DECLINING HOME BIAS AND THE INCREASE IN INTERNATIONAL RISK SHARING: LESSONS FROM EUROPEAN INTEGRATION

Artis, M J; Hoffmann, M

FILIPPO BALBO - 3294008
Term paper
International Economics and Finance

18/08/2021, Bonn

Introduction

During the middle of 90s there has been a virtual explosion of international crossholding of financial assets and consequently this has brought to a gradual disappearance of portfolio home bias. So, these two factors lead to a more efficient international risk sharing, based on authors opinion.
The authors of the original paper, Artis and Hoffman, have tried to assess to this effect looking at the consumption-based measures of risk sharing. It is used the conventional form of the regression and, after explained the problems in the measure that this classic approach presents, also a different approach developed by them, that is based on the relative levels of consumption and output.
In addition, they also have tried to understand which is the main channel through which the risk is shared following the SWYZ decomposition.
In my work, I've tried to replicate the original paper performed by Artis and Hoffman, but in addition with the challenge of the extension of the time. In fact, firstly I replicated their work and then I tried to extend these analyses until 2009 for OECD countries and until 2012 for EU and EMU countries.
Despite I faced several complications in handling the data, most of the results obtained are statistically significant and coherent with the original paper. Additionally, the new results make way for new development about the understanding the level of international risk sharing and how new factors affect it.

Data

The data used are from Penn World Table, in particular from 2 different database, one from 1960 to 2009 and the second one from 1960 to 2016, that contains data only for European countries.
The countries included into estimation are divided into 3 groups:

- OECD (23 countries) : Canada, US, Japan, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK, Australia, New Zealand.
- EU (15 countries) : Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, UK.
- EMU (12 countries) : Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain.

Specifically, replicating the original paper I used data from the first database to present results until 2004.
Then for OECD countries I will present results of the new period, from 2004 to 2009, even with the first database.
Instead for the EU and EMU countries, the estimated results for the new period, from 2004 to 2012, are produced with data from the second database.
All the data are per capita and in real terms.
I will report results for three subperiods.
The first two subperiods are a replication of the results presented from the authors in the original work. So basically, the first subperiod ranges from 1980 to 1990 and it covers a period in which there was an increase in the liberalization of international capital markets.
The second subperiod reported is the one from 1990 to 2004, and it covers a period in which there has been a huge increase in the international asset position and the authors referred to this one as "Globalization Period".
Instead, the new period estimated by me, the third one, covers the period from 2004 to 2009 for OECD countries and from 2004 to 2012 for EU and EMU countries.
In this new period, I took a couple of choice that probably have influenced in a certain way the results obtained: in particular, managing the database regarding new EU and EMU data, I had to face two problems, one was the choice of a new group of aggregates data, different from the one used for all the other data and the other was about the computation of real term data. In fact, for all the other computation, the aggregates were simple averages of all the countries' data[1], as indicated in the original paper, while the computation of real terms data was already computed using constant price of 2005, as indicated in the database used. For new EU and EMU data I decided to use a pre-computed aggregate of European Union with 15 countries, that I thought it suited to my situation and to compute the real term data I decide to use the deflator of each year, and so dividing the data of each year for the correspondent deflator of that year.
Besides these two issues, that for sure have influenced in a certain way the results, the new period is really interesting to analyse because, from a certain point of view, it allows us to understand the new developments of the international risk sharing, after a period (the second subperiod) in which there have been some strong positive effects that have heavily influenced the risk sharing level, as the evolution and the maturity of the European Monetary Union. But the main reason why this period is interesting is the fact that it covers the financial crisis period and only for EU and EMU also the Sovereign Bond Crisis period.

[1] Called Rest of the World (RoW)

Estimation

The increase in international risk sharing

The financial globalization should have a positive impact on the allocation of consumption risk, allowing the increase on the level of risk sharing thanks to a better openness of the international financial markets.
So, I tried to assess this effect using the basic risk sharing regression with differences. I will present the results in the Table 1, running the following regression:

Basic Risk Sharing regression: $\Delta c_t^k - \Delta c_t^* = constant + \beta_u \left(\Delta y_t^k - \Delta y_t^*\right) + u_t^k$ (1)

In the Table 1 are presented the results for the three mentioned subperiod: 1980-1990, 1990-2004 and 2004-2009/12. The results presented are from simple OLS panel estimation procedure.
On the contrary with the evidence found from the authors, the results that I have obtained from the regressions suggest that there has been a significant increase in risk sharing for all the group of countries from the first to the second subperiod.
Comparing these results with the ones obtained by the authors, there are some differences in the starting point of the estimation of β_u in the first subperiod, because they have obtained lower estimation. Thinking about the possible explanation of that I can suppose that the differences are due to the fact that the database used is an updated version of the one used from the authors and there might be some differences, starting from the constant prices used2.
Going through the third subperiod, an important increase of the β_u coefficient is clear, that means an important decrease of the level of risk sharing. In particular, there is a more pronounced effect on EU and EMU countries, that theoretically should be the group of countries with more risk shared among them.
That can be explained by two main reasons:
The first reason could be found in the source of data, since the results of the third subperiod comes from two different database. In fact, the data for OECD countries comes from the first database, used for the other subperiods too, while the data for EU and EMU countries, from 2004 to 2012, come from the second database, in which the data are different and managed in different way3.
The second reason can be found in the length of the subperiod. In fact, the data for EU and EMU countries cover the period from 2004 to 2012, instead the data for OECD countries cover the period only until 2009.
Two problems have arisen in this situation:
The first one is that the time window analysed is really small because it covers only a period of 5 years and I think the sample is small for a panel OLS estimation, even if the results are statistically significant.
The second problem is due to the fact that a period from 2004 to 2009 may have some difficulties in picking up the effect of financial crisis of 2008, on contrary the data of EU and EMU countries cover a period until 2012, and it make easier to pick up the effect of financial crisis and of the sovereign bond crisis of 2011. This problem could certainly influence the results, affecting heavily and in a negative way the results for EU and EMU countries.
Anyway, in a context of financial crisis, for the third subperiod a decreasing of risk sharing makes absolutely sense, because in a crisis situation I expect a decreasing in the holding of

[2] For example the one used from the authors didn't use constant prices of 2005 to compute real terms data but 1996 international price
[3] As I explained in data section

financial assets and in particular in the international crossholding of financial assets, that are recognized also from the authors as the main determinants of the variability of risk sharing.
In addition, after this first analysis, the authors stressed out a problem with the basic risk sharing regression, because it is sensible to the effects of cross-sectional variability of output growth rates and so it often fails to pick-up long-term changes in risk sharing.

So, to show this problem, following the original paper, I divided the basic risk sharing regression into a sequence of cross-sectional regression at each point during the sample periods (from 1980 to 2000), I run:

Cross-sectional Risk Sharing regressions: $\Delta c_t^k - \Delta c_t^* = constant + \beta_u \left(\Delta y_t^k - \Delta y_t^*\right) + u_t^k$ (2)

Looking to the path of the risk sharing coefficient for the first period considered, from 1980 to 2000, it is evident how the estimation presents a huge volatility. For this reason, I applied an HP-filter in order to better understand the trend of the estimated coefficient. Through the HP-filter is clear how the risk shared among these group of countries is increasing in the period analysed, picking up speed in the trend from 1990. Additionally, it is possible to understand how EU and EMU countries shared more risk than OECD countries, and in general I can say that the results obtained in Table 1 are basically confirmed.
Moving to the second period, from 2000 to 2009/12, is possible to understand an upward trend of the coefficient β_u even through an HP-filter, since also in this period, a very huge volatility is present.
Generally, I can confirm that in this case the evidence found in the Table 1 are confirmed too.
However, the problems raised on the estimation of the Table 1 and the issue about volatility are not solved. These difficulties come from the fact that these estimates are likely to be sensitive to the exact nature of shocks and to the correlation between consumption and output at busyness cycle frequencies.
Given these disturbing problems of volatility, that does not allow me to analyse properly the obtained results, I tried to implement another approach, following the original work.
In fact, the authors implement a more direct approach able to emphasize the low-frequency co-movement of consumption and output and this is possible applying a risk sharing regression in terms of relative levels rather than in relative differences. The authors relied on this estimation also because they think that this level risk sharing regression can pick up longer-term risk sharing. So, I run the following regressions:

Cross-sectional Risk Sharing regression with levels: $c_t^k - c_t^* = constant + \beta_u^{LR}\left(y_t^k - y_t^*\right) + v_t^k$ (3)

As it possible to see, in the above regression there are not the differences as in the previous ones.
Looking the graphs in the Figure 1.1, the ones for the first period, it is clear the potential usefulness of this different approach: long run risk sharing coefficient has a clear downward trend that is clear even without filters. As we would expect, EU and EMU countries has a more pronounced downward path. In particular, there is an evident speed up in the trend of all the three areas after 1990.
Going through the new period estimated, the risk sharing coefficient in the second period, we can see an initial upward trend followed by an important downward trend of the coefficient that highlights a significant increasing in the risk sharing until the 2007/2008 after which the level of risk sharing dropped consistently. As I have already commented for the results of the new period for the Table 1, I suppose that this effect is due to the financial crisis combined with an important decrease in international crossholding of financial assets.

In addition, analysing the figures of OECD countries, is noticeable how the risk sharing coefficient is going to increase from 2008. This allow us to suppose that OECD data are not going to pick up the effect of the crisis because they stopped at 2009, as already stressed out in the previous analysis.

Patterns of international risk sharing

After the first part of the study, in which I have analysed the development of the risk sharing coefficient, I will turn to estimate the level of risk sharing regressions as a panel relation. In this way I have attempted to identify the channels through which the international risk sharing has come about.
Using Asdrubali, Sorensen and Yosha decomposition to the regressions and following the authors approach, I have been able to identify two fundamental channels through which risk sharing can occur. The first one is the capital income flow channel and the second one is accumulation channel or consumption smoothing channel.
The capital income flow channel is determined by countries that have diversified by swapping assets ex ante and so these countries will obtain capital income flow from these assets.
While the consumption smoothing channel is simply characterized by accumulation or decumulation of assets.
So, I measured the role of capital income flow channel by the co-movement of international net factor income flows, given by the difference between GDP and GNP with home GDP fluctuations.

Capital Income flow channel of long run risk sharing: $gdp_t^k - gnp_t^k = \beta_k^{LR} gdp_t^k + u_t^k$ (4)

Where *gdp* and *gnp* denote the idiosyncratic relative component of the logarithm of GDP (output) and GNP (income) in country k:

- $gdp^k = \log (GDP^K - GDP^*) = y_t^k - y_t^*$
- $gnp^k = \log (GNP^K - GNP^*) = inc_t^k - inc_t^*$

Then I measured the contribution of the consumption smoothing channel by the co-movement of the difference between income and consumption, that represent saving or dissaving with consumption, with GDP.

Accumulation / Decumulation smoothing channel: $gnp_t^k - cons_t^k = \beta_C^{LR} gdp_t^k + \xi_t^k$ (5)

Where:

- $cons^k = \log (C^K - C^*) = c_t^k - c_t^*$

So, by construction, the uninsured component of output risk is given by:

- $\beta_u^{LR} = 1 - \beta_K^{LR} - \beta_C^{LR}$

Where basically β_u^{LR} is the coefficient of the above panel version of the level risk sharing regression defined by the regression (3) and which for convenience we reproduce using the compact notation:

- $cons_t^k = \beta_u^{LR} gdp_t^k + v_t^k$ (6)

So, I estimated the three equation (4), (5) and (6) by panel OLS.

To estimate the above equations, I followed the same approach of the authors, except for using normal panel OLS instead of weighted panel OLS, adopting a more simple approach.
In addition, I decided to control only for time fixed effects, because, following the approach of the authors, they stressed out the fact that the heterogeneity of the different countries is interesting from a risk sharing point of view.
I will show the results obtained in the Table 2.
Generally, the results obtained are in line with what I've found from the cross-sectional regressions with levels in the previous figures. From a pretty high level of risk sharing coefficient in the first period, these groups of countries were able to increase the risk shared until a 20% of their initial level. The results obtained in the first two periods are highly statistically significant even if they are slightly different to the ones obtained in the original paper. Specifically, the effects and the tendency are the same, but the starting level of the results and the size of the changes are slightly dissimilar. I think that these outcomes are due to the different methods used. In fact, I used a normal panel OLS rather than a Weighted Panel OLS in two stages as the authors.
Then I want to stress out the results of EU and EMU. As it is possible to notice these countries shared slightly more risk than the OECD countries, even in the first period. This could be due to the elimination of exchange rate risk along with the emergence of a common monetary policy and so they confirm the assumption of the authors.
Anyway, even though all the countries had an increase in the second period in the risk sharing, we can notice that there are not so many differences between the way in which the risk is shared between the countries with the use of the accumulation / decumulation channel as the main one to share the risk, even if EU and EMU have a slightly larger part of risk shared by capital income flows.
Instead in the third period, the new period extended by me, there is still a decreasing of the risk sharing in the EU and Emu countries. I could explain these effects with the same reasons already explained before: the change in the source of data, because I used a different database for the last period of EU and EMU countries and the presence of the effects of Financial Crisis in the data of these two groups of countries.
But since one of the main questions that characterized the issue of this paper is to understand how the risk is shared and which channel is mainly used in these countries among the selected subperiods, I have concluded the research with the analysis of the path of the risk shared among the two identified channel to understand the development of them in the last years, through a cross-sectional level risk sharing regression instead of panel OLS.
Looking the graphs of Figure 2.1, from 1980 to 2000 the risk shared through capital income flow is quite low and this is coherent with the Table 2, but it is possible to notice that there is an expansion on the risk shared through this channel that is visible, even if the filters seem to flatten at the end of the period. Looking the graphs about capital income channel obtained from the authors, there are similar results but with a different smoothing filters. This is due to different magnitude in the obtained results, since their starting point of the trend lines are lower and their levels of β_u until the end of 80s are lower, and this makes the shape of their smoothing filters different, that's more convex.
Instead looking the first set of figures about asset accumulation/decumulation channel in the period 1980-2000, the previous findings are confirmed, and it is clear how this channel was the main channel of risk sharing in this sub-period, even if the curve of β_c seems to have flatten in the second half of 90s.
Rather, going through the new periods, there is an explicit inversion of trend in the graphs in the Figure 2.2.
Considering the results presented in the Table 2 in the sub-period from 2000 to 2009/2012, the result suggested a large decrease of risk sharing, mainly in Europe, however there is an evident

difference in the main channel through which this risk is shared and this is clear from the graphs for EU and EMU countries, in which is possible to notice an upward trend in the use of this channel.
In fact, it is possible to notice a large increase in the risk shared among capital income flows, that basically represent all the risk shared among the European countries.
Instead considering the OECD countries there is an important decreasing in the importance of this channel.
Obviously, at contrary, in the OECD countries for the sub-period 2000-2009 there is an increase in the importance of asset accumulation/decumulation channel even if the trend seems decreasing in 2008, at the beginning of the financial crisis, but unfortunately the data for these countries stopped in 2009. Instead with regard to EU and EMU countries in the sub-period 2000-2012, a downward trend of risk shared among asset accumulation/decumulation is visible, in particular there is an initial upward trend in EU countries that flattened prominently, starting to decrease in 2008 and after a small rebound, it continued to drop again after 2010.
Focusing on EMU countries, the downward trend is more clear. It starts to fall on 2007, year that coincide to the real beginning of financial crisis, then is possible to notice a small rebound around 2010, probably due to a small recovery in the economy, followed by another consistent drop in the trend.
I supposed that the crisis had a large effect in these results and in this shift in the risk sharing channel. In fact, based on the literature explained in the original paper, the asset accumulation/decumulation channel is more sensible to shocks, and so in a financial crisis environment, I can expect that this channel is the most affected one. In fact, I suppose that during one of the most important and tough financial crises of the history like the one of the 2007/2008, the investors were likely to sell as more assets as they could.
That is why the authors have indicated the capital income flow channel as the preferred one, because it tends to be more stable and for a long-term period, so it is less sensible to shock and crises.
Another aspect that I would like to point out is how the EMU countries have been able to share more risk by capital income channel than the other group of countries. In fact, looking the charts in Figure 2.2 of the new period, from 2000 to 2012, it is clear how they have been able to give importance to this channel and how a monetary union and its consequences, like a common monetary policy or the elimination of exchange rate, could help for this aim.

CONCLUSION

International risk sharing has increased from 1990 onwards, mainly in Europe and in the European Monetary Union, even if it seems they have been particularly affected by the financial crises after 2007, comparing with OECD countries. Without considering the already explained data problems, an important drop in the risk sharing in those years is probably due to the correlation among EU and in particular EMU countries, while OECD is a more heterogeneous group of countries. In fact, I could expect that a financial crisis could heavily affect a group of country as EMU, because they are strictly linked between themselves, and so a shock could affect the whole group of countries, which could affect each other, increasing the negative effect of the crisis.

Instead looking another key aspect of the research, the way in which this risk is shared, an important finding is that in the recent years we have found an increase in the importance of the capital income flow as channel.

This is important because, as Blanchard and Giavazzi wrote in their paper, it assure a long run solutions for the country to decouple its savings from its investment, and the main reason because this situation can take place is the elimination of the exchange rate variability, because thanks to this factor, the countries can hold more homogeneous portfolios with less turnover; thanks to that, risk sharing may take place through income flows rather than through continual sale and purchase of assets.

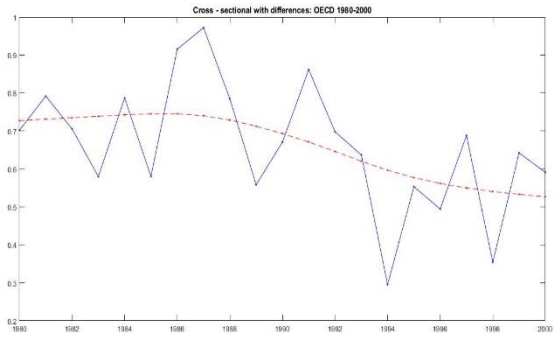
Thinking about the last years, uncovered by my database, I could expect that after 2012, and so in the last decade, the risk sharing has increased for sure, mainly after the countries have recovered their situation from the financial crisis, and that the capital income flows channel is the main channel to share the risk or at least as important as the consumption smoothing one, following the upward trend started in the 90s.

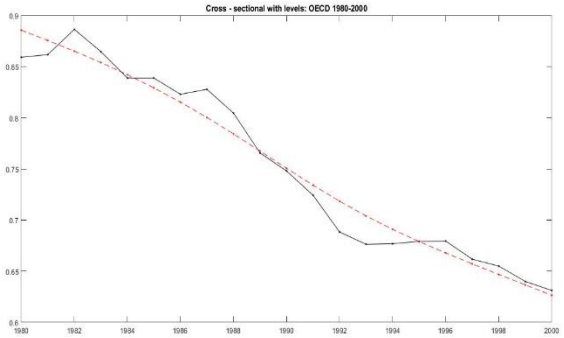
TABLE 1:

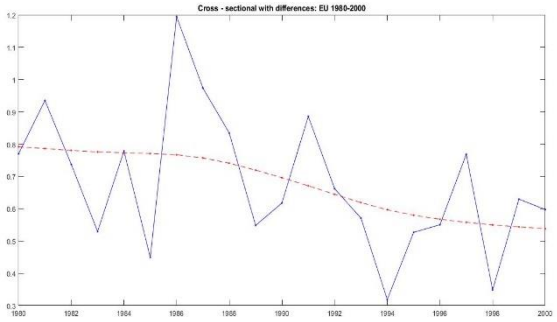
Basic risk sharing regression: $\Delta c_t^k - \Delta c_t^* = constant + \beta_u \left(\Delta y_t^k - \Delta y_t^*\right) + u_t^k$ (1)

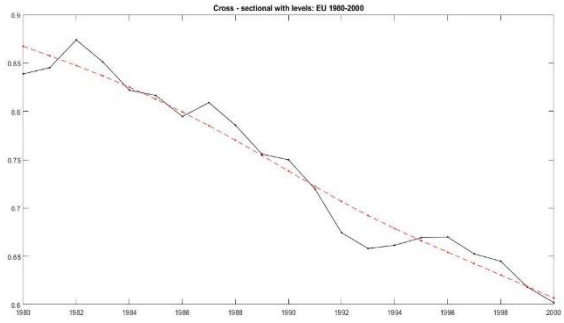
AREA	1980-1990	1990-2004	2004-2009/2012
OECD	0,73 *** *(19,22)*	0,62 *** *(18,18)*	0,73 *** *(9,48)*
EU	0,74 *** *(16,83)*	0,61 *** *(14,50)*	0,82 *** *(16,08)*
EMU	0,74 *** *(14,55)*	0,59 *** *(12,47)*	0,82 *** *(14,43)*

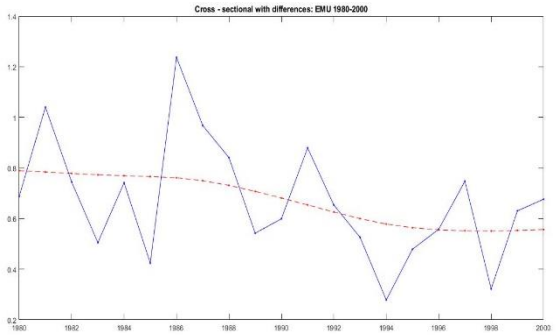
FIGURE 1.1: CROSS SECTIONAL RISK SHARING REGRESSIONS 1980 - 2000











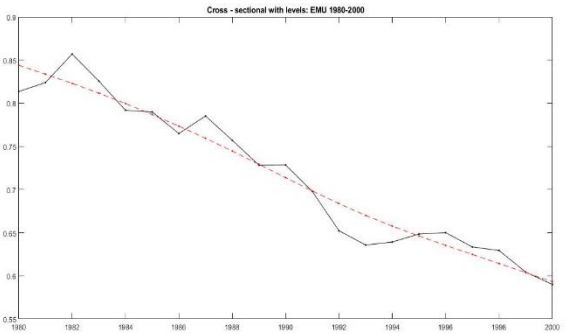
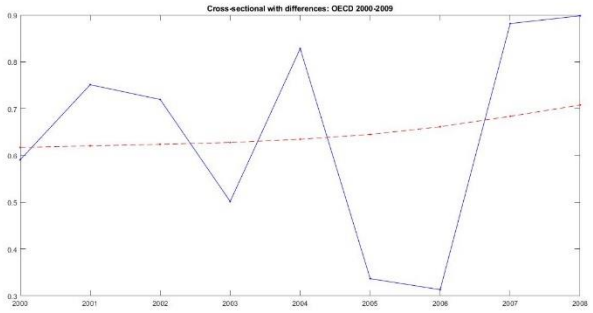
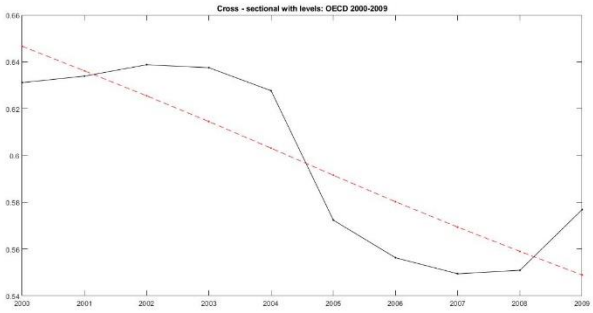
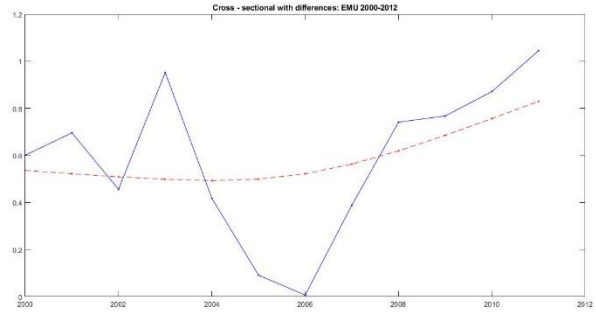
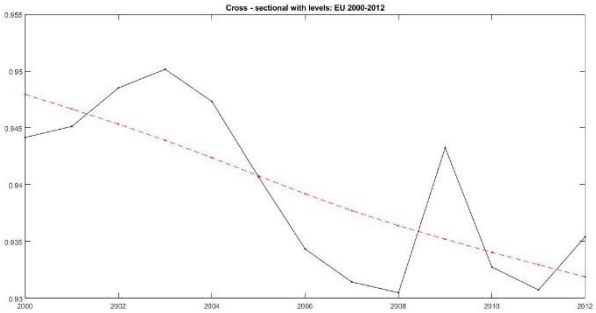


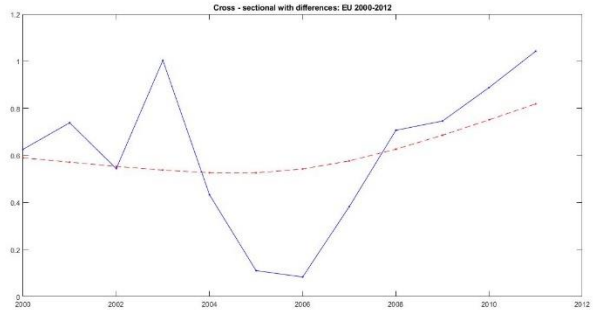
FIGURE 1.2: CROSS SECTIONAL RISK SHARING REGRESSIONS 2000 – 2009/12











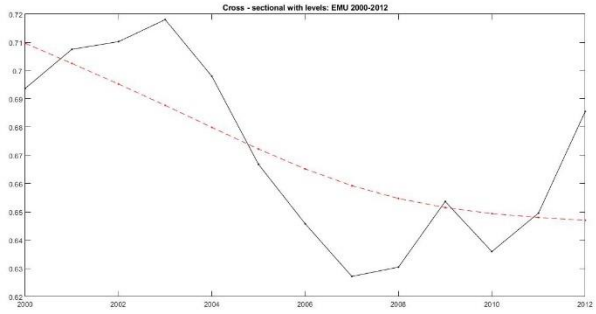


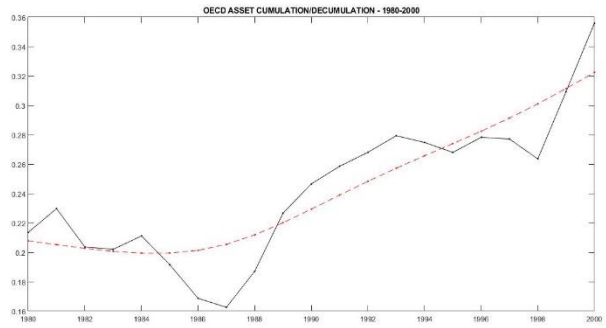
TABLE 2:

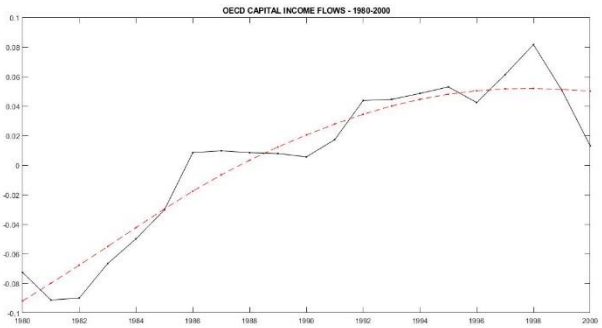
Channels of long-run risk sharing regression: $x_t = const + \beta_X^{LR}\, gdp_t^k + u_t^k$ [4]

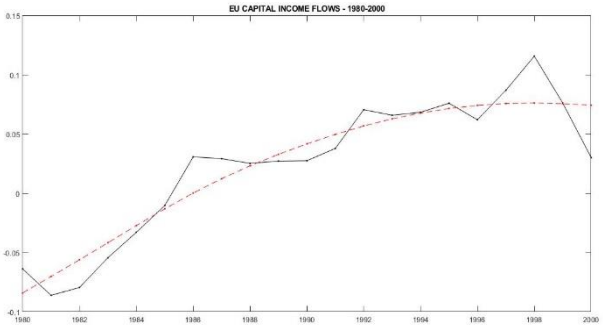
Countries	Channels of Risk Sharing	1980-1990	1990-2004	2004-2009/2012
OECD	β_K^{LR}	-0,03 *** *(-3,41)*	0,04 *** *(4,88)*	-0,005 *(-0,91)*
	β_C^{LR}	0,20 *** *(11,67)*	0,29 *** *(16,79)*	0,43 *** *(14,56)*
	β_U^{LR}	0,83 *** *(45,81)*	0,67 *** *(36,55)*	0,57 *** *(19,009)*
EU	β_K^{LR}	-0,01 *(-1,39)*	0,06 *** *(5,76)*	0,44 *(0,26)*
	β_C^{LR}	0,20 *** *(11,95)*	0,29 *** *(18,40)*	-0,32 * *(-1,76)*
	β_U^{LR}	0,81 *** *(45,51)*	0,65 *** *(38,91)*	0,88 *(0,54)*
EMU	β_K^{LR}	-0,018 *(-1,38)*	0,07 *** *(5,63)*	0,44 *(0,64)*
	β_C^{LR}	0,23 *** *(12,04)*	0,30 *** *(17,58)*	-0,28 *(-0,41)*
	β_U^{LR}	0,79 *** *(37,34)*	0,63 *** *(34,40)*	0,84 *** *(18,03)*

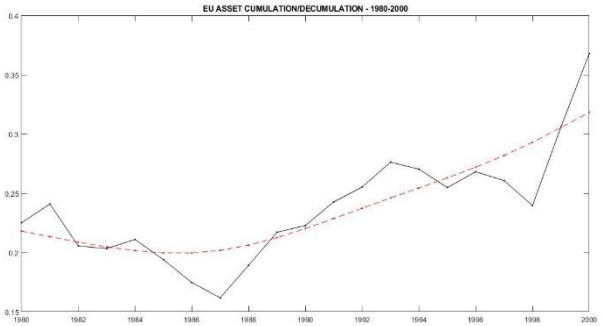
[4] The table reports estimates of the long-run (level) risk sharing regressions for the capital income flow ($x = gdp - gnp, X = K$) and the asset accumulation and decumulation ($x = gnp - cons,\ X = C$) channels as well as for the unsmoothed component $x = cons, X = U$).

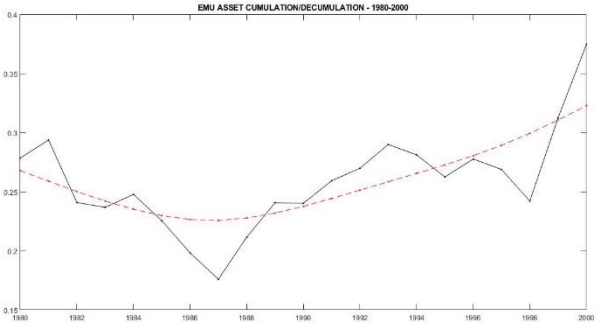
FIGURE 2.1: CROSS-SECTIONAL LEVEL RISK SHARING REGRESSIONS 1980 - 2000











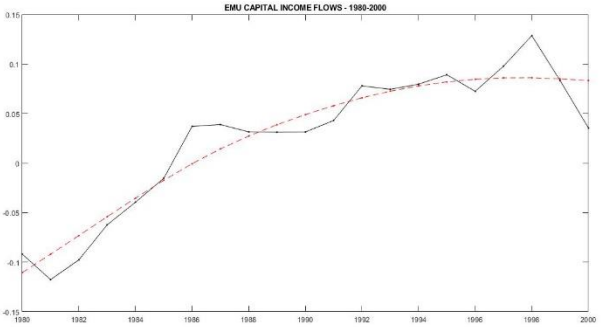
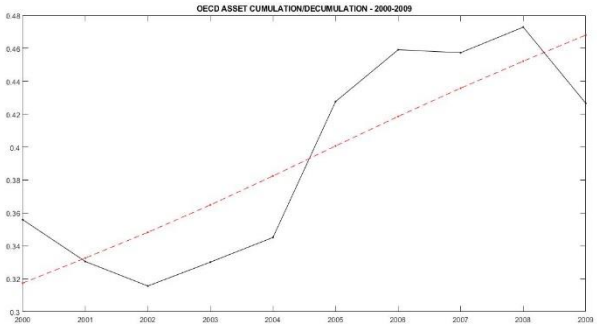
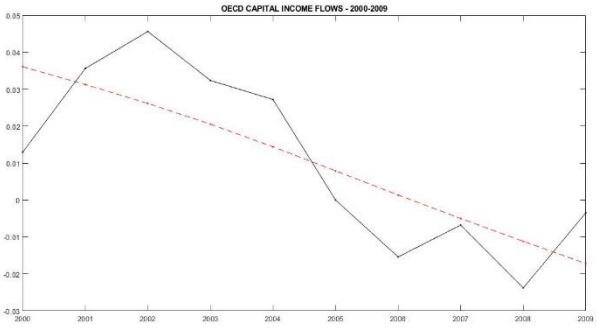
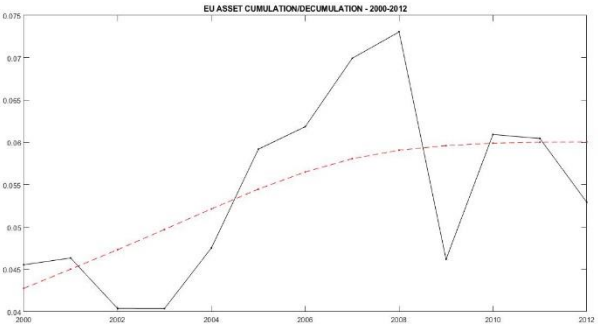
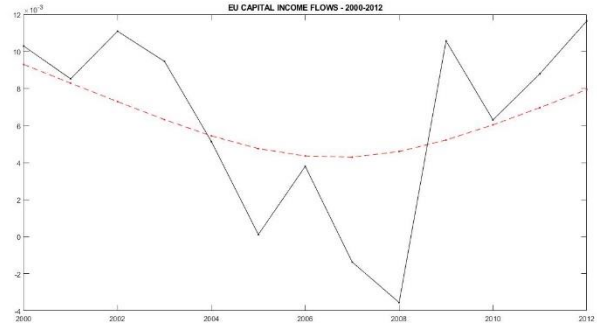


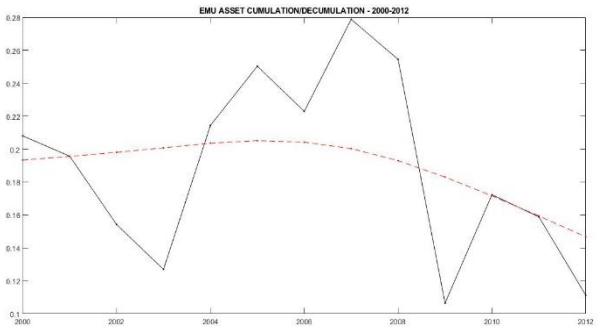
FIGURE 2.2: CROSS-SECTIONAL LEVEL RISK SHARING REGRESSIONS 2000 – 2009/12

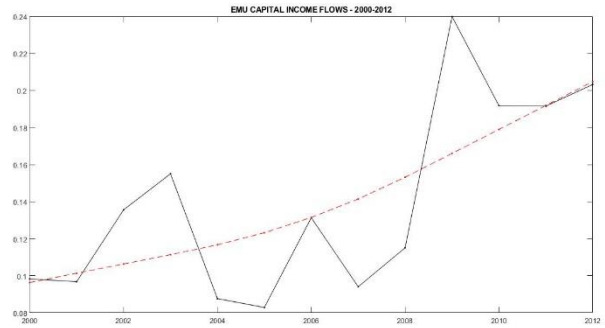












References

Artis, Michael J. and Mathias Hoffmann (2004). "Financial Globalization, International Business Cycles and Consumption Risk"

Asdrubali, P., Sørensen, P. E. and Yosha, O. (1996). "Channels of interstate risk sharing: United States 1963-90"

Blanchard, O. and F.Giavazzi (2002). "Current account deficits in the EuroArea: the end of the Feldstein-Horioka puzzle?"