For a long-run investor, the situation is different, because the politically determined environment can not be assumed to be stable. If there are no capital restrictions today, obstacles to the repatriation of capital or unfavorable treatment of foreigners could be introduced again at some point in the future. Hedging exchange rate risks on the long run is often not possible. Even if it is possible, it is likely to be relatively expensive due to the lower liquidity of long term in comparison to short term forward markets. Thus, in principle, a low degree of capital mobility in the FH sense is possible, even if financial integration is perfect in the light of the (short-run) covered interest parity condition.

Different lines of criticism have, nevertheless, been put forward against the FH approach (for a summary of the criticism see Lemmen and Eijffinger, 1995. Obviously, there is an endogeneity problem in regressing investments on savings. In the original paper, the authors have been well aware of this problem and made use also of a two stage least squares approach in a simultaneous equation framework with a specified saving function. The results of the simple OLS estimation proved to be robust.[3] Apart from that, the use of suitable period averages is able to decrease the problem of endogeneity along business cycles.

The calculation of averages might, however, lead to another problem. Due to the intertemporal budget restriction of an economy, current account deficits should on the long run add up to zero.[4] Since the difference between domestic investment and saving is the current account deficit, a high correlation between both variables coming out of a regression based on long run period averages could simply reflect the fact that a country can not permanently increase its foreign debt. Using long run averages thus may imply a bias for finding a low degree of capital mobility (Sinn, 1992). This argument has also been used in a slightly modified manner (Summers, 1988) which is important in the EMU context: Governments often include the current account to the list of policy objectives. In this case they will employ suitable policy instruments to improve the current account in the situation of large deficits. Thus the FH finding of a high correlation between saving and investment might simply reflect a political strategy of current account targeting. If this is the case, EMU will improve capital mobility ac-

[3] In this context, FH made use of several instrumental variables in different combinations: the growth rate of total private income, the ratio of the number of retirees over the age of 65 to the population aged 20 to 65, the ratio of the number of younger dependants to the working age population, the benefit-earnings replacement ratio as well as the labour force participation rate of older men. Testing for linearity, they found no evidence of non-linearity in the saving-investment correlation. Also, the rate of population growth potentially having a strong impact on the saving rate did not exert a statistically significant effect on the investment rate while the original saving retention coefficient remained almost constant.

[4] This is a very approximate statement, since real growth rate and interest rates of an economy have to be taken into account to calculate a sustainable current account deficit, which could well be positive for long periods.

cording to the FH concept because under EMU current account targeting is a very unlikely strategy for national policy makers. Within a monetary union the current account restriction ceases to be a restriction because negative consequences of large deficits such as exchange rate crises are no longer feasible.

Finally, the FH measure for capital mobility is only adequate as long as the small country assumption holds. A large country will experience an impact of its saving ratio on its investment ratio because the domestic saving ratio is of relevance for the world level of interest rates and thus for world investment. This problem, however, will probably be relevant only for very large economies like the USA or Japan.

One or the other, however, both the FH methodological approach and the main findings have survived its critiques. This is the reason why it seems adequate to use this measure for an analysis of the development of the degree of capital mobility and EMU's influence on it.

The impact of economic integration and the exchange rate regime on capital mobility according to the FH criterion has been touched in a couple of papers but remains unresolved. From a long run perspective, Hogendorn (1998) shows that capital mobility has fluctuated considerably in the last 150 years. It was highest during the decade 1905-1914, the zenith of the classical gold standard. In contrast to that, the Bretton Woods era was characterized by a saving retention coefficient of 1, i.e. complete immobility of capital. After the end of the Bretton Woods system capital mobility increased again (see also Feldstein/Bacchetta, 1991), it has however not yet reached again the levels of the period before World War. The increasing capital mobility after the end of fixed exchange rate is an interesting result in regard to EMU since it contradicts the view that exchange rate certainty is a substantial accelerator of capital mobility. In contrast to this, Bhandari/Mayer (1990) find the EMS to have a positive influence on capital mobility of its member countries. Generally, a deepening of economic integration as it is under way in Europe is expected to increase financial flows (Feldstein/Bacchetta, 1991; Artis/Bayoumi, 1991), although Dornbusch (1991) on the basis of data 1960-1986 fails to find a significant European Community effect.

Helliwell and McKitrick (1998) focus on capital mobility on the level of Canadian provinces and find that correlation between savings and investment disappears among provinces whereas it is significant on the national level. They ascribe this findings vaguely to barriers to trade and investment associated with national borders. Thus it remains unanswered which particular characteristics of a national border hinder the flow of capital. A more precise identification is, however, necessary to assess capital mobility within EMU since the Euro zone is a mixed case between a unified economy and a group of sovereign countries.

III. Updating Feldstein Horioka

According to conventional wisdom, the nineties have sped up the process of globalization. In Europe, the years since 1990 have shown different developments relevant for capital mobility. The period 1992-1995 has been a turbulent time on foreign exchange markets. Within the

EMS, there were several crises with a high volatility of exchange rates. While these events might have negatively affected capital mobility, the completion of the internal market 1993 should have had a positive impact. Therefore, an update of the FH is necessary.

In comparison to the original FH work, data for Iceland, Portugal and Turkey are included, data for Luxemburg are excluded.[5] The following subgroups are used:

- *Core*: includes the DM-zone countries Austria, Belgium, Denmark, France, West Germany and the Netherlands
- *Rest of EU*: includes Finland, Great Britain, Greece, Italy, Portugal, Spain, Sweden and Ireland
- *Rest of the world*: includes Australia, Canada, Iceland, Japan, Norway, New Zealand, Switzerland, Turkey and the USA.

Investment ratios are calculated by dividing gross fixed capital formation by GDP.[6] Gross saving ratios are calculated by dividing net savings plus consumption of capital by GDP. Data originate from the OECD National Accounts. Time series for saving and investment ratios are shown in the Appendix I (Illustration 1).

In order to limit the impact of business cycle effects period averages are used in the FH analysis. As an illustration, table A1 in Appendix II gives yearly saving retention coefficients of annual cross-sectional regressions for two country-groups, all countries and the subgroup EU core countries.[7] On the basis of these estimations diagram 1 presents the saving retention coefficients for all countries and EU core countries from 1960 to 1996. The saving-investment correlation coefficients actually show a high annual variability. The correlation is not constantly at a high degree, but seems to underlie itself cyclical influences.

[5] It does not seem to be sensible to include the outlier Luxemburg with its specific characteristics of a small country with a huge financial market place.

[6] All variables have been constructed in the same way as in the original FH approach. Although instead of "Gross Domestic Investment" "Gross Fixed Capital Formation" was taken in order to avoid arbitrary fluctuations in stocks. Bayoumi (1990) has used both concepts but found the regression results to be very similar.

[7] As the cross-section regressions for the subgroup of EU core countries only contains 6 observation points, the regression results should be interpreted very carefully.

Diagram 1: Development of saving retention coefficients of yearly cross-sectional regressions.

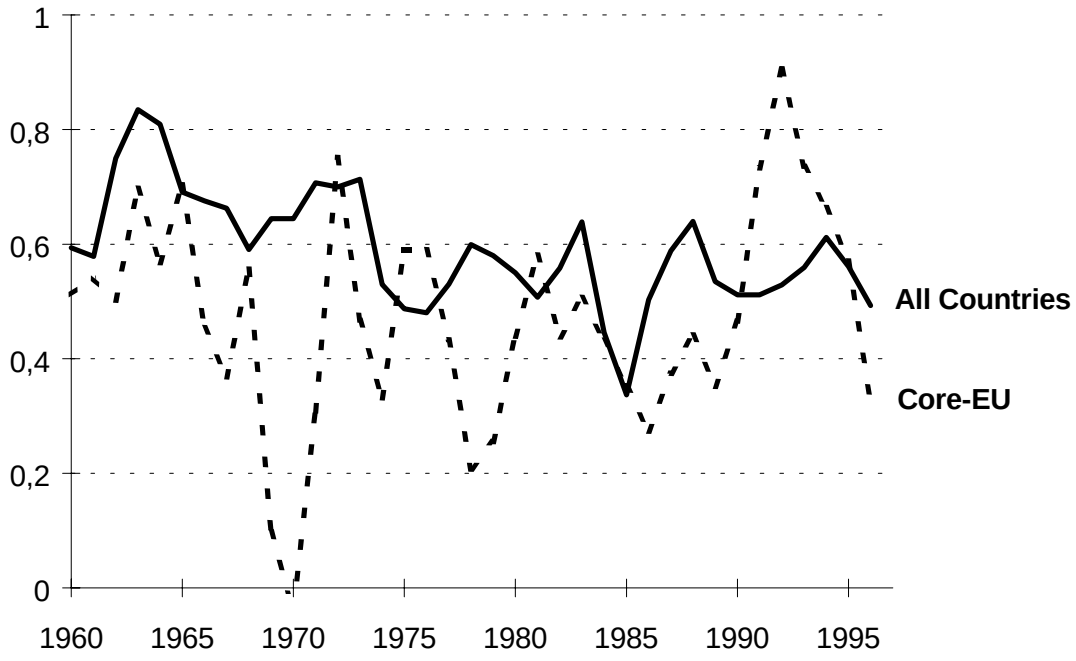
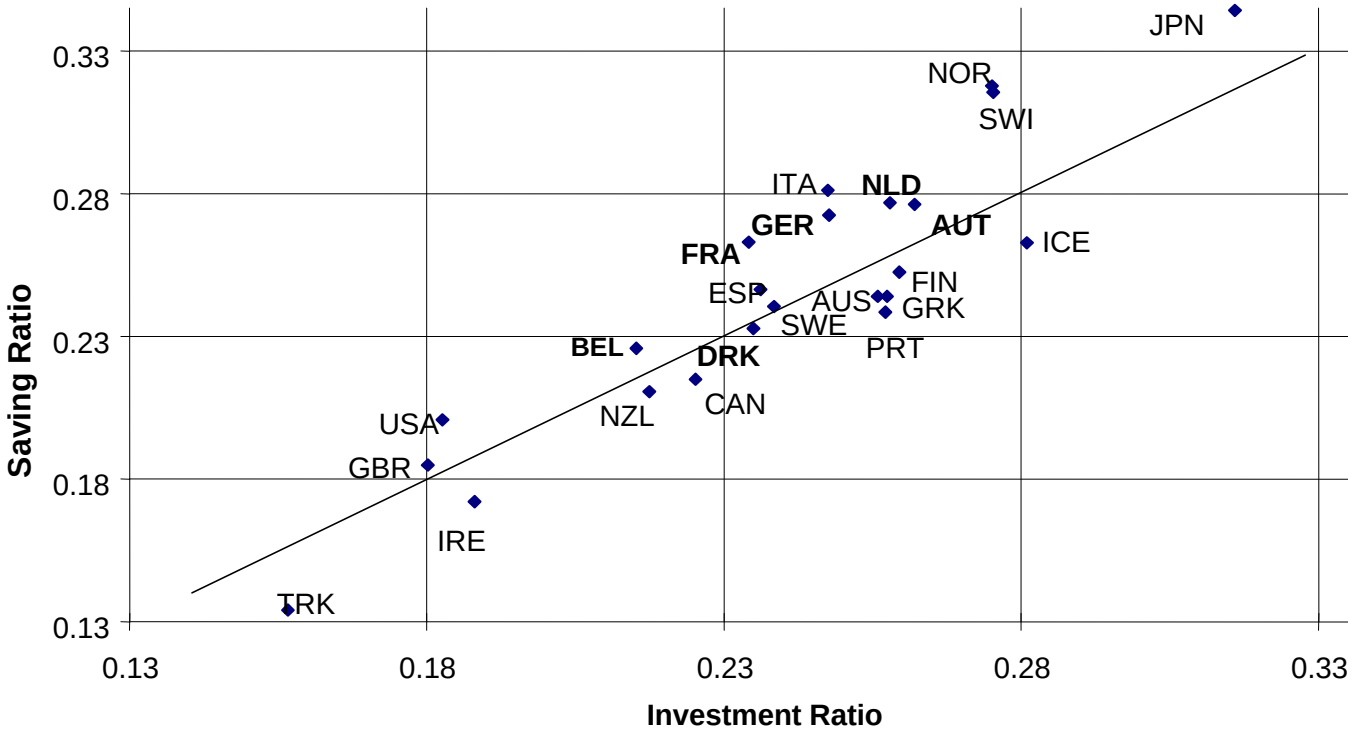
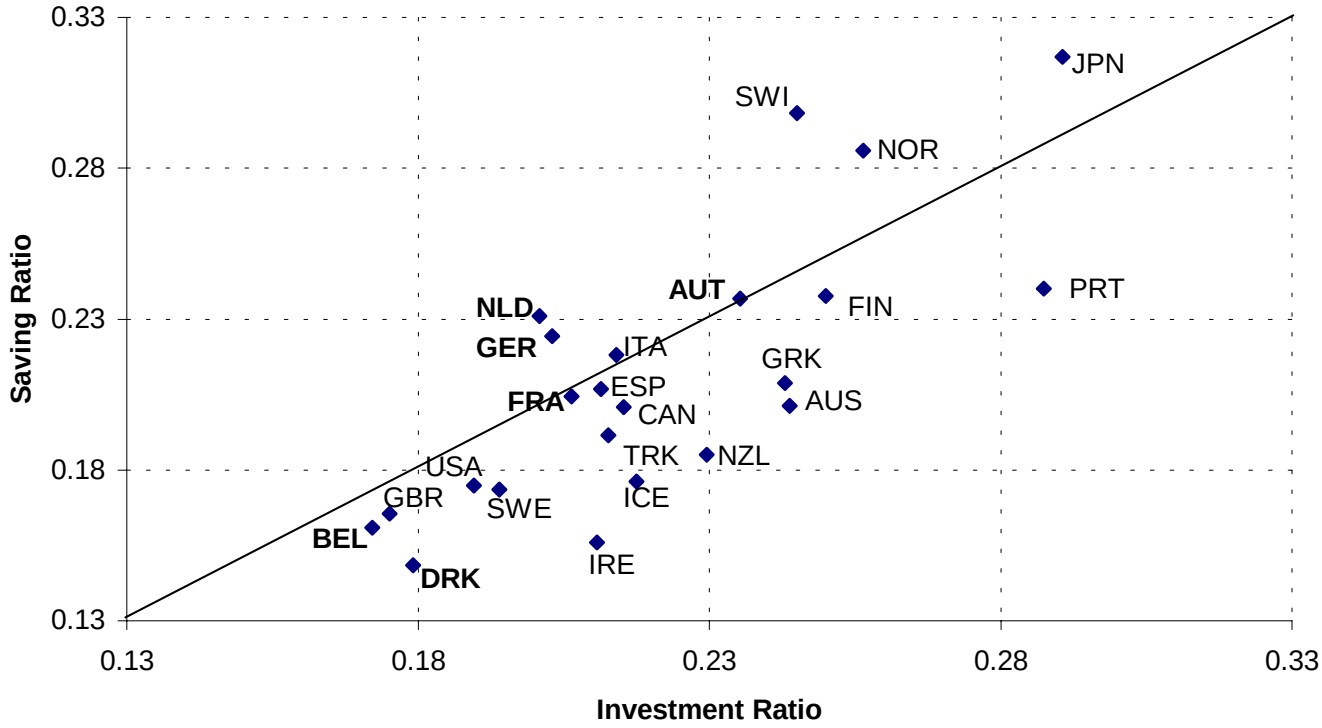


Diagram 2: Scatter plot for average saving and investment ratios in the 1960s



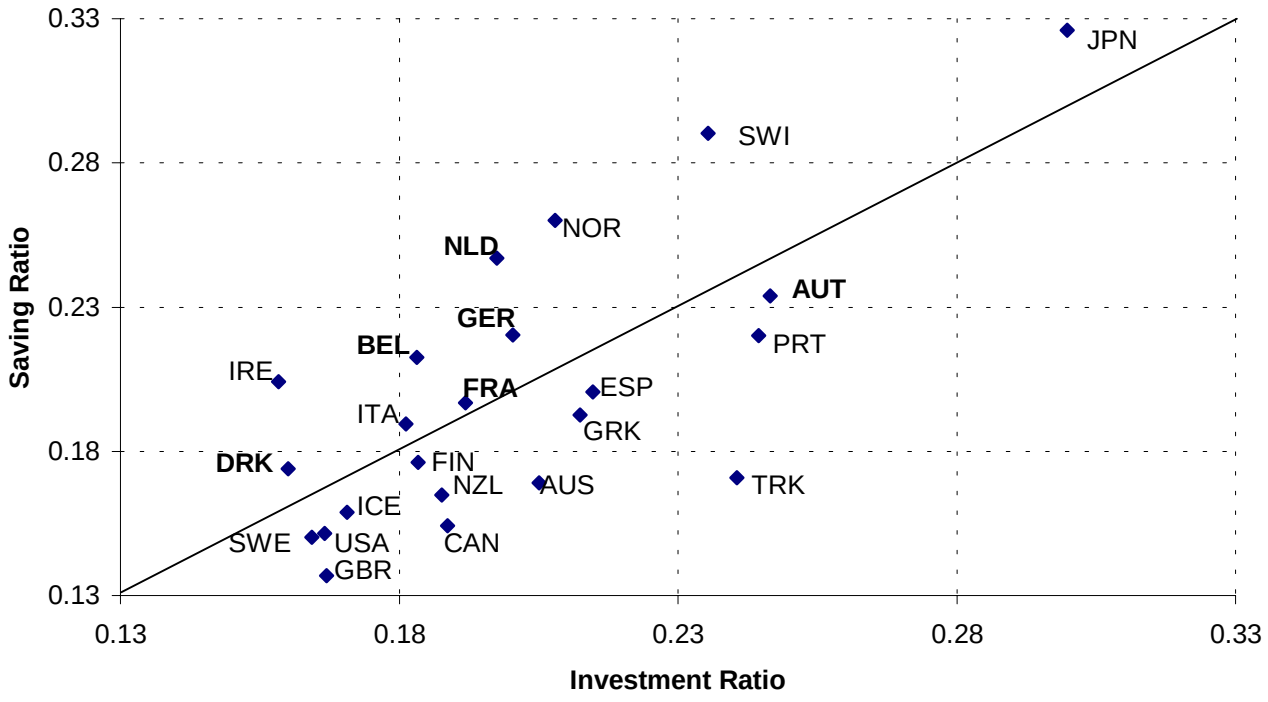
Note: EU core countries are presented in bold letters

Diagram 3: Scatter plot for average saving and investment ratios in the 1980s



Note: EU core countries are presented in bold letters

Diagram 4: Scatter plot for average saving and investment ratios in the 1990s



Note: EU core countries are presented in bold letters

Diagrams 2-4 present the position of 23 industrial countries regarding the correlation between saving and investment ratios of different time averages. A position on the 45-degree-line represents complete immobility of capital in the FH sense. These diagrams already hint on increasing capital mobility after the sixties.

Table 1 and 2 summarize results of the update of the FH approach. The tables present saving retention coefficients as they result from the basic FH regression (see above section 2) based on a cross section of period averages. Table 1 reports results for five-year-averages and table 2 for ten-year averages. The coefficients in these tables are regarded with respect to their significant difference from zero.

Table 1: Saving retention coefficients (FH regression based on five-year averages)[8]

	ALL COUNTRIES
1960-1964	0.737 ***
1965-1969	0.674 ***
1970-1974	0.685 ***
1975-1979	0.594 ***
1980-1984	0.572 ***
1985-1989	0.539 ***
1990-1994	0.562 ***
no. of observ.	23

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.

Table 2: Saving retention coefficients (FH regression based on ten-year averages)[9]

	ALL COUNTRIES
1960-1969	0.708 ***
1970-1979	0.666 ***
1980-1989	0.553 ***
1990-1996	0.532 ***
no. of observ.	23

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.

For the 23 OECD countries, the results show the expected pattern. From the sixties onwards a long run tendency to a lower correlation between domestic investment and saving is observed. In comparison to the FH results, the estimations show a smaller β, even in 1960-64, 1965-69 and 1970-74. Additionally, the saving retention coefficients are significantly different from unity according to the Wald-Test. Although far from being perfect it seems that the international mobility of capital in the FH sense is increasing, especially in the 1980s and 1990s.

[8] Detailed results can be found in Appendix II Table A2.

[9] Detailed results can be found in Appendix II Table A3.

Due to the small number of observations (one observation per country per subperiod), period average regressions for subgroups would show a low degree of significance. In order to achieve correlations for the same time periods, but different country groups, while including a sufficient number of observations, the FH relation is explored by time series cross section regressions of the following type[10]:

$$(I/Y)_{i\,t} = \alpha + \beta\,(S/Y)_{i\,t}$$

with *i* being the country index and *t* the time index.

This specification is also helpful in order to check the robustness of the period average results against the criticism by Sinn (1992) that - due to long-run limitations on foreign indebtedness - period averages tend to bias the saving retention coefficient towards 1.

In order to control for the bias resulting from the business cycle in the use of annual data, the given specification is estimated both with the usual, non adjusted, (table 3) and cyclically adjusted (table 3a) annual data for the five-year periods.[11] For the estimation based on ten-year periods only results without cyclical adjustment are reported.

Table 3: Saving retention coefficients (panel estimation, five-year periods) [12]

	Core EU	Rest of EU	Rest of the World	All countries
1960-1964	0.534***	0.624***	0.792***	0.696***
1965-1969	0.413***	0.628***	0.673***	0.644***
1970-1974	0.327***	0.552***	0.739***	0.642***
1975-1979	0.308***	0.384***	0.669***	0.533***
1980-1984	0.510***	0.509***	0.524***	0.544***
1985-1989	0.364***	0.682***	0.463***	0.520***
1990-1994	0.706***	0.789***	0.530***	0.558***
No. of obs.	30	40	45	115

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.

Table 3b: Saving retention coefficients

[10] While previous studies in general concentrated on cross-country estimations, Vamvakidis and Wacziarg (1998) is another study analyzing panel estimations. This research also controls for fixed effects in this context since country-specific effects might be correlated with the domestic saving rate and thus bias the saving retention coefficient. Vamvakidis and Wacziarg hereby find roughly the same results than in their cross-sectional analysis. The use of this method therefore does not seem to change or even to bias the results. In our analysis, we, however, do not make use of fixed effects in order to avoid further problems of insufficient observation points.

[11] In order to get cyclically adjusted data, a trend variable of the original data was created by use of the Hodrick Prescott Filter of 10. The use of a filter of 10 and not of 100 was motivated by the highly smoothing effect of the filter of 100.

[12] Detailed results can be found in Appendix II Table A4.

(panel estimation based on cyclically adjusted data, five-year periods) [13]

	Core EU	Rest of EU	Rest of the World	All countries
1960-1964	0.566***	0.674***	0.789***	0.710***
1965-1969	0.383***	0.658***	0.742***	0.701***
1970-1974	0.347***	0.646***	0.746***	0.690***
1975-1979	0.418***	0.511***	0.729***	0.627***
1980-1984	0.452***	0.657***	0.523***	0.579***
1985-1989	0.407***	0.786***	0.496***	0.543***
1990-1994	0.667***	0.801**	0.550***	0.570***
no. of obs.	30	40	45	115

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.

Table 4: Saving retention coefficients (panel estimation, ten-year periods) [14]

	Core EU	Rest of EU	Rest of the World	All countries
1960-1969	0.499 ***	0.625 ***	0.732 ***	0.677 ***
1970-1979	0.413 ***	0.455 ***	0.679 ***	0.565 ***
1980-1989	0.428 ***	0.587 ***	0.490 ***	0.530 ***
1990-1996	0.652***	0.715***	0.511***	0.543 ***
no. of obs.	60 (40)	80 (56)	90 (63)	230 (159)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Numbers of observations in brackets relate to time period 1990 - 1996.

These results on the basis of the panel estimation show that the findings according to the original FH period average approach are robust. The panel estimation coefficients for all countries are in fact smaller than the period average estimation coefficients. It seems that the latter actually tend to be biased towards one. But the similarity of the estimation results of tables 1 and 3 as well as tables 2 and 4 proves that cross section time series estimations are not biased by business cycles. Additionally, the fact that the results of tables 3 and 3a are not very different also indicates that cyclical movements do not affect the correlation systematically.

The estimation results again show a tendency to a lower correlation between domestic saving and investment, i.e. increasing capital mobility, from 1960 to 1990. It is also not surprising that for most subperiods the correlation is lower for the European core countries than for the rest of EU or the rest of the world. It is, however, striking that the correlation is increasing again in the 1990s, an effect particularly strong in the European core countries. The consequence is that correlations in the nineties are higher in Europe than in the rest of the world.

[13] Detailed results can be found in Appendix II Table A5.

[14] Detailed results can be found in Appendix II Table A6.

IV. The Role of Current Account Targeting

After the introduction of a single European currency the sustainability of internal current accounts within Euroland ceases to be a restriction for national economic policy. This was different before. Under the EMS regime, due to the potential effects on exchange rates attention was paid to current account developments. Therefore, the presumption is that current account targeting could be the main reason behind the finding of low capital mobility in industrial countries. Current account targeting could also possibly be the explanation for the reversion to a higher correlation between saving and investment in Europe in the nineties. As a consequence of exchange rate turbulences attempts to balance the current account might have been intensified in the nineties. If this presumption is supported by the data, the conclusion for capital mobility within EMU is straightforward: it will increase.

If current account targeting existed, the saving retention coefficient of the private sector should differ from the coefficient of the total economy. More precisely, current account targeting might take place if the mobility of private capital is higher than the one of aggregated domestic capital.[15] This refers to a lower private saving retention coefficient. Bayoumi (1990) using a sample of 10 OECD countries already found a lower correlation for private sector data and concluded that either structural reasons or economic policy must cause this phenomenon.

In order to derive private sector investment and saving, shown in Appendix I Figure 2, general government investment (general government saving) had to be subtracted from total fixed investment (total saving).[16]

As general government sector data were rarely available from 1960 on, regressions start in 1970. Also, the group-specific estimates have to be modified as government data are not available for all 23 countries. Therefore, estimations are run for the core countries of EU (being Germany, Belgium, Denmark and France, as well as Austria from 1975 on and the Netherlands from 1980 on) as well as all countries being 15 altogether (6 core countries plus Australia, Canada, Finland, Japan and UK as well as from 1980 on Italy, Norway, Sweden and USA).

[15] Hereby attention has to be paid to the fact that government investment is not only financed by government saving. As instead government investment often exceed government saving, savings are deprived of the private sector. As a consequence, the correlation of private investment and private saving might a priori be lower than 1.

[16] In the OECD National Accounting System general government saving is defined as general government current receipts minus general government current disbursement. Therefore, general government saving can be negative saving if current disbursement (not including spending on investments) of the government exceeds its returns. Although these OECD data are standardized, country-specific characteristics cannot always be excluded.

Table 5: Saving retention coefficients for private sector data for five-year periods[17]

	CROSS SECTIONAL ESTIMATION BASED ON PERIOD AVERAGES	PANEL ESTIMATION	
	All countries	Core EU	All countries
1970-1974	0.621** (9)	-0.059 (19)	0.627*** (44)
1975-1979	0.384* (10)	0.232** (24)	0.336*** (56)
1980-1984	0.366* (15)	0.288 (30)	0.346*** (75)
1985-1989	0.046 (15)	0.059 (30)	0.021 (75)
1990-1994	0.455** (15)	0.342** (30)	0.264*** (75)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Number of observations is given in brackets.

Table 6: Saving retention coefficients for private sector data for ten-year periods[18]

	CROSS SECTIONAL ESTIMATION BASED ON PERIOD AVERAGES	PANEL ESTIMATION	
	All countries	Core EU	All countries
1970-1979	0.523** (9)	0.098 (46)	0.504*** (100)
1980-1989	0.196 (15)	0.118 (60)	0.147** (150)
1990-1995	0.471** (15)	0.339** (35)	0.248*** (87)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Number of observations is given in brackets.

For private sector investment and saving, saving retention coefficients are systematically lower than for total saving and investment. In the 1980s, coefficients are not significantly different from zero indicating a high degree of capital mobility. These findings suggest that current account targeting has been relevant. Unbalanced current accounts of the private sector tend to be balanced by compensatory government activity. The reversion from high to low capital mobility from the 1980s to the 1990s can, however, also be detected in the private sector data. However, private sector data correlation in the EU core countries is not very different from private sector data correlation regarding all countries while the correlation of total savings and investment was much higher in the EU countries than in the non-EU countries. An explanation for the surprisingly low capital mobility in the first half of the 1990s particularly strong in the EU countries could therefore come from increasing capital account targeting of the EU governments. Such a policy behavior can be due to the higher exchange rate volatility in this period, a hypothesis analyzed in the following section.

[17] Detailed results can be found in Appendix II Table A 7.

[18] Detailed results can be found in Appendix II Table A8.

V. Impact of Exchange Rate Variability and Taxation

With EMU, European monetary integration will change the economic environment concerning exchange rate movements and possibly taxation. By definition nominal exchange rate fluctuations that have influenced economic decisions in the past will be eliminated inside EMU by definition. As this volatility is supposed to have exerted negative impacts e.g. on foreign direct investment and investment abroad, exchange rate stability might increase the international mobility of capital in the future. Therefore, it is important to identify the effect of exchange rate volatility on capital flows in the past. If it actually represented an obstacle to the international mobility of the supply of capital, the increasing capital mobility could play a more important role as a stabilizer in EMU than in the past. The impact of EMU on taxation is of a more indirect nature. It can be expected that the single currency will intensify tax competition which again may speed up tax harmonization. If tax differentials are relevant for the mobility this could be another channel through which EMU affects capital mobility.

The impact of exchange rate volatility and tax differentials on capital mobility is analyzed in the context of an extended FH equation. In order to measure the influence of the economic openness on the saving-investment correlation, FH used a similar extension in their original paper of the following form:

$$(I/Y)_i = \alpha + (\beta_0 + \beta_1 * X_i) * (S/Y)_i$$

with i being the country index.

This statistical specification allows the saving retention coefficient to vary according to the influence of different measures of economic openness X_i.[19] The same econometric approach is used in the following regarding the effect exerted by exchange rate volatility and tax differentiation on capital mobility.

First, the analysis of the influence of exchange rate volatility focuses on the 19 industrialized countries[20] for which data of the external value of their currencies against the other 18 countries has been available from the German Bundesbank. In order to obtain measures of the degree of volatility of these currencies, yearly standard deviations of the monthly percentage changes of each external value against all other 18 countries are constructed. The averaging is based on trade weights. Since this measure focuses on the volatility of each country against all others, only the group of „all countries“ is included in the estimations.

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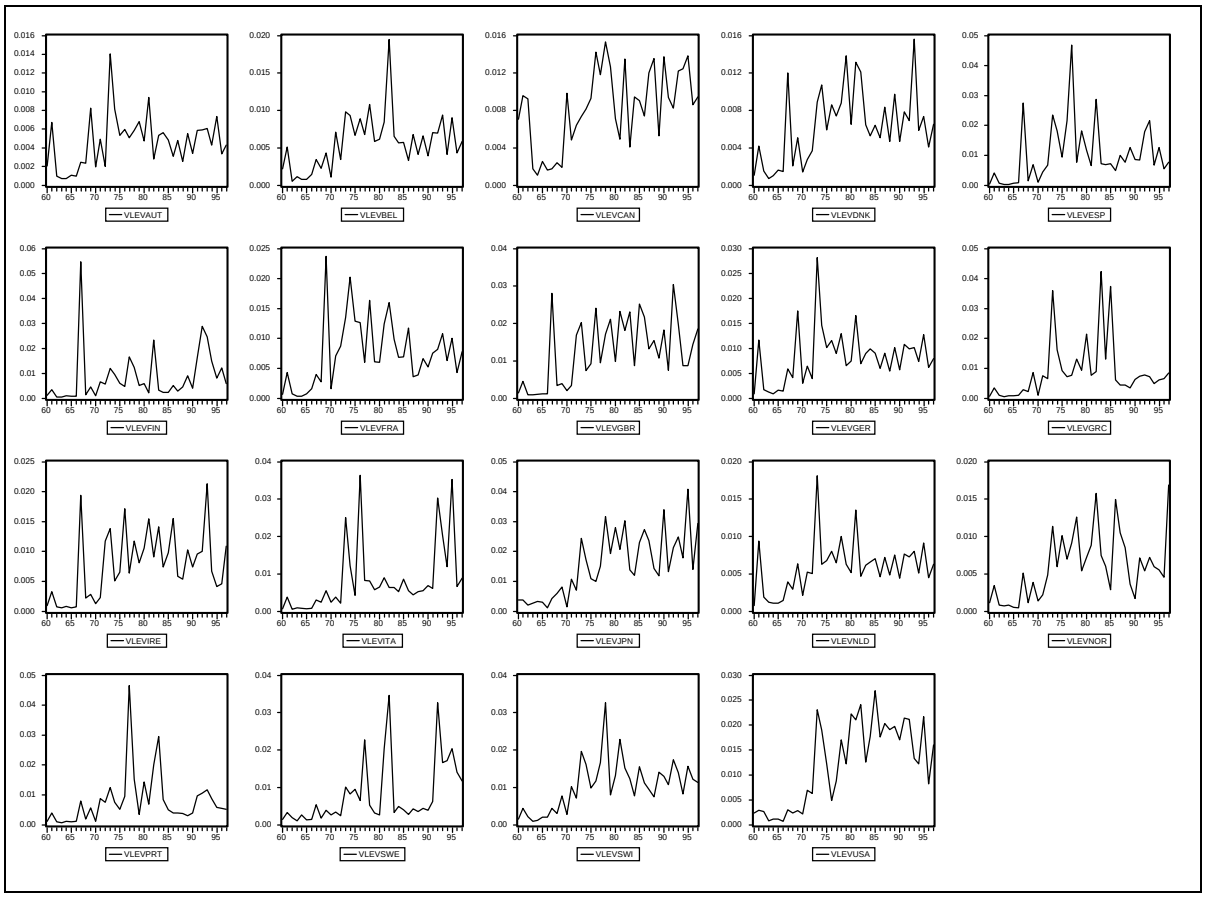
[19] Vamvakidis/Wacziarg (1998) tested for the influence of trade openness with the similar approach. In contrast to FH(1980) they found the openness interaction term to have a significant negative sign.

[20] Australia, Iceland, New Zealand and Turkey could not be included because of lack of data. As a consequence, only 19 countries were entering the group of all countries.

Diagram 5: Yearly volatility measures calculated by the standard deviation of monthly percentage changes of external values of the currencies of 19 industrialized countries, trade weights. Source: German Bundesbank, own calculations.



These yearly volatility indices multiplied by the saving ratios are included as explanatory variables in the regressions[21]:

$$(I/Y)_{it} = \alpha + (\beta_0 + \beta_1 * Vola_{it})*(S/Y)_{it} = \alpha + \beta_0(S/Y)_{it} + \beta_1(Vola * S/Y)_{it}$$

with i the country index and t the time index.

If the volatility interaction β_1 is significant, volatility exerts an influence on the correlation of domestic saving and investment. It should be expected to have a positive sign, since exchange rate volatility should be associated with a decreasing international mobility of capital. Tables 7 and 8 summarize the estimation results for this approach.

Table 7: Saving retention coefficients for

[21] Regarding capital flows and exchange rate volatility, a problem of endogeneity can occur. However, as volatile exchange rate changes are more likely to be induced by short-term financial flows and less by long-term investment flows, this problem should not be present in the following analysis.

five-year periods (panel estimation)[22]

		All Countries
1960-1964	Saving Ratio	0.674***
	Vola*SavR	-0.490
1965-1969	Saving Ratio	0.631***
	Vola*SavR	0.983
1970-1974	Saving Ratio	0.619***
	Vola*SavR	1.096
1975-1979	Saving Ratio	0.532***
	Vola*SavR	0.406
1980-1984	Saving Ratio	0.488***
	Vola*SavR	4.318**
1985-1989	Saving Ratio	0.547***
	Vola*SavR	1.500
1990-1994	Saving Ratio	0.558***
	Vola*SavR	2.493
no.of obs.		95

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.

Table 8: Saving retention coefficients for ten-year periods (panel estimation)[23]

		All Countries
1960-1969	Saving Ratio	0.653***
	Vola*SavR	0.799
1970-1979	Saving Ratio	0.550***
	Vola*SavR	1.259
1980-1989	Saving Ratio	0.506***
	Vola*SavR	3.662***
1990-1996	Saving Ratio	0.545***
	Vola*SavR	2.406*
no. of obs.		190 (131)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Number of observations for time period 90 to 96 given in brackets.

In the five- as well as in the ten-year period panel estimations the expected positive sign of the volatility interaction term can be found in the estimations (with the early sixties the only exception). This effect is statistically significant in the ten-year-panel for the 1980s and 7-year-panel for the 1990s. This supports the view that exchange rate volatility is among the factors relevant for both the low degree and the fluctuations of capital mobility. While in the

[22] Detailed results can be found in Appendix II Table A9.

[23] Detailed results can be found in Appendix II Table A10.

1960s and in part of the 1970s the Bretton Woods system was established and only gradual exchange rate changes took place, the 1980s have been marked by different periods of exchange rate stability and therefore of exchange rate sensitivity. Particularly the decreasing capital mobility in the first half of the 1990s in the EU could partly be caused by the increasing volatility of exchange rates in this period resulting in a stronger current account targeting. This finding backs the optimism that capital mobility will further increase in Europe with the introduction of the Euro.

The results for tax differentials are less conclusive. The basic idea about tax differentials affecting capital mobility is the following: If company taxes vary strongly in different countries, investment is more attractive in those countries with lower tax burdens.[24] Increasing tax harmonization might reduce international mobility of capital insofar this mobility has been motivated by company's reactions to tax differentials.

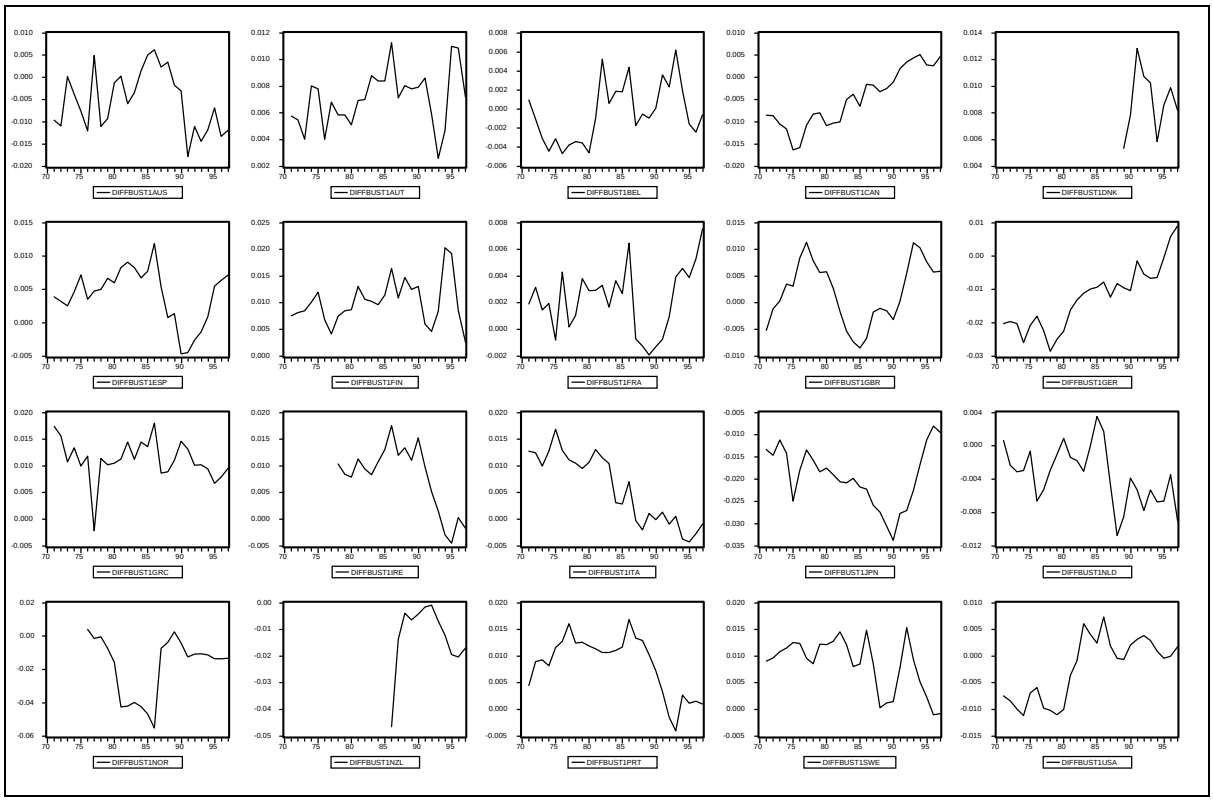
In order to catch the possible effect of differential company taxation on capital mobility, a measure of differential tax burden is constructed. This measure refers to direct business taxes according to the Fiscal Positions and Business Cycles of the OECD. In this data base Iceland, Turkey and Switzerland are not included, therefore the estimations presented below are based only on 20 countries.

As a rough macroeconomic proxy for the relative company tax burden the level of direct business taxes is set in relation to GDP. Since tax differentials are the focus of the analysis, direct business taxes/GDP of each country are subtracted from the OECD average of direct business taxes/GDP (*taxdiff* in the equation below).

If this deviation of a country's company tax burden from the OECD average tax burden was zero for all countries, company tax burdens would be totally harmonized according to this indicator. The absolute deviation from zero can be interpreted as a measure for tax differentiation. The absolute value is used since deviation from OECD average tax burdens can be expected to induce capital mobility for both the case of a burden above average and the case of a burden below average.

[24] Of course, there are other financial burdens such as national insurance contributions which are of relevance as well but which are not included in this analysis.

Diagram 6: OECD average of Direct Business Taxes/GDP minus National Direct Business Taxes/GDP.



Note: A negative (positive) value of the tax differential variable refers to a country-specific tax burden which is above (below) average. Data source: OECD National Accounts, OECD Fiscal Positions and Business Cycles, own calculation.

Since differential company taxation should have an influence on private investment decision and not on government investment behavior, estimations were conducted on the basis of private sector data. The variable is included in the FH equation in the same way as the exchange rate volatility variable above:

$$(I/Y)_{it} = \alpha + (\beta_0 + \beta_1 * | \, taxdiff_{\;it} \, |) * (S/Y)_{it} = \alpha + \beta_0 (S/Y)_{it} + \beta_1 (| \, taxdiff \, | * S/Y)_{\;it}$$

with i the country index and t the time index.

A negative β_1 would be in line with the hypothesis about large tax differentials to increase capital mobility. Tables 9 and 10 summarize the results of the panel estimations based on five- and ten-year periods. The tax-differential interaction with the saving ratio has both negative and positive signs in different periods. Only for the some cases with positive signs this variable is significant. Therefore the empirical results seem to indicate a decreasing effect of tax differentials on capital mobility. Obviously, these results should be interpreted very carefully since the chosen indicator measuring tax differentials might be too highly aggre-

gated. Further, the estimation method might be inadequate as the "autonomous" saving retention coefficient generally looses its significance when introducing the volatility interaction term in the regression.

Apart from this, taxation is only one of a whole range of relevant variables relevant for the profitability of foreign direct investment. As direct investment is a long term decision, it can not easily be modified in the short run when changes in taxation take place. Insufficient tax harmonization might therefore rather have an impact on foreign portfolio investment being more flexible in the short or middle term.

Table 9: Saving retention coefficients for five-year periods (panel estimation, private sector)[25]

		Core EU	All countries
1971-1974	Saving Ratio	-1.585	0.619***
	Tax-Diff*SavR	-8.709 (12)	6.912** (32)
1975-1979	Saving Ratio	0.5143**	0.286**
	Tax-Diff*SavR	-2.337 (22)	1.967 (51)
1980-1984	Saving Ratio	-0.094	0.140
	Tax-Diff*SavR	8.872* (25)	7.057*** (70)
1985-1989	Saving Ratio	0.072	-0.098
	Tax-Diff*SavR	10.931** (26)	7.719*** (71)
1990-1994	Saving Ratio	0.339**	0.143
	Tax-Diff*SavR	-4.558 (30)	9.134*** (75)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Number of observations is given in brackets.

Table 10: Saving retention coefficients for ten-year periods (panel estimation, private sector)[26]

		Core EU	All countries
1971-1979	Saving Ratio	0.374	0.472***
	Tax-Diff*SavR	-0.306 (34)	2.961 (83)
1980-1989	Saving Ratio	0.033	-0.005
	Tax-Diff*SavR	10.157***(51)	7.466*** (141)
1990-1996	Saving Ratio	0.339**	0.136
	Tax-Diff*SavR	0.282 (35)	9.000*** (87)

/**/:** indicating that the coefficient is significant at the 10/5/1 percent level.
Number of observations is given in brackets.

[25] Detailed results can be found in Appendix II Table A11.

[26] Detailed results can be found in Appendix II Table A12.

VI. Conclusion

By definition EMU will increase capital mobility in the sense of equalizing nominal interest rates. The end of the nominal exchange rate risk eliminates exchange rate expectations and a possible exchange rate risk premium as determinants for interest rate differentials. In contrast to interest rate parity related concepts, the FH definition of capital mobility is not directly affected by the introduction of a single currency. However, the question how closely domestic saving and investment are tied together within EMU is important from a stabilization point of view. If the link is very strong, any shock affecting domestic saving capacity immediately influences domestic investment. Therefore, after the loss of the adjustment instrument of a nominal exchange rate, an increasing capital mobility in the FH sense would be particularly desirable.

In order to draw indirect conclusions for capital mobility within EMU the role of current account targeting, exchange rate volatility and tax differentials have been explored in this paper. All three variables probably are affected by EMU. Current accounts will largely lose the character of a political target for national policy-makers. Exchange rate volatility is eliminated within the Eurozone. Finally, tax differentials can be expected to narrow due to intensified tax competition under a single currency.

Behind this background two central results feed the expectation of increasing capital mobility in the FH sense within EMU: Current account targeting seems to have been one reason for low capital mobility. This conclusion can be drawn from the different results of the FH estimation approach for total saving and investment ratios on the one hand and for private sector aggregates on the other hand. Furthermore, there is some evidence that exchange rate volatility had a limiting impact on capital mobility. In particular, exchange rate volatility is helpful to explain the decreasing capital mobility from the 1980s to the 1990s in Europe: This seems at least partly to have been caused by increasing capital account targeting. In contrast to these results the analysis of the impact of tax differentials is inconclusive.

The basic message is the following: After the introduction of the Euro the link between domestic saving and investment will be weakened for EMU member countries. This structural change is good news for the stabilization problem in a monetary union.

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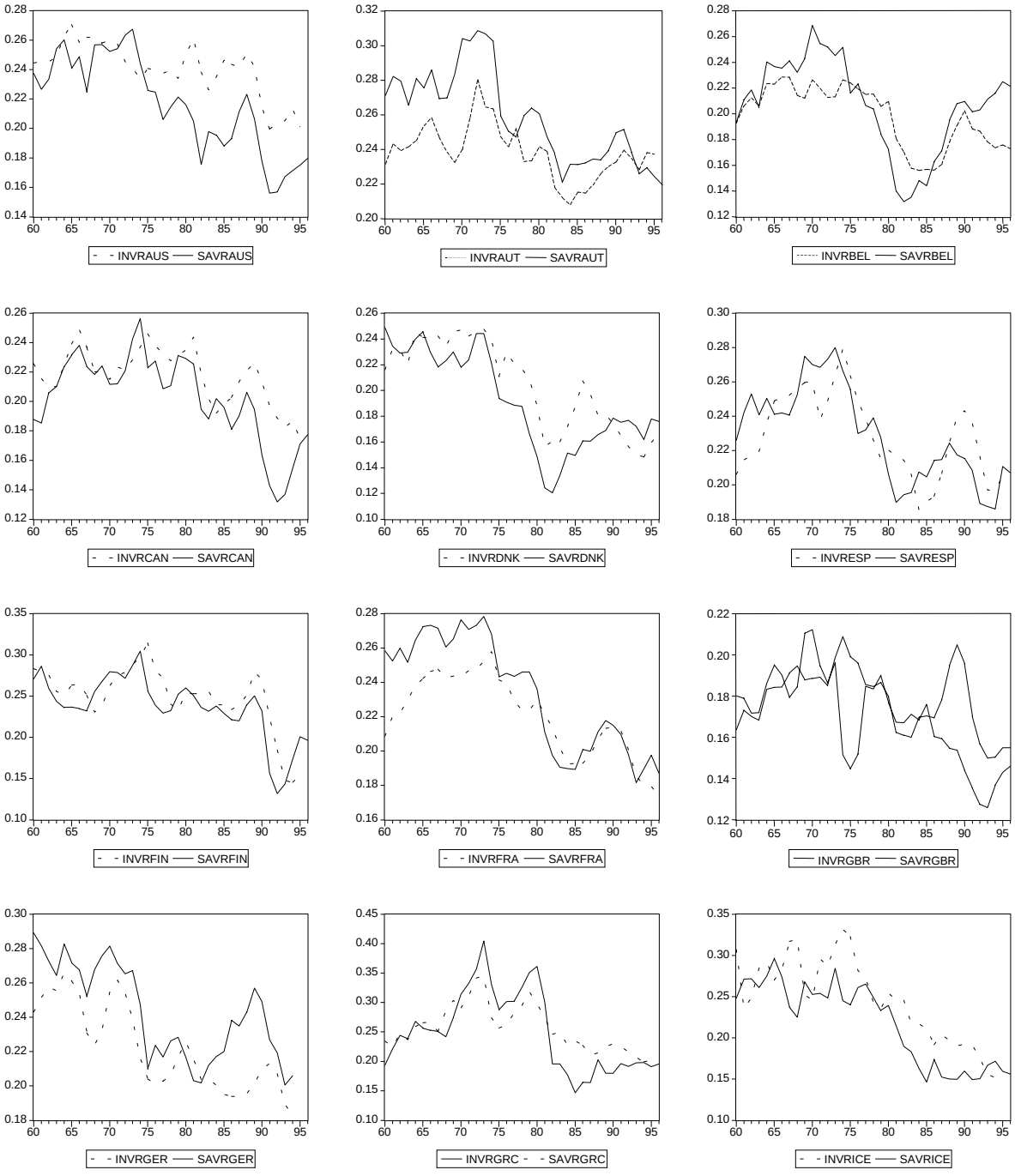
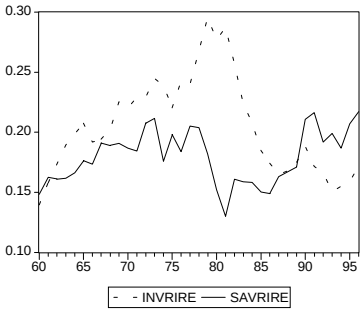
APPENDIX I:

Illustration 1: Gross investment ratio(broken line) and gross saving ratio (thin line)

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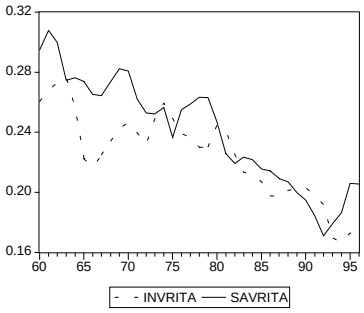
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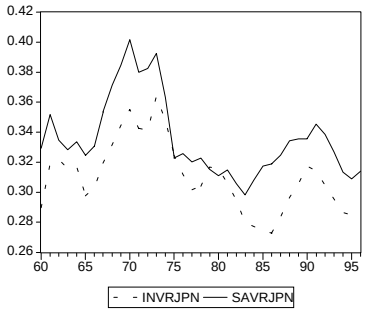
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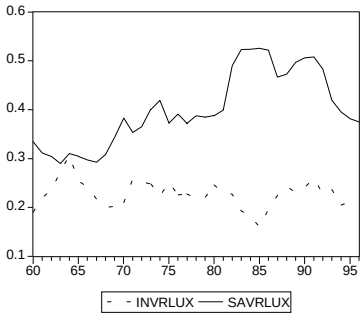
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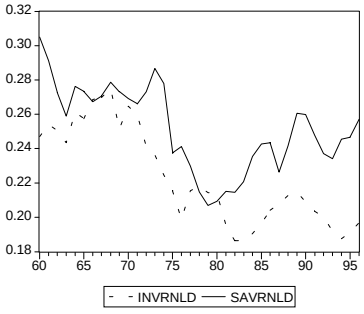
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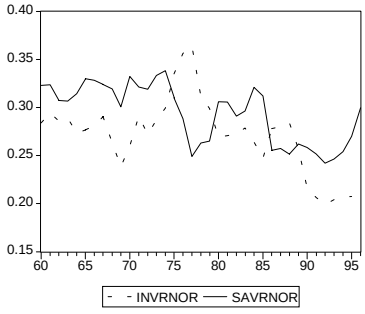
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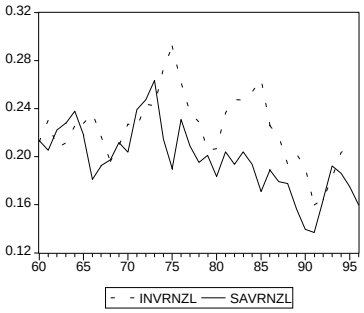
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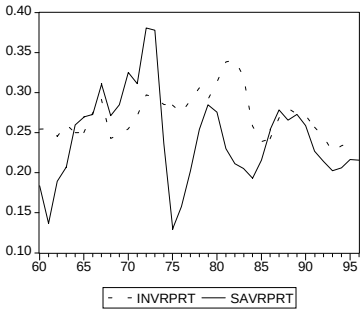
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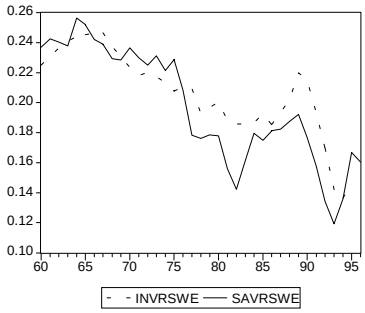
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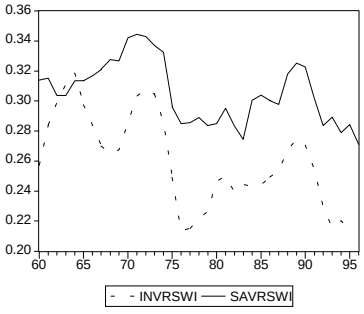
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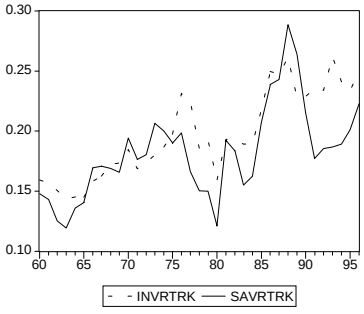
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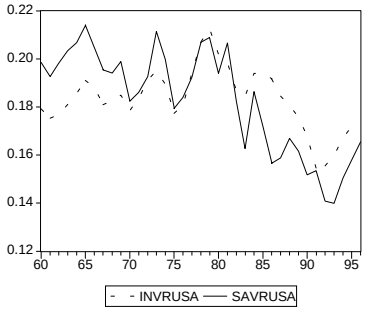
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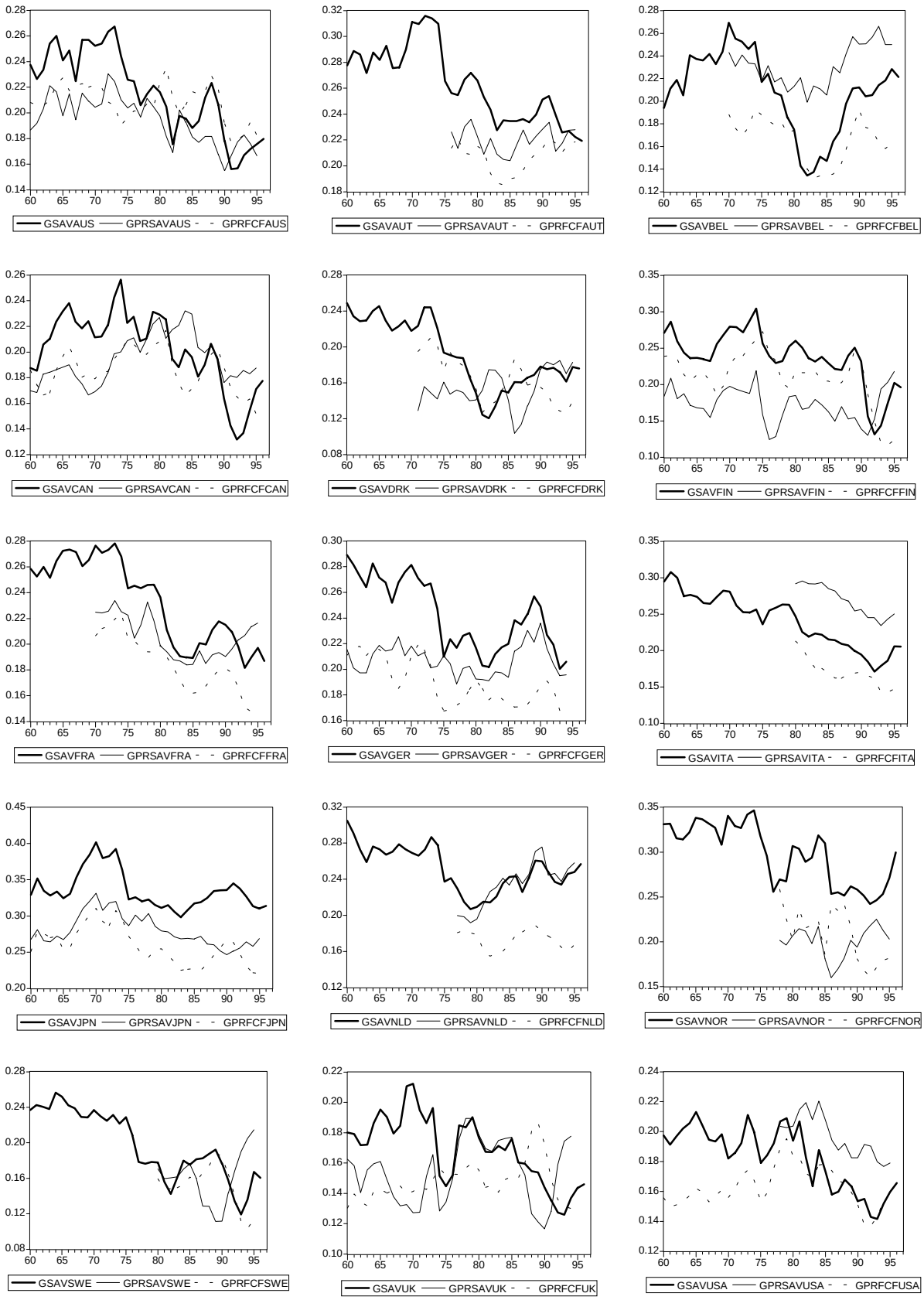
Illustration 2: Gross saving ratios (bold line), gross private saving ratios (thin line) and gross private fixed capital investment ratios (broken line)



APPENDIX II

Table A1: Saving retention coefficients for cross section estimations for each single year for gross total investment and saving data

year	Core countries	All Countries
1960	0.512 (5.758)	0.594 (5.184)
1961	0.541 (4.554)	0.579 (6.462)
1962	0.502 (2.274)	0.751 (9.571)
1963	0.698 (5.605)	0.835 (10.358)
1964	0.567 (2.071)	0.809 (11.604)
1965	0.704 (3.153)	0.691 (8.005)
1966	0.454 (2.089)	0.675 (7.099)
1967	0.366 (1.233)	0.662 (6.063)
1968	0.556 (1.494)	0.591 (4.788)
1969	0.098 (0.296)	0.645 (7.031)
1970	-0.039 (-0.171)	0.587 (7.894)
1971	0.309 (1.163)	0.707 (9.365)
1972	0.751 (2.445)	0.700 (10.072)
1973	0.467 (1.730)	0.713 (9.253)
1974	0.332 (1.110)	0.530 (4.205)
1975	0.590 (2.941)	0.487 (2.823)
1976	0.107 (0.256)	0.480 (2.835)
1977	0.433 (1.427)	0.530 (2.809)
1978	0.208 (1.576)	0.599 (4.623)
1979	0.255 (5.589)	0.580 (4.744)
1980	0.439 (7.852)	0.550 (5.882)
1981	0.581 (4.795)	0.507 (3.457)
1982	0.438 (3.633)	0.558 (3.438)
1983	0.507 (3.857)	0.639 (4.393)
1984	0.432 (3.633)	0.446 (4.058)
1985	0.353	0.337

	(2.513)	(3.148)
1986	0.273 (1.146)	0.503 (4.738)
1987	0.375 (1.579)	0.588 (6.529)
1988	0.441 (2.067)	0.639 (7.459)
1989	0.352 (1.886)	0.535 (6.090)
1990	0.466 (2.399)	0.512 (5.484)
1991	0.733 (3.187)	0.512 (5.179)
1992	0.907 (3.151)	0.529 (5.801)
1993	0.736 (2.028)	0.559 (4.826)
1994	0.664 (1.804)	0.612 (4.768)
1995	0.571 (1.051)	0.561 (4.024)
1996	0.326 (2.958)	0.493 (3.570)
no. of obs.	6	23

(t-values in brackets)

Table A2: Regression results using five-year averages of total investment and saving ratios

time period	variable	Core Countries	Rest of EU	Rest of the World	All Countries
1960-1964	Constant	0.061 (1.605)	0.068 (1.412)	0.045 (2.342)	0.057 (3.194)
	Saving Ratio	0.688 (4.696)	0.711 (3.361)	0.794 (10.645)	0.737 (10.147)
	R^2 adjusted	0.808	0.595	0.934	0.823
	no. Of observ.	6	8	9	23
1965-1969	Constant	0.089 (1.216)	0.078 (1.576)	0.069 (1.983)	0.074 (3.376)
	Saving Ratio	0.606 (2.140)	0.665 (3.240)	0.689 (5.155)	0.674 (7.834)
	R^2 adjusted	0.417	0.576	0.762	0.733
	no. Of observ.	6	8	9	23
1970-1974	Constant	0.094 (1.251)	0.090 (3.511)	0.057 (1.670)	0.070 (3.653)
	Saving Ratio	0.576 (2.060)	0.619 (6.463)	0.739 (5.992)	0.685 (9.685)
	R^2 adjusted	0.394	0.853	0.814	0.808
	no. Of observ.	6	8	9	23
1975-1979	Constant	0.104 (1.663)	0.142 (2.365)	0.090 (1.433)	0.105 (2.996)
	Saving Ratio	0.538 (1.932)	0.456 (1.748)	0.673 (2.600)	0.594 (3.968)
	R^2 adjusted	0.354	0.227	0.419	0.401
	no. Of observ.	6	8	9	23
1980-1984	Constant	0.091 (3.641)	0.099 (1.131)	0.120 (3.802)	0.105 (3.761)
	Saving Ratio	0.564 (40441)	0.662 (4.024)	0.503 (3.703)	0.572 (4.394)

	R^2 adjusted	0.789	0.169	0.614	0.454
	no. Of observ.	6	8	9	23
1985-1989	Constant	0.116 (2.411)	0.067 (1.837)	0.127 (6.492)	0.103 (5.589)
	Saving Ratio	0.398 (1.756)	0.730 (4.024)	0.474 (5.661)	0.539 (6.353)
	R^2 adjusted	0.294	0.685	0.795	0.641
	no. Of observ.	6	8	9	23
1990-1994	Constant	0.020 (0.270)	0.096 (2.044)	0.100 (3.737)	0.091 (4.557)
	Saving Ratio	0.831 (2.362)	0.572 (3.161)	0.547 (4.418)	0.562 (5.777)
	R^2 adjusted	0.478	0.562	0.698	0.595
	no. Of observ.	6	8	9	23

(t-values in brackets)

Table A3: Regression results using ten-year averages of total investment and saving ratios

time	variable	Core Countries	Rest of EU	Rest of World	All Countries
1960-1969	Constant	0.068 (1.464)	0.055 (1.368)	0.064 (2.608)	0.065 (3.962)
	Saving Ratio	0.673 (3.724)	0.766 (4.477)	0.716 (7.483)	0.708 (10.756)
	R^2 adjusted	0.720	0.731	0.873	0.839
	no. of observ.	6	8	9	23
1970-1979	Constant	0.097 (1.600)	0.091 (2.421)	0.080 (2.331)	0.082 (3.833)
	Saving Ratio	0.560 (2.236)	0.646 (4.279)	0.683 (5.110)	0.666 (7.819)
	R^2 adjusted	0.445	0.712	0.758	0.732
	no. of observ.	6	8	9	23
1980-1989	Constant	0.098 (3.086)	0.045 (0.854)	0.134 (5.656)	0.104 (4.949)
	Saving Ratio	0.505 (3.247)	0.886 (3.411)	0.439 (4.284)	0.553 (5.638)
	R^2 adjusted	0.656	0.603	0.684	0.583
	no. of observ.	6	8	9	23
1990-1999	Constant	0.033 (0.394)	0.061 (2.608)	0.110 (3.648)	0.094 (4.152)
	Saving Ratio	0.765 (1.972)	0.707 (2.132)	0.497 (3.550)	0.532 (4.834)
	R^2 adjusted	0.366	0.336	0.592	0.504
	no. of observ.	6	8	9	23

(t-values in brackets)

Table A4: Regression results for five-year periods for total investment and saving ratios (panel estimation)

time period	variable	Core Countries	Rest of EU	Rest of World	All Countries
1960-1964	Constant	0.097 (4.886)	0.088 (4.238)	0.046 (3.766)	0.067 (6.740)
	Saving Ratio	0.534 (6.936)	0.624 (6.901)	0.792 (16.420)	0.696 (17.335)
	R^2 adjusted	0.619	0.545	0.859	0.724
	no. Of observ.	30	40	45	115
1965-1969	Constant	0.136 (4.144)	0.087 (3.755)	0.075 (4.343)	0.081 (7.049)
	Saving Ratio	0.413 (3.253)	0.628 (6.554)	0.673 (10.281)	0.644 (17.267)
	R^2 adjusted	0.248	0.518	0.704	0.640
	no. Of observ.	30	40	45	115
1970-1974	Constant	0.157 (5.064)	0.108 (7.182)	0.058 (3.603)	0.081 (7.761)
	Saving Ratio	0.327 (2.832)	0.552 (9.886)	0.739 (12.665)	0.642 (16.670)
	R^2 adjusted	0.195	0.713	0.784	0.708
	no. Of observ.	30	40	45	115
1975-1979	Constant	0.152 (7.872)	0.158 (6.342)	0.092 (3.368)	0.119 (7.379)
	Saving Ratio	0.315 (3.586)	0.384 (3.562)	0.669 (5.966)	0.533 (7.770)
	R^2 adjusted	0.290	0.231	0.440	0.342
	no. Of observ.	30	40	45	115
1980-1984	Constant	0.099 (8.311)	0.130 (4.250)	0.117 (8.924)	0.111 (9.004)
	Saving Ratio	0.510 (8.417)	0.509 (3.459)	0.524 (9.396)	0.544 (9.557)
	R^2 adjusted	0.707	0.219	0.665	0.442
	no. Of observ.	30	40	45	115
1985-1989	Constant	0.121 (7.721)	0.077 (4.190)	0.130 (11.865)	0.107 (11.619)
	Saving Ratio	0.364 (4.922)	0.682 (7.490)	0.463 (9.912)	0.520 (12.324)
	R^2 adjusted	0.445	0.586	0.688	0.570
	no. Of observ.	30	40	45	115
1990-1994	Constant	0.045 (1.877)	0.053 (2.300)	0.103 (8.319)	0.091 (9.359)
	Saving Ratio	0.706 (6.339)	0.788 (6.233)	0.530 (9.298)	0.558 (11.794)
	R^2 adjusted	0.575	0.492	0.660	0.548
	no. Of observ.	30	40	45	115

(t-values in brackets)

Table A5: Regression results for five-year periods based on cyclically adjusted data for total investment and saving ratios (panel estimation)

time period	variable	Core Countries	Rest of EU	Rest of the World	All countries
1960-1964	Constant	0.089 (5.289)	0.077 (3.753)	0.047 (5.623)	0.063 (7.356))
	Saving Ratio Trend	0.566 (8.696)	0.674 (7.556)	0.789 (24.026)	0.710 (20.358)
	R^2 adjusted	0.720	0.590	0.929	0.784
	no. of observ.	30	40	45	115
1965-1969	Constant	0.145 (5.341)	0.079 (4.900)	0.057 (4.591)	0.066 (7.744)
	Saving Ratio Trend	0.383 (3.688)	0.658 10.059	0.742 (15.782)	0.701 (21.011)
	R^2 adjusted	0.303	0.720	0.849	0.794
	no. of observ.	30	40	45	115
1970-1974	Constant	0.151 (6.443)	0.086 (6.692)	0.059 (4.160)	0.071 (7.671)
	Saving Ratio Trend	0.347 (3.889)	0.646 (13.077)	0.746 (14.261)	0.690 (19.831)
	R^2 adjusted	0.327	0.813	0.821	0.775
	no. of observ.	30	40	45	115
1975-1979	Constant	0.128 (9.790)	0.130 (5.718)	0.075 (3.946)	0.096 (7.477)
	Saving Ratio Trend	0.418 (7.256)	0.511 (5.264)	0.729 (9.500)	0.627 (11.622)
	R^2 adjusted	0.642	0.407	0.669	0.540
	no. of observ.	30	40	45	115
1980-1984	Constant	0.110 (13.610)	0.096 (3.081)	0.118 (9.682)	0.102 (8.845)
	Saving Ratio Trend	0.452 (11.117)	0.656 (4.371)	0.523 (10.035)	0.579 (10.800)
	R^2 adjusted	0.808	0.317	0.694	0.504
	no. of observ.	30	40	45	115
1985-1989	Constant	0.112 (9.377)	0.060 (3.283)	0.121 (16.248)	0.103 (12.635)
	Saving Ratio Trend	0.407 (7.178)	0.786 (8.531)	0.496 (15.316)	0.543 (14.363)
	R^2 adjusted	0.635	0.648	0.841	0.643
	no. of observ.	30	40	45	115
1990-1994	Constant	0.053 (2.269)	0.048 (2.133)	0.098 (9.176)	0.088 (9.921)
	Saving Ratio Trend	0.667 (6.160)	0.801 (6.604)	0.550 (11.230)	0.570 (13.362)
	R^2 adjusted	0.560	0.522	0.740	0.609
	no. of observ.	30	40	45	115

(t-values in brackets)

Table A6: Regression results for ten-year periods for total investment and saving ratios (panel estimation)

time period	variable	Core Countries	Rest of EU	Rest of World	All Countries
1960-1969	Constant	0.110 (6.000)	0.088 (5.851)	0.060 (5.747)	0.073 (9.735)
	Saving Ratio	0.499 (7.028)	0.625 (9.856)	0.732 (18.001)	0.674 (22.581)
	R^2 adjusted	0.451	0.549	0.784	0.690
	no. Of observ.	60	80	90	230
1970-1979	Constant	0.131 (9.797)	0.138 (9.907)	0.082 (5.520)	0.106 (11.843)
	Saving Ratio	0.413 (7.635)	0.455 (8.230)	0.679 (11.907)	0.527 (15.935)
	R^2 adjusted	0.493	0.458	0.613	0.525
	no. Of observ.	60	80	90	230
1980-1989	Constant	0.111 (11.436)	0.105 (5.467)	0.124 (14.814)	0.109 (14.006)
	Saving Ratio	0.428 (8.998)	0.587 (6.253)	0.490 (13.708)	0.530 (14.751)
	R^2 adjusted	0.575	0.325	0.677	0.486
	no. Of observ.	60	80	90	230
1990-1996	Constant	0.056 (2.449)	0.063 (5.625)	0.102 (8.735)	0.089 (9.550)
	Saving Ratio	0.645 (6.118)	0.699 (5.625)	0.527 (9.783)	0.550 (12.123)
	R^2 adjusted	0.489	0.380	0.637	0.503
	no. Of observ.	39	51	55	145

(t-values in brackets)

Table A7: Regression results for five-year periods for private sector data

		PERIOD-AVERAGED DATA	PANEL ESTIMATION	
Time period	variable	All countires	Core EU	All countries
1970-1974	Constant	0.081 (1.935)	0.213 (9.109)	0.079 (4.395)
	Gross Private Saving	0.624 (3.159)	-0.059 (-0.531)	0.327 (7.472)
	R^2 adjusted	0.529	-0.042	0.560
	no. of observ.	9	19	44
1975-1979	Constant	0.121 (2.893)	0.141 (6.844)	0.131 (6.984)
	Gross Private Saving	0.383 (1.916)	0.232 (2.295)	0.336 (3.707)
	R^2 adjusted	0.229	0.157	0.188
	no. of observ.	10	24	56
1980-1984	Constant	0.108 (2.554)	0.111 (2.859)	0.112 (5.870)
	Gross Private Saving	0.366 (1.816)	0.288 (1.478)	0.346 (3.813)
	R^2 adjusted	0.141	0.039	0.155
	no. of observ.	15	30	75
1985-1989	Constant	0.177	0.161	0.182

		(5.276)	(9.422)	(12.189)
	Gross Private Saving	0.046 (0.281)	0.059 (0.717)	0.021 (0.287)
	R^2 adjusted	-0.070	-0.017	-0.013
	no. of observ.	15	30	75
1990-1994	Constant	0.078 (0.283)	0.098 (2.915)	0.117 (5.902)
	Gross Private Saving	0.455 (2.497)	0.342 (2.250)	0.264 (2.741)
	R^2 adjusted	0.272	0.123	0.081
	no. of observ.	15	30	75

(t-values in brackets)

Table A8: Regression results for ten-year periods for private sector data

		PERIOD-AVERAGED DATA	PANEL ESTIMATION	
time period	variable	Core Countries	Core Countries	All Countries
1970-1979	Constant	0.097 (2.228)	0.173 (10.500)	0.100 (7.572)
	Gross Private Saving	0.523 (2.529)	0.098 (1.233)	0.504 (8.005)
	R^2 adjusted	0.403	0.011	0.389
	no. of observ.	9	46	100
1980-1989	Constant	0.145 (3.817)	0.147 (8.671)	0.155 (12.915)
	Gross Private Saving	0.196 (1.061)	0.118 (1.417)	0.147 (2.536)
	R^2 adjusted	0.009	0.017	0.0352
	no. of observ.	15	60	150
1990-1995	Constant	0.073 (1.898)	0.098 (3.046)	0.119 (6.267)
	Gross Private Saving	0.471 (2.540)	0.339 (2.344)	0.248 (2.731)
	R^2 adjusted	0.280	0.117	0.070
	no. of observ.	15	35	87

(t-values in brackets)

Table A9: Regression results for five-year periods for total saving and investment ratios including the Vola*Saving ratio interaction (panel estimation)

time period	variable	All Countries	t-statistics	R^2 adjusted	no. of observ.
1960-1964	Constant	0.071	6.182	0.696	95
	Saving Ratio	0.674	14.404		
	Saving Ratio*Vola	-0.490	-0.119		
1965-1969	Constant	0.081	7.207	0.697	95
	Saving Ratio	0.631	14.683		
	Saving Ratio*Vola	0.983	0.895		
1970-1974	Constant	0.083	8.400	0.780	95
	Saving Ratio	0.619	16.350		
	Saving Ratio*Vola	1.096	1.150		
1975-1979	Constant	0.115	6.352	0.336	95
	Saving Ratio	0.532	6.619		
	Saving Ratio*Vola	0.406	0.222		
1980-1984	Constant	0.109	8.114	0.476	95
	Saving Ratio	0.488	7.323		
	Saving Ratio*Vola	4.318	2.296		
1985-1989	Constant	0.094	9.873	0.649	95
	Saving Ratio	0.547	11.646		
	Saving Ratio*Vola	1.500	0.997		
1990-1994	Constant	0.0821	8.214	0.624	95
	Saving Ratio	0.558	10.873		
	Saving Ratio*Vola	2.493	1.534		

Table A10: Regression results for ten-year periods for total saving and investment ratios including a Vola*Saving ratio interaction (panel estimation)

time period	variable	All Countries	t-statistics	R^2 adjusted	no. of observ.
1960-1969	Constant	0.076	9.483	0.701	190
	Saving Ratio	0.653	20.892		
	Saving Ratio*Vola	0.799	0.714		
1970-1979	Constant	0.105	11.057	0.557	190
	Saving Ratio	0.550	14.260		
	Saving Ratio*Vola	1.259	1.270		
1980-1989	Constant	0.102	12.241	0.542	190
	Saving Ratio	0.506	12.257		
	Saving Ratio*Vola	3.662	3.014		
1990-1996	Constant	0.081	8.461	0.588	120
	Saving Ratio	0.545	11.198		
	Saving Ratio*Vola	2.520	1.921		

Table A11: Regression results for five-year periods for private saving ratio including a tax-differential saving ratio interaction (panel estimation)

GROSS PRIVATE DATA			
time period	variable	Core Countries	All Countries
1971-1974	constant	0.569 (2.156)	0.064 (2.774)
	Saving Ratio	-1.585 (-1.404)	0.620 (5.354)
	Tax-Differential	-8.709 (-1.167)	6.913 (2.063)
	adjusted R^2	0.004	0.631
	no. of obs.	12	32
1975-1979	constant	0.083 (1.634)	0.137 (5.842)
	Saving Ratio	0.514 (2.212)	0.286 (2.337)
	Tax-Differential	-2.337 (-1.284)	1.967 (0.718)
	adjusted R^2	0.295	0.145
	no. of obs.	22	51
1980-1984	constant	0.183 (2.868)	0.142 (7.937)
	Saving Ratio	-0.094 (-0.312)	0.140 81.597)
	Tax-Differential	8.872 (2.071)	7.057 (4.868)
	adjusted R^2	0.130	0.323
	no. of obs.	25	70
1985-1989	constant	0.144 (5.128)	0.194 (13.453)
	Saving Ratio	0.072 (0.546)	-0.098 8-1.367)
	Tax-Differential	10.931 (2.663)	7.716 (5.199)
	adjusted R^2	0.208	0.264
	no. of obs.	26	71
1990-1994	constant	0.104 (2.963)	0.128 (7.057)
	Saving Ratio	0.339 (2.206)	0.143 (1.562)
	Tax-Differential	-4.559 (-0.674)	9.134 (4.205)
	adjusted R^2	0.105	0.252
	no. of obs.	30	75

(t-values in brackets)

Table A12: Regression results for ten-year periods for private saving ratio including a tax-differential saving ratio interaction (panel estimation)

GROSS PRIVATE DATA			
time period	variable	Core Countries	All Countries
1971-1979	constant	0.112 (1.925)	0.099 (5.747)
	Saving Ratio	0.374 (1.439)	0.473 (5.364)
	Tax-Differential	-0.306 (-0.151)	2.961 (1.344)
	adjusted R^2	0.038	0.364
	no. of obs.	34	83
1980-1989	constant	0.154 (6.122)	0.174 (15.364)
	Saving Ratio	0.033 (0.283)	-0.005 (0.093)
	Tax-Differential	10.157 (3.708)	7.466 (7.186)
	adjusted R^2	0.224	0.278
	no. of obs.	51	141
1990-1995	constant	0.098 (2.888)	0.128 (7.334)
	Saving Ratio	0.339 (2.309)	0.136 (1.563)
	Tax-Differential	0.282 (0.045)	9.000 (4.261)
	adjusted R^2	0.089	0.226
	no. of obs.	35	87

(t-values in brackets)