International Income Risk-Sharing and the Global Financial Crisis of 2008–2009

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Abstract

We examine the impact of the global financial crisis on the degree of international income and consumption risk-sharing among industrial economies using returns on cross-border portfolio holdings (e.g., debt, equity, FDI). We split the returns from the net foreign holdings as receipts (inflows) and payments (outflows) to investigate which of the two sides exhibited the greater resilience for income risk-sharing during the recent crisis. First, we find that debt delivered better risk-sharing than equity, mainly reflecting the deficit deterioration in EMU countries during the post-crisis period. FDI, by contrast, did not correspond to noticeable risk diversification. Second, separating output shocks into positive and negative components reveals that debt holding receipts (equity liability payments) performed better under negative (positive) realizations of the shock variable. Third, the unwinding of capital flows resulted in a sharp fall in income dis-smoothing via the debt liability channel in the new EU countries.

JEL Codes: F36.

Keywords: Financial crisis, international portfolio diversification, income smoothing.

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1 Introduction

The financial crisis and global recession of 2008–2009 was associated with a significant deterioration in economic activity across developed economies. In particular, the crisis has put significant pressure on public finance in several mature economies. Between the end of 2007 and the end of 2010, average budget deficits in OECD countries increased from 1% to 8% of GDP (gross domestic product) and gross government debt rose from 73% to 97% of GDP.[1] This was the outcome of a multitude of factors including the great upheaval in the global financial markets, a general loss of confidence, a dramatic collapse in world international trade and hence a contraction in global output growth.

One particular aspect that played a central role in the ongoing world financial crisis was the deepening of financial globalization, which is typically measured by using a proxy consisting of the ratio of cross-border assets and liabilities (averaged) over GDP.[2] Although, from a historical perspective, financial globalization is not a new phenomenon,[3] the depth and breadth of globalization has been accelerated particularly by the formation of the European monetary union in 1999. As a result, a wider range of financial instruments has created additional investment opportunities allowing investors to spread their income risk. According to Deutsche Bundesbank (2009), total cross-border assets and liabilities documented worldwide amounted to some US$192 trillion at the end of 2007 – reflecting an almost four-fold increase compared with 1999. However, the global financial crises of 2008–2009 abruptly halted this decade-long expansion of the global capital market. According to the McKinsey (2009), the total value of global financial assets fell from $194 trillion in 2007 (equivalent to 343% of world GDP) to $178 trillion by the end of 2008. This decline was the largest compared with the previous economic and financial turmoil seen in 1990–91, 1997–98 and 2000–02.

A growing body of empirical studies has documented that greater financial globalization leads to increased risk-sharing, at least, among industrial countries – see Kose et al. (2007) for a summary of findings of related papers. However, much of these findings are related to an era of financial upturn (fueled by the creation of the European monetary union, EMU), and does not provide a complete picture of the risk exposure during financial market downturn. Indeed,

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[1]See Davies and Ng (2001) for a graphical illustration.

[2]See, among others, Lane and Milessi Ferreti (2007) for an empirical illustration based on this measure. We use the similar measure in this paper. For a list of alternative measures used in the literature see Schmukler (2004).

[3]Bordo et al. (1999) offer a detailed account of the characteristics of the wave of financial globalization before 1914 compared to today's.

"the impact in terms of diversification will be beneficial to the extent that globalization does not lead to an increase of the degree comovement between international stock markets" (Beine et al., 2010, p. 184). This is the so-called *knife-edge* property of the financial markets, whereby financial interconnections serve as a shock absorber (i.e., risk-sharing) within a certain range, but beyond the tipping point, interconnections serve as a shock amplifier (i.e., risk-spreading) – see Tasca and Battiston (2011) for further details. Recent research by Christoffersen et al. (2012) conclude that the benefits of international diversification across both developed and emerging markets have lessened because of a gradual increase in the average correlation of these markets. Moreover, Beine et al. (2010) show that the ongoing globalization process has increased the probability that the two markets will crash simultaneously. Relatedly, Ibragimov et al. (2011) derive conditions under which it may be socially optimal to have financial intermediaries hold less diversified portfolios in order to have a lower probability of widespread collapse. These findings cast doubt on the desirability of international portfolio diversification, particularly during market downturn when investors need diversification benefits most (Vermeulen, 2011).

Although it is still early to reach rock-solid conclusions whether to blame globalization for the severity of the ongoing global financial crisis, interestingly, the spread of the recent financial crisis from the US to other countries was itself an example of international risk-sharing. Indeed, as documented by Mendoza and Quadrini (2010), the impact of the crisis on the US economy has been smaller because the crisis has been shared with other countries. Nonetheless, it was not an example of perfect risk-sharing, as some countries were heavily hit than others. On the other hand, the lack of a fiscal risk-sharing mechanism at the Euro area level has been identified as one of key factors behind the ongoing Eurozone's sovereign debt crisis (Allard, 2011). The global financial and economic crisis of 2008–2009, therefore, marks an opportune time to revisit the issue of international risk-sharing.

In this paper, we study the impact of financial crisis on the degree of international risk-sharing for a set of industrial economies using annual data over the 1999–2009 period. We consider income-based risk-sharing based on gross national income (GNI), which is proxied by "income betas" estimated by the slope of per capita GNI to GDP growth, both taken as deviations from aggregate (or world) levels. We disaggregated the difference between GDP and GNI (i.e., net factor income flows) as the receipts and payments of the portfolio holdings (debt, equity, FDI) to examine (i) which forms of assets delivered better risk-sharing and (ii) whether liability payments provided risk-sharing differently from assets. These issues are evaluated further using

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a shock decomposition of GDP (positive versus negative aggregate shocks) to assess the relative contribution of the risk-sharing channels in light of the financial crisis. We also check the sensitivity of our analysis by estimating the contribution to consumption risk-sharing via factor income flows. In our analysis, the impact of the 2008–2009 financial crisis is captured by simply comparing the results between the 1999–2007 and 1999–2009 periods. Finally, albeit limited by data availability, we perform a similar analysis for the new EU countries and compare them vis-à-vis their EMU counterparts.

The rest of the paper is organized as follows. Section 2 presents the empirical methodology. Section 3 presents the data and empirical results. Section 4 documents risk-sharing among the group of new EU countries. Finally, Section 5 concludes. However, before summarizing the findings of our results, let us take a detour through the recent empirical literature on international risk-sharing.

1.1 Related literature

For brevity, in this sub-section, we summarize the findings of some recent empirical work related to this paper. Our paper is closely related to the category of studies that employ various regression models to measure the extent of risk-sharing and to examine the impact of financial flows on the degree of risk-sharing. Our empirical work has particular relevance for studies that routinely monitor the progress of financial integration in Europe (see, e.g., European Central Bank, 2011).

Sørensen et al. (2007) propose a general framework to examine how financial integration facilitates international risk-sharing. Employing data over the period 1993–2003, they find that larger holdings of foreign assets are associated with better risk-sharing for countries in the European Union (EU) and the Organization for Economic Development and Cooperation (OECD), while foreign liabilities did not yield any noticeable risk-sharing. Somewhat similar results were obtained by Demyanyk et al. (2008), who extended the Sørensen et al. (2007) study using additional data (1995–2006) and more countries. They notice that the effect of diversification on risk-sharing is roughly similar for foreign assets and liabilities. Balli et al. (2011), on the contrary, find that increased holdings of foreign assets caused income dis-smoothing during 2001–2007, the years surrounding the introduction of the Euro. They interpret their result as a consequence of increased business cycle synchronization across EMU and EU countries.

Bracke and Schmitz (2011), using annual data over 1970–2005 for 35 industrial and emerging

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market economies, find that net capital gains behaved in the required countercyclical way (particularly since the mid-1990s) but for only the industrial countries, whereas emerging market economies did not seem to benefit from such risk-sharing. A similar result was obtained by Kose et al. (2009). Employing annual data over the period 1960–2004 for a sample of 69 countries – 21 industrial and 48 developing (of which 21 were emerging economies) – they find that only industrial countries had attained better risk-sharing outcomes during the recent period of globalization, whereas developing countries had, by and large, been shut out of this benefit. These findings suggest that financial globalization has, so far, led to asymmetric benefits globally. Recently, Balli et al. (2012) examine risk-sharing through capital gains for EMU, EU and other OECD countries over the period 1992–2007. They find that risk-sharing from capital gains is higher than risk-sharing from factor income flows, whereas saving remains the most important source of overall international consumption risk-sharing in the Euro area.

Our main finding is that, for risk-sharing through cross-border investments, the factor income inflow channel (the sum of debt, equity and FDI holding receipts) was a better shock absorber than the factor income outflow channel (the sum of debt, equity and FDI liability payments) during the current financial crisis. In the aftermath of the crisis, receipts from debt securities resulted in a more potent channel of income risk-sharing than the receipts of equity securities. However, the increased risk-sharing through debt receipts itself was a by-product of the financial crisis, because to offset the decline in equities, industrial economies increased their debt issuance to stimulate domestic economy. Results are very similar when consumption risk-sharing is considered. Although FDI holdings did not correspond to noticeable income smoothing, it did support higher consumption smoothing in OECD countries in the run-up to the financial crisis. A decomposition of output shocks revealed that debt receipts (equity payments) performed better under negative (positive) output shocks. In the new EU countries, the unwinding of capital flows resulted in a sharp fall in income dis-smoothing via the debt payment liability channel, which appears to be consistent with the switching of their average external balance from deficit to surplus following the intensification of the global financial crisis. Moreover, receipts from debt holdings played a less potent channel of risk-sharing in the new EU countries (compared to their EMU counterparts) under negative output shocks.

2 Methodology

One simple way to analyze income smoothing from internationally diversified portfolios is to look at the difference between a country's GNI and GDP over time. Consider the following identity

$$\text{GNI} = \text{GDP} + r_D A_D - r_F A_F$$

where A_F is the stock of domestic assets owned by foreign residents, r_F is the rate of return on these assets and A_D and r_D are domestically owned foreign assets and the return on those, respectively. The term $r_D A_D - r_F A_F$ is widely known as the net factor income (NFI). If NFI is not perfectly correlated with GDP, the GNI of a country may be less variable than it would be in the absence of international assets, thus partially insulating income streams against the idiosyncratic fluctuations in GDP. Based on this reasoning, Sørensen et al. (2007) propose an empirical framework for testing the extent of international income smoothing using the following panel regression

$$\Delta \log \widetilde{\text{GNI}}_t^i = v_{i,t} + \beta_f \Delta \log \widetilde{\text{GDP}}_t^i + \epsilon_{i,t} \tag{1}$$

where $\Delta \log \widetilde{\text{GDP}}_t^i$ is the annual change in GDP per capita in constant prices minus the union-wide (or aggregate) counterpart ($\Delta \log \text{GDP}_t$), $\Delta \log \widetilde{\text{GNI}}_t^i$ is the annual change in GNI per capita in constant prices minus the aggregate counterpart ($\Delta \log \text{GNI}_t$), and $\nu_{i,t}$ and $\epsilon_{i,t}$ are constant and error terms, respectively. Depending on the occasion, the aggregate variable corresponds either to OECD, EMU or EU member countries. The reason for removing aggregate output fluctuations from country fluctuations is to isolate the smoothable output fluctuations. The slope coefficient β_f measures the average co-movement of a country's idiosyncratic GNI growth (i.e., the deviation from aggregate/union-wide GNI growth) with idiosyncratic GDP growth in year t. The lower the β_f, the higher the income risk-sharing and vice versa. Therefore, the scalar $1 - \beta_f$ measures the amount of income smoothing via net factor income flows. The metric $1 - \beta_f$ will take the value 1 if risk-sharing is perfect and the value zero if GNI moves one-to-one with GDP.

2.1 A decomposition of income smoothing via net factor income

Following Balli et al. (2011), we decompose income smoothing via the NFI channel into factor income *inflows* and factor income *outflows* using following regression specification

$$\Delta \log \widetilde{\mathrm{GDPIN}}^i_t = \nu^+_{f,t} + \beta^+_f \ \Delta \log \widetilde{\mathrm{GDP}}^i_t + \epsilon^+_{i,t} \tag{2}$$

$$\Delta \log \widetilde{\mathrm{GDPOUT}}^i_t = \nu^-_{f,t} + \beta^-_f \Delta \log \widetilde{\mathrm{GDP}}^i_t + \epsilon^-_{i,t} \tag{3}$$

where GDPIN = GDP + FACTOR INCOME INFLOW and GDPOUT = GDP − FACTOR INCOME OUTFLOW. Adding these two equations together yields the following equation

$$\beta_f \approx \beta^+_f + \beta^-_f \tag{4}$$

where β^+_f (β^-_f) is the coefficient of income smoothing via the factor income inflows (outflows) channel.

As NFI in OECD countries is dominated by net revenues from financial assets held abroad, we proceed to disaggregate the NFI into its subcomponents, namely receipts and payments of interest, dividends and retained earnings.[4] To observe the extent of risk-sharing arising from the revenue of these components, we also decompose the NFI into the receipts of interests, dividends and FDI retained earnings from foreign assets as well as payments of interest, dividends and FDI retained earnings to foreign liabilities. Algebraically, NFI is formulated as

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\begin{aligned}
\mathrm{NFI} \quad \approx \quad & \mathrm{INTEREST\ RECEIPTS} + \mathrm{DIVIDEND\ RECEIPTS} \\
+ \quad & \mathrm{RECEIPTS\ ON\ FDI\ REINVESTMENT\ EARNINGS} - \mathrm{INTEREST\ PAYMENTS} \\
- \quad & \mathrm{DIVIDEND\ PAYMENTS} - \mathrm{PAYMENTS\ ON\ FDI\ REINVESTMENT\ EARNINGS}.
\end{aligned}
$$

In order to quantify the amount of risk-sharing from each of the subcomponents, we make use of the following regression specification

$$\Delta \log \left(\widetilde{\mathrm{GDP} + X}\right)^i_t = \nu_{i,t} + \beta_f \ \Delta \log \widetilde{\mathrm{GDP}}^i_t + \epsilon_{i,t} \tag{5}$$

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[4]The remaining items, net tax on imports and net compensation of employees from abroad, are smaller in magnitude compared with the other items and are therefore not considered in the OECD sample. However, for the new EU countries, the contribution of net compensation of employees from abroad is included in the analysis.

where X corresponds to the receipts (payments) of bond, equity and FDI assets (liabilities). For example, to examine the degree of income smoothing via interest revenue from bond holdings (i.e., INTEREST RECEIPTS) we estimate

$$\Delta \log \left(\text{GDP} + \widetilde{\text{INTEREST RECEIPTS}} \right)_t^i = \nu_{i,t} + \beta_f \; \Delta \log \widetilde{\text{GDP}}_t^i + \epsilon_{i,t} \tag{6}$$

where $\Delta \log \left(\text{GDP} + \widetilde{\text{INTEREST RECEIPTS}} \right)_t^i$ is the annual change in GDP plus interest receipts per capita in constant prices minus the union-wide counterpart, $\Delta \log (\text{GDP} + \text{INTEREST RECEIPTS})_t$, and likewise for the other components.

We end the discussion of this section by briefly outlining the econometric methodology employed throughout the paper. To account for autocorrelation in the residuals, we assume that the error terms in each equation/country follow an AR(1) process. Due to the short sample period, we restrict the autocorrelation parameter to be identical across countries/equations. We allow for country-specific variances of the error terms. Following Sørensen and Yosha (1998), the estimation is carried out using a two-step generalized least squares (GLS) procedure: (i) the entire panel is estimated using ordinary least squares (which is equivalent to a seemingly unrelated regression type estimation since the model contains identical regressors) and (ii) residuals from the first step is used to estimate variance for each country and corrected for heteroscedasticity. Unless stated otherwise, we use differenced data at a yearly frequency.

3 Empirical results

3.1 Data and descriptive statistics

We use a dataset for 22 industrial countries with annual data between 1999 and 2009, surrounding the year of the introduction of the Euro. Country selection is essentially driven by data quality and consistency requirement. The sample is divided into several country groups: EMU, EU, new EU and OECD countries – see Table 1 for the complete country list. Our country selection and data coverage are comparable to those of Sørensen et al. (2007), Demyanyk et al. (2008) and Balli et al. (2011). Per capita figures are obtained by normalizing over the population of each country. All series are expressed in real per capita terms. Major variables such as GDP, GNI, factor income inflows and outflows, population and consumer price indices were taken from OECD National Accounts database (volume I). Disaggregated NFI flows, i.e., interest receipts

(payments), dividend receipts (payments) and retained earnings (payments) on FDI were obtained from OECD National Accounts detailed tables (Volume II). In particular, equity receipts (payments) were reported in OECD dataset as the distributed income of corporations which predominantly include dividends received (paid) from (to) foreign equity investments, while debt receipts (payments) simply reflect the interest obtained (paid) on foreign debt holdings.[5] The FDI retained earnings receipts (payments) reflect the distributed income of FDI.

Table 1 displays the descriptive statistics for most variables used. GDP and GNI growth are higher but more variable among new EU countries than those of EMU and OECD countries. The average annual growth rates of most receipt and payment items are relatively larger in size among EMU countries (despite having slightly higher variability) than in the overall OECD aggregate, which would support portfolio flows as a potentially more important channel for the Euro area countries. In both EMU and OECD countries, the return on debt instruments was higher that those of equity and FDI portfolios (as ratios of GDP). This picture is line with the rapid growth of leverage – enabled by the globalization of banking and a period of unusually low interest rates and risk spreads – after 2000 in most mature economies.[6] Among the new EU countries, the larger payment of debt liabilities compared to receipts from debt assets (as ratios of GDP) also appear consistent with their net debtor position, fueled by reduced borrowing costs and the improved creditworthiness, of these economies.[7]

3.2   Income smoothing

How have factor income flows contributed to international risk-sharing in developed economies over the past decade? Did factor income inflows or factor income outflows contribute more to income smoothing? How did the recent global economic and financial crises affect these international risk-sharing channels? A quantitative assessment of these questions is presented in Table 2. Answers to the first question – for which we are able to get a historical picture – is presented in the topmost row in panels A and B, respectively, for EMU and OECD countries. Overall, the results paint a mixed picture for both groups of countries. If we focus on the first three sub-periods (1971–80; 1981–90; 1991–00), we find that NFI flows caused income dis-

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[5]The distributed income of corporations consists of dividends plus withdrawals from the income of quasi-corporations (see OECD Annual National Accounts).

[6]See McKinsey (2010) for an economic assessment of the growth of debt and leverage before the crisis in different countries.

[7]See European Commission (2011) for a collection of papers studying the economic properties of foreign capital flows into new EU economies.

smoothing in OECD countries (indicated by the negative $1 - \beta_f$ coefficient), whereas the impact was more favorable for the EMU countries. One likely interpretation of this difference in results is due to increased home bias in bonds and equity in some non-EMU OECD countries (e.g., Japan, the United States) compared to their EMU counterparts.[8] Since 2000, the contribution of NFI flows to income smoothing has been higher and statistically significant for both groups of nations. However, the asymmetric impact of the global financial crisis on NFI flows in relation to risk-sharing is a key focus of this paper. We find that relative to the 2001–2007 period, during 2001–2009, EMU countries experienced a slight decline in income smoothing via the NFI flows, while the OECD countries as a whole registered a modest increase in income smoothing. Clearly, the non-EMU OECD member nations – including the resource-rich economies of Australia, Canada and Norway – showed stronger resilience than EMU countries during the global financial crisis that has seriously disrupted capital movements around the world.

Turning to the second and third questions posed above, we find that factor income inflows (measured by $1 - \beta_f^+$) provided a buffer against idiosyncratic output shocks during the global financing crisis, which is evident when comparing the results between 2001–2007 and 2001–2009. For EMU countries, the inflow effect (albeit statistically insignificant) was in sharp contrast to the strong income dis-smoothing behavior observed over the 1991–2007 period. A likely explanation is that following the intensification of the global financial crisis in the fall of 2008, investors rapidly sold off their foreign assets to (partially) insulate income from the residual GDP shocks. However, this positive effect was overshadowed by abrupt outflows of capital during the crisis period, as evident from a sharp decline in the contribution from factor income outflows (measured by $1 - \beta_f^-$) during 2001–2009 relative to the 2001–2007 period. The EMU countries have seen a 50% decline in income smoothing via the factor income outflow channel, which explains the similar drop in income smoothing in the OECD countries. This was verified from alternative groupings of the OECD sample, where we have done similar analysis for EU and non-EU OECD countries.[9] Unreported results reveal that income smoothing via factor income outflows actually increased – instead of decreasing, as in EMU countries – during 2001–2009 in both EU and non-EU OECD countries.[10] The effect was much larger for non-EU OECD countries, indicating a 100% increase in income smoothing, coming from a low base. These results highlight the

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[8]See Table 2 in Sørensen et al. (2007) and Table 1 in Balli et al. (2011) for the extent of debt and equity home bias across OECD countries during 1990s and 2000s.

[9]EU includes the EMU plus Denmark, Sweden and the UK. Non-EU OECD includes Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland and the US.

[10]These results are available from the corresponding author on request.

comparative vulnerability of the EMU member nations in the wake of the global financial crisis.

Finally, Figures 1a–d graphically illustrate the results presented above. The year-by-year coefficients are obtained after smoothing the time-variation using a Normal kernel with a bandwidth (standard deviation) of 2. As can be seen, the trends described above are clearly visible. Overall, holdings of both assets and liabilities mattered in international income risk-sharing during the recent global economic crisis. Returns on assets (factor income inflows) provided the needed buffer against output shocks in EMU countries, while liability payments (factor income outflows) helped the non-EU OECD countries to insulate themselves partially from residual output shocks. These effects were, however, far from perfect risk-sharing, as is evident from the rather smaller coefficients of factor income flows.

3.3 The contribution of bonds, equity and FDI

What class of assets underlies the international income risk-sharing documented above? In this section, we provide the relative contribution of the receipts and payments of the bonds (and bank loans), equity and FDI in the international risk-sharing process in OECD countries. We continue to focus on the 1999–2009 period (relative to 1999–2007) to find out the effect of the global financial crisis on international risk-sharing. Table 3 reports the detailed results of each asset category in terms of its receipts, payments and net position. A quick glance at Table 3 suggests that debt assets, which include bonds and bank loans, played a key favorable role in contrast to equity and FDI assets in terms of risk-sharing in the aftermath of the global financial crisis. The results of the disaggregated returns show that debt asset holdings (measured by interest receivables) contributed strongly to risk-sharing, thus making the net contribution from debt positive and significant (particularly for EMU countries). The income dis-smoothing effect of interest payable on debt liabilities can be explained in light of the observed convergence between nominal and real bond returns, especially in the Eurozone and in industrial economies.[11] The results are quite similar, but to a lesser extent, over the pre-crisis period (1999–2007), corroborating the fact that the debt market in general is more predictable/stable than the equity market.

By comparison, (net) returns from equity assets resulted in income dis-smoothing during 1999–2009, contrary to the positive risk-sharing observed during the 1999–2007 period. In the aftermath of the global financial crisis, gains from dividend payments on equity were outweighed

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[11]See, among others, Baele et al. (2004), Balli (2009) and Balli et al. (2010) for empirical evidence on bond yield convergence across the Eurozone.

by the loss in dividend receivables from equity. As dividend payments[12] are roughly proportional to domestic output, it is not surprising to notice positive income smoothing via the equity liability channel. This result provides a good illustration of promoting cross-border equity flows intended for productive use. On the other hand, the observed income dis-smoothing via dividend receipts from foreign equity holdings is likely to have arisen from increased business cycle synchronization among EU/OECD countries, thus making dividend receipts pro-cyclical vis-á-vis domestic output.

Putting all these findings together, the relatively robust performance of debt holdings, compared to equity holding, to hedge fluctuations in output during the current financial crisis appears consistent with the upheaval in the world financial markets. As mentioned in the Introduction, between 2007 and 2008, the value of the world's financial assets declined from a peak of \$194 trillion to \$178 trillion; in which falling equities accounted for virtually all of the drop in global financial assets (McKinsey, 2009).[13] Whilst financial assets declined in nearly every country, some of the worst equity market performers considered in our sample were Austria, Greece and Ireland. In contrast, the market value of private and government debt grew during 2008–2009. The aggregate global debt-to-equity ratio nearly doubled from 124% in 2007 to 244% by the end of 2008 (McKinsey, 2009). However, the rise in debt issuance was itself a by-product of the financial crisis. That is, to offset the decline in equities, countries have launched themselves into debt issuance to recapitalize local banks as well as to stimulate domestic economy fiscally. A possible implication of the reduction in the relative role of equity funding and a rise in debt financing is that GDP growth is slower and more volatile, which, in turn, would undermine future international risk-sharing.

Finally, the lower panel in Table 3 shows that FDI did not correspond to noticeable risk diversification over recent years. Although some evidence of income smoothing via FDI liability was observed in EMU countries during the pre-crisis period, the effect was not statistically significant. Employing a broader sample of mature and emerging market economies but using pre-crisis data, Fratzscher and Imbs (2009) find that FDI or bank loans are associated with lower (consumption) risk-sharing. They point to the higher transaction costs (e.g., the likelihood of expropriation or contract repudiation) associated with FDI and international loans as lying

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[12]More broadly, domestic liabilities which include equity and FDI liabilities, as is often assumed in theoretical models of international risk-sharing.

[13]Together with real estate values, equity assets have erased \$28.8 trillion of household and investor wealth in 2008 and the first half of 2009. To put this in perspective, at the 2008 savings rate (or \$1.6 trillion), it would take 18 consecutive years for world's households to amass \$28.8 trillion. See McKinsey (2009) for further details.

behind the low risk-sharing. However, these costs are likely to be particularly worrisome in countries with poor institutional quality and which are closed to international markets, but less so in mature economies as considered in the present analysis. In summary, the precise magnitude of the gains from FDI holdings remains an open question.

3.4 Income smoothing under asymmetric output shocks

The preceding discussion made no allowance for the distinction between positive and negative output shocks, an omission that could bias the coefficients attached to output, thereby leading to a misinterpretation of the results. For example, when a country is on a positive growth path, it is likely to face more permanent positive shocks compared to negative ones, causing the absolute value of the coefficient attached to positive shocks to inflate. If the economy is fairly well insured against negative shocks, not distinguishing positive shocks from negative shocks might result in lack of recognition of these insurance capabilities (Pierucci and Ventura, 2010). To guard against this possibility, following Pierucci and Ventura (2010), we augment Equation (6) by explicitly distinguishing between the "positive" and "negative" realizations of the GDP shock variable

$$\Delta \log \left(\text{GDP} + \widetilde{\text{INTEREST RECEIPTS}} \right)^i_t = \nu_{f,t} + \beta^+_{f1} \Delta \log \widetilde{\text{GDP}^+_{it}} + \beta^+_{f2} \Delta \log \widetilde{\text{GDP}^-_{it}} + \epsilon_{i,t} \qquad (7)$$

where GDP^+_{it} and GDP^-_{it} are the positive and negative output shocks, respectively. Shock decomposition for other components (equity and FDI) are derived in a similar fashion. We use an output gap process to distinguish between positive and negative realizations of the GDP. Assuming that trend output is the level of output that a country wishes to secure, the negative GDP component is defined as those that correspond to periods with a negative output gap (actual GDP minus trend GDP), and positive GDP components are those corresponding to periods with a positive output gap.[14] This shock decomposition will allow us to capture favourable or unfavourable shocks even when $\Delta \log \text{GDP}_{it}$ is positive at all times, which is generally the case under normal circumstances.

Table 4 displays the results for receipt (payment) of the bonds, equity and FDI assets (liabilities) under asymmetric output shocks over the 1999-2009 period. The overall results are consistent with those of Table 3, confirming that debt assets and equity liability, respectively,

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[14]We use the Hodrick and Prescott (1997) filter to extract the time-varying trend from the original data.

provided countries the ability to cushion the effects of negative and positive output shocks. For example, about 26% of negative income shocks are smoothed by interest received on debt assets in EMU countries, compared with 15% of adverse shocks in the OECD. The magnitude of income smoothing from equity returns is also much higher in EMU (25%) than OECD (5%) when they are hit by a positive shock. As stock market returns generally reflect the country-specific performance of of listed firms, equity returns tend to be positively correlated with the output of the issuing country, which help explains why equity returns provided the buffer when a country's output was hit by a positive shock. In contrast, when a country is hit by a negative shock, its ability to raise fund through stock market diminishes amid weakening growth prospect. As the recent experience of the several peripheral EMU countries show, during economic downturns countries increasingly rely on new sovereign debt issuances – albeit at higher marginal cost – mainly to meet the debt service on the existing stock. Overall, the estimates are somewhat noisy due to the small sample size and to the possible noise in the measurement of output gap. The results, however, offer a tentative picture about the way countries respond to asymmetric economic shocks.

3.5   Consumption smoothing

Although consumption risk sharing is essentially determined by income risk sharing and by patterns of saving; in practice, households care more about smoothing their consumption than income. In this section we quantify the impact of factor income flows on consumption risk sharing in both OECD and EMU countries. The estimation strategy is similar to that of the income smoothing model discussed above. The panel regression equation is specified as

$$\Delta \log \widetilde{(\mathrm{C})}_t^i = \upsilon_c + \beta_c \Delta \log \widetilde{\mathrm{GDP}}_t^i + \epsilon_{i,t} \tag{8}$$

where $\Delta \log \widetilde{(\mathrm{C})}_t^i$ is the difference between country i's per capita final consumption and aggregate per capita final consumption for the group at time t; $\Delta \log \widetilde{(\mathrm{GDP})}_t^i$ is defined as above; υ is a constant and $\epsilon_{i,t}^+$ are error terms. The coefficient β_c measures the average co-movement of a country's idiosyncratic consumption growth with its idiosyncratic GDP growth in year t. The lower the co-movement, the higher amount of consumption is buffered against GDP fluctuations, therefore a lower β_c is expected such that the metric $1 - \beta_c$ measures 'total consumption smoothing.'

In a similar manner, we quantify the effect of the 'factor income inflows' vs. 'factor income outflows' on consumption smoothing using the following regression specification

$$\Delta \log \left(\text{C} - \widetilde{\text{FACTOR INCOME INFLOW}} \right)_t^i = \upsilon_c^+ + \beta_c^+ \Delta \log \widetilde{\text{GDP}}_t^i + \epsilon_{i,t}^+, \qquad (9)$$

and

$$\Delta \log \left(\text{C} + \widetilde{\text{FACTOR INCOME OUTFLOW}} \right)_t^i = \upsilon_c^- + \beta_c^- \Delta \log \widetilde{\text{GDP}}_t^i + \epsilon_{i,t}^-, \qquad (10)$$

where the coefficient β_c^+ (β_c^-) measures the average co-movement of a country's idiosyncratic consumption with factor income inflow (outflow) growth with respect to its idiosyncratic GDP growth in period t; whereas the metric $1 - \beta_c^+$ $(1 - \beta_c^-)$ measures the amount of total consumption smoothing via factor income inflows (outflows).

Table 5 reports the estimation results corresponding to Equations (8)–(10). A first remark is that compared with the extent of income smoothing (see Table 2) the magnitude of consumption smoothing is higher since the latter entails all likely sources of risk-sharing including income, government consumption, precautionary saving, credit rationing and developments in the housing market (see Demyanyk et al., 2008, for further discussion). Second, despite the fluctuations, the citizens of the EMU and OECD countries were able to maintain a surprisingly comparable level of consumption smoothing over the past four decades. In fact, the financial crisis contributed to only a slight drop in consumption risk-sharing in EMU and OECD, which can be seen by comparing the estimated parameters $(1 - \beta_c)$ in the last two columns in Table 5. Further, while factor income outflows (external liabilities) contributed to a 4% increase in consumption smoothing in both regions; factor income inflows (external assets) instead lowered consumption smoothing in EMU countries by 2%. Although the estimates are somewhat noisy due to short samples, there is little doubt that until 2009 the global financial crisis has affected the factor income channel of consumption risk-sharing considerably.

As above, we are able to examine the impact of different asset classes (bonds, equity, FDI) on consumption risk-sharing achieved through factor income flows. This estimation is conducted using the regression model similar to Equation (5)

$$\Delta \log \left(\widetilde{\text{C} - X} \right)_t^i = \upsilon_c + \beta_c^+ \Delta \log \widetilde{\text{GDP}}_t^i + \epsilon_{i,t} \qquad (11)$$

where X corresponds to the receipts (payments) of bond, equity and FDI assets (liabilities) and

are modelled using the same procedure as in Equation (6).[15]

Results are presented in Table 6. The estimated coefficients in the first row of Table 6 – which are obtained by regressing a country's consumption level on its output – are interpreted as the amount of unsmoothed shocks and is seen to have widened more in EMU than OECD in the run-up to the financial crisis. The estimated coefficients of the remaining sub-channels can be interpreted as follows. Recall that, in each sub-channels the dependent variable is obtained by subtracting the receipts (or adding payments) component from consumption and then regressing the transformed item on output, see Equation (11). Hence, for example, an increase in the estimated coefficient in these regressions (relative to that shown in the first row, c) imply a higher correlation between consumption and output, and is therefore interpreted as an increase in consumption risk-sharing. Consistent with the findings above, we find that in both regions interest receipts on debt assets provided a significant amount of consumption smoothing in the run-up to the financial crisis. By contrast, interest payments on debt liabilities resulted in a drop in consumption smoothing by a higher amount in EMU compared with OECD. The net positive impact on consumption risk-sharing from debt assets is thus higher in OECD than EMU. On the other hand, the net contribution from dividend receipts on equity assets in buffering shocks to consumption is identical (6%) in EMU and OECD, where the positive risk-sharing stemmed from returns on equity liabilities than returns on equity assets. Finally, the most highlighted aspect of FDI-supported consumption smoothing is present in OECD countries during the 1999–2009 sample originating from payments to FDI retained earnings.

4   New EU members

The preceding analysis has focused upon the core EMU member countries. The recent enlargement of the European Union by 11 countries mostly Central and Eastern European (CCE) countries (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland, Slovenia and Slovakia) heralds the enlargement of the EMU. Although some CCE countries are still outside the union, the new member states are obliged to join the EMU as soon as they fulfill the Maastricht criteria for monetary, fiscal and exchange rate convergence (Grauwe and Schnabl, 2011). One key aspect of the increased financial integration between old and new

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[15]This is the general model. For the case of payments, e.g., interest payment, we add the item to consumption.

EU members has been the large capital inflows from older to newer economies.[16] During the pre-crisis boom years, large foreign capital inflows into the CCE region not only contributed to a rapid catching-up in many countries, they also led to the build-up of imbalances and variabilities (European Commission, 2011, p. 4). Although, unlike the core EMU and OECD countries, detailed information on the composition of factor income flows are not available for the new EU member countries, we were able to obtain *aggregate* data for receipts on financial assets (including interest receipts, dividend receipts and FDI retained earnings), payments on financial liabilities (including interest payments, dividend payments and FDI retained earning payments) and the sum of net compensation of employees.

Table 7 presents a comparative picture of the new and old EU countries in relation to the various channels of international risk-sharing on the spread of the financial crisis, as captured by comparing results between 1999–2007 and 1999–2009. For the CCE region, we find no change in the contribution of net factor income flows $(1 - \beta_f)$ to income smoothing following the financial crisis, which is rather unsatisfactory when compared to the core EMU countries, who experienced an increase in risk-sharing in times of economic hardship. While receipts on financial assets contributed to a 1% increase in risk-sharing in the new EU countries during the crisis period, this gain is barely comparable with the significant large gain achieved by core EMU countries over the same period. In addition to the size difference (see Table 1), these differing results may have been created by differences in the quality of asset holdings in the two groups of countries. In the CCE region, payments on financial liabilities caused income dis-smoothing, although the effect seemed to have largely dissipated following the financial crisis compared to the pre-crisis samples (1999–2007). The negative smoothing can be interpreted in light of evidence that in the CCE region, a large part of investment financed by capital inflows was directed towards the non-tradable sector, implying a lower contribution to productivity growth and prospective export potential (Jevčák et al., 2010). However, the fall in the amount of dis-smoothing on the spread of the financial crisis is consistent with the sharp change in the net external position of CCE countries vis-à-vis the rest of the world over the 1999–2009 period. During the pre-enlargement period, the average annual external borrowing of the CCE countries (except for Malta and Slovenia) hovered within a relatively narrow range between 5.8% of GDP in 1999 to 6% of GDP in 2003. Following the 2004 enlargement, average external borrowing increased

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[16]Roughly half of the CCE region's gross foreign liabilities was held by Euro-area residents, as their gross claims (excluding financial derivatives) amounted to some € 540 billion at the end of 2008 (Jevčák et al., 2010.)

sharply from 6.7% of GDP in 2005 to 10.6% of GDP in 2007. However, with the intensification of the financial crisis, the average external balance for the CCE region increased from a deficit of almost 9% of GDP in 2008 to a surplus of more than 1% of GDP in 2009.[17] Hence the switching of the CCE's average external balance from deficit to surplus underlies the sharp fall in the contribution of interest payable to risk-sharing as well as the overall decline in income from net financial assets by 50% on the spread of the financial crisis.

Turning to the net compensation of employees,[18] we find that non-resident workers' remittance from abroad provided income dis-smoothing in the CCE region (the results are similar – but in a lesser magnitude – for the core EMU countries). After the EU's enlargement in 2004, unlike the recorded large capital movements, initial migration flows between the new and old EU members were quite modest on average (European Commission, 2006). While Ireland, Sweden and the UK opened access to their labor markets immediately after the EU's enlargement, eight of the core EU countries (Spain, Finland, France, Greece, Portugal, Italy, the Netherlands and Luxembourg) opened their labor market as late as November 2008 – see Kahanec and Zimmermann (2009) for further details. The last row in Table 7 shows that compensation of employees caused income dis-smoothing for both old and new EU countries. This result is probably driven by the pro-cyclicality between output and labor income in new EU countries, which is not surprising, given the higher business cycle synchronization documented between old and new EU countries in recent years. For instance, Savva et al. (2010) find that both new and old EU countries experienced a sizable increase in their business cycle synchronization with the Euro area. Moreover, for some new EU members, the business cycle correlations have changed from negative and small to positive correlations. Comparable results have been found by Darvas and Szapáry (2008), Afonso and Furceri (2007), Kutan and Yigit (2004) and Artis et al. (2004).

Finally, Table 8 presents how each of the international risk-sharing channels fared under asymmetric output shocks. Focusing on the negative output shocks (ΔGDP$^-$), which characterize the current financial crisis, we see that while contribution from financial assets (i.e., interest receivable, dividend receipts and FDI receipts) and debt liabilities (i.e., interest payable, dividend payments and FDI payments) towards income smoothing has marginally declined in the new EU nations, it has noticeably increased in the old EU countries. As suggested above, for the new EU countries, this decline is in line with the substantial capital outflows documented following

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[17]Further details are available in Jevčák et al., (2010).
[18]We use *net* figures, which are adjusted for all remittance outflows from the CCE region.

the financial crisis. However, in the wake of the financial crisis, many core EMU countries issued substantial debt to stabilize the sharply contracting European economy. Following the experience of sizable debt reduction during 1999–2007, the government debt-to-GDP ratio in the Euro area as a whole exceeded the 60% reference value (see Lojsch et al., 2011). Even after controlling for the lower nominal GDP growth – which is the denominator in the debt-to-GDP ratio – the increase in the Euro area's debt ratio reflects how debt deterioration during the period 2008–2010 was due to adopting sizable fiscal stimulus measures. Such countercyclical fiscal policies in the Euro area, which have led to an increased supply of sovereign debt, helped them to address the impact of the financial crisis, at least partially. Interestingly, the estimates of the 'income from net financial assets' before and after the financial crisis remain unchanged in both groups of EU countries. Lastly, the contribution from net compensation of employees played a more favorable role in the new EU nations than in the old members.

5   Conclusions

In this paper, we have examine the extent to which the global financial crisis of 2008–2009 has affected international income risk-sharing across a set of industrial economies comprised of EMU, EU and other OECD countries. Rather than focusing solely on the returns of the cross-border portfolios, we split portfolios into net factor income channel inflows and outflows to investigate which of the two sides delivered the largest insurance against income shocks during the recent crisis. We find that the factor income inflow channel proved to be a better shock absorber than the factor income outflow channel during the current financial crisis. In the aftermath of the crisis, interest receipts from debt securities provided a more potent channel of risk-sharing than the receipts on equity holdings. However, the increased risk-sharing through interest receipts itself was a by-product of the financial crisis, because to offset the decline in the receipts of equity holdings, industrial economies increased their debt issuance to stimulate domestic economy. Results are very similar when consumption risk-sharing is considered. Although FDI holdings did not correspond to noticeable income smoothing, it did support higher consumption smoothing in OECD countries in the run-up to the financial crisis. A decomposition of output shocks revealed that debt assets and equity liability performed better under negative and positive output shocks, respectively. In the new EU countries, the unwinding of capital flows resulted in a sharp fall in income dis-smoothing via the debt liability channel, which appears to be consistent with the

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switching of their average external balance from deficit to surplus following the intensification of the global financial crisis. Moreover, debt portfolios played a less potent channel of risk-sharing in the new EU countries (than in their EMU counterparts) under negative output shocks. The negative income smoothing via the net compensation of employees channel appears to suggest that the intended benefit of labor migration from new to old EU countries following the EU's enlargement was mostly evaporated by the higher business cycle synchronization of output between these two groups of countries.

Figure 1: Risk-sharing via factor income inflows and factor income outflows in selected country groups (percent)
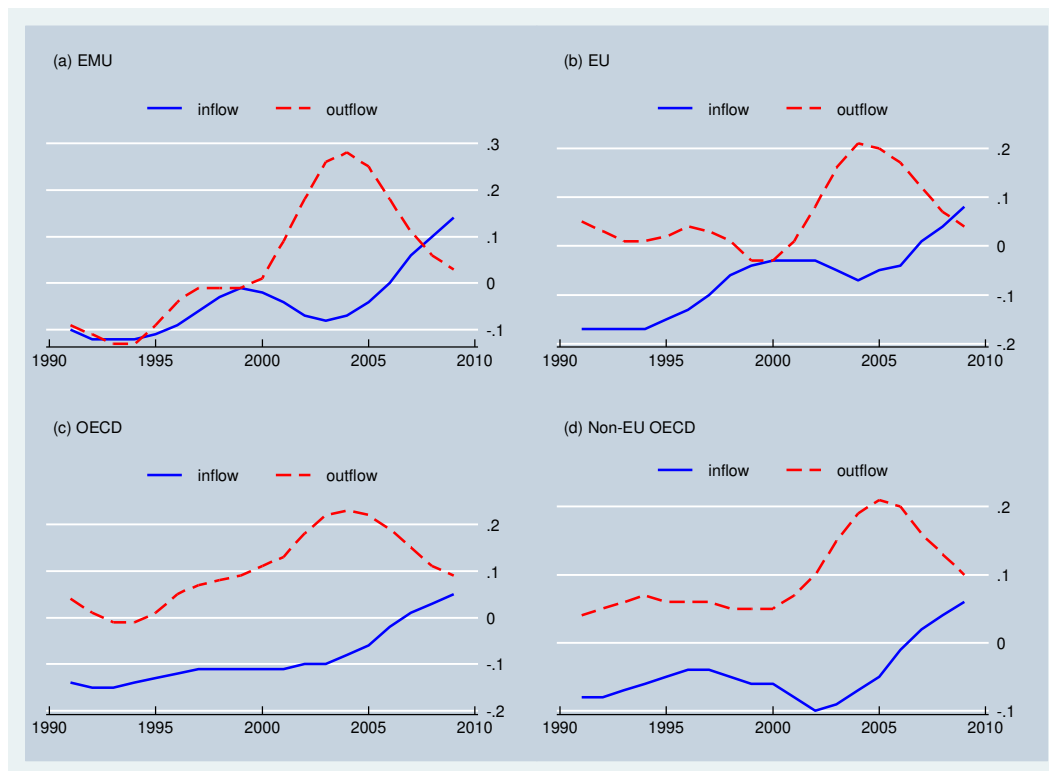
Sample period: 1991–2009. EMU (European Monetary Union); EU (European Union); OECD (Organization for Economic Cooperation and Development). Risk-sharing is estimated cross-sectionally year-by-year and is smoothed by using a Normal kernel with a bandwidth (standard deviation) equal to 2.

Table 1: Descriptive statistics: 1999–2009

	EMU			OECD		
	Mean	Stdev1	Stdev2	Mean	Stdev1	Stdev2
$\Delta \log$ GDP	1.18	1.18	2.38	1.05	0.95	2.25
$\Delta \log$ GNI	1.21	1.67	2.62	1.08	1.18	2.40
$\Delta \log$ (GDP + FACTOR INCOME INFLOW)	2.14	1.98	2.26	2.22	1.88	2.01
$\Delta \log$ (GDP − FACTOR INCOME OUTFLOW)	2.44	2.66	3.38	2.32	2.71	3.01
$\Delta \log$ (GDP + INTEREST RECEIPTS)	1.22	1.36	2.39	1.16	1.05	2.26
$\Delta \log$ (GDP − INTEREST PAYMENTS)	1.15	1.52	1.92	0.98	1.20	1.68
$\Delta \log$ (GDP + DIVIDEND RECEIPTS)	1.36	1.69	2.86	1.28	2.55	2.69
$\Delta \log$ (GDP − DIVIDEND PAYMENTS)	0.94	1.67	2.35	0.81	1.44	2.22
$\Delta \log$ (GDP + RECEIPTS ON FDI RE.E.)	1.15	1.74	2.81	1.01	1.56	2.67
$\Delta \log$ (GDP − PAYMENTS ON FDI RE.E.)	1.19	1.91	2.78	1.08	1.53	2.40
INTEREST RECEIPTS/GDP	5.06	2.73	1.28	6.05	3.45	1.13
INTEREST PAYMENTS/GDP	4.80	3.13	1.18	5.49	3.15	1.13
DIVIDEND RECEIPTS/GDP	2.67	2.32	1.08	2.83	2.71	1.14
DIVIDEND PAYMENTS/GDP	3.19	3.44	1.24	3.17	3.97	1.21
RECEIPTS ON FDI RE.E./GDP	0.79	1.35	0.76	0.93	1.56	0.76
PAYMENTS ON FDI RE.E./GDP	1.04	1.55	1.04	0.75	1.09	0.82
FACTOR INCOME INFLOW/GDP	10.01	6.76	2.30	10.34	6.89	2.25
FACTOR INCOME OUTFLOW/GDP	9.64	5.98	2.19	10.39	6.89	2.14
	New EU countries					
	Mean	Stdev1	Stdev2			
$\Delta \log$ GDP	2.30	2.54	2.23			
$\Delta \log$ GNI	2.43	2.66	3.04			
$\Delta \log$ (GDP + RECEIPTS ON FINANCIAL ASSETS)	2.61	2.99	3.01			
$\Delta \log$ (GDP − PAYMENTS ON FINANCIAL LIABILITIES)	3.52	2.34	2.67			
$\Delta \log$ (GDP + NET COMPENSATION OF EMPLOYEES)	2.44	2.99	3.56			
INTEREST RECEIPTS/GDP	3.55	3.13	3.23			
INTEREST PAYMENTS/GDP	5.67	3.63	4.78			
NET COMPENSATION OF EMPLOYEES/GDP	3.01	3.08	3.71			

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Spain. The OECD sample includes the EMU countries plus Australia, Canada, Denmark, Japan, Korea, New Zealand, Norway, Switzerland, Sweden, the UK and the US. The new EU countries are Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland, Slovenia and Slovakia. FDI RE.E. denotes FDI REINVESTMENT EARNINGS. Stdev1 (cross-section) is the time average of $[(1/n) \sum_i (X_{it} - \bar{X}_t)^2]^{1/2}$ where $\bar{X}_t$ is the period t average of X_{it} across countries and n is the number of countries. Stdev2 (time series) denotes the average across countries of $[(1/T) \sum_t (X_{it} - \bar{X}_i)^2]^{1/2}$ where $\bar{X}_i$ is the time average of X_{it} for country i and T is number of the years in the sample. Means and standard deviations are in percentages.

Table 2: International income smoothing via net factor income and its subcomponents (percent): 1970–2009

	A. EMU				
	1971–1980	1981–1990	1991–2000	2001–2007	2001–2009
$(1 - \beta_f)$	0	0	4	8	7
	(1)	(3)	(3)	(2)	(2)
$(1 - \beta_f^+)$	4	1	-10	-9	3
	(2)	(3)	(3)	(6)	(6)
$(1 - \beta_f^-)$	-3	-2	14	18	9
	(1)	(1)	(7)	(8)	(4)
OBS	110	110	110	77	136
	B. OECD				
	1971–1980	1981–1990	1991–2000	2001–2007	2001–2009
$(1 - \beta_f)$	-2	-5	-2	7	9
	(1)	(2)	(3)	(3)	(3)
$(1 - \beta_f^+)$	-1	0	-5	3	7
	(1)	(1)	(2)	(6)	(2)
$(1 - \beta_f^-)$	-1	-4	4	8	2
	(1)	(2)	(2)	(5)	(2)
OBS	220	220	220	154	198

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain. The OECD sample includes the EMU countries plus Australia, Canada, Denmark, Japan, Korea, New Zealand, Norway, Switzerland, Sweden, the UK and the US. Percentages describe the shocks absorbed at each level of smoothing. Standard errors are in parentheses. OBS denotes number of observations. $(1 - \beta_f)$ is the amount of income smoothing via the net factor income flow channel and the coefficient β_f is the GLS estimation of the slope in the regression of $\Delta \log \widetilde{\mathrm{GNI}}_t^i$ on $\Delta \log \widetilde{\mathrm{GDP}}_t^i$. $(1 - \beta_f^+)$ is the amount of income smoothing via the factor income inflow channel where β_f^+ is the GLS estimation of the slope in the regression of $\Delta \log (\mathrm{GDP} + \mathrm{FACTOR\ INCOME\ INFLOW})_t^i$ on $\Delta \log \widetilde{\mathrm{GDP}}_t^i$. $(1 - \beta_f^-)$ is the amount of income smoothing via the net factor income outflow channel, and the coefficient β_f^- is the GLS estimation of the slope in the regression of $\Delta \log (\mathrm{GDP} - \mathrm{FACTOR\ INCOME\ OUTFLOW})_t^i$ on $\Delta \log \widetilde{\mathrm{GDP}}_t^i$.

Table 3: Smoothing via bonds, equity and foreign direct investment (percent): 1999–2009

	1999–2007		1999–2009	
	EMU	OECD	EMU	OECD
A. Bonds				
INTEREST RECEIPTS	12	0	21	5
	(5)	(4)	(3)	(4)
INTEREST PAYMENTS	-7	-1	-3	-5
	(6)	(5)	(5)	(5)
NET INTEREST RECEIPTS	4	1	13	1
	(2)	(2)	(3)	(2)
B. Equity				
DIVIDEND RECEIPTS	-11	-4	-13	-5
	(5)	(5)	(4)	(3)
DIVIDEND PAYMENTS	18	10	12	3
	(6)	(5)	(7)	(4)
NET DIVIDEND RECEIPTS	7	3	-3	-2
	(3)	(4)	(7)	(4)
C. Foreign direct investment (FDI)				
RECEIPTS ON FDI RE.E.	-1	-2	-1	-2
	(4)	(3)	(5)	(3)
PAYMENTS ON FDI RE.E.	6	1	0	0
	(5)	(4)	(6)	(4)
NET REC. ON FDI RE.E.	2	-1	-2	-1
	(6)	(6)	(7)	(3)

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The OECD sample includes the EMU countries plus Canada, Japan, Korea, Norway, Switzerland and the US. FDI RE.E. denotes FDI REINVESTMENT EARNINGS. Standard errors are in parentheses. Income smoothing via interest receipts is the slope of the regression of $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + X)^i$ on $\Delta \log \text{GDP}^i$, where X corresponds to a specific component reported in the table.

Table 4: Smoothing via bonds, equity and foreign direct investment under asymmetric output shocks (percent): 1999–2009

	EMU		OECD	
	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$
		A. Bonds		
INTEREST RECEIPTS	6	26	1	15
	(12)	(6)	(14)	(5)
INTEREST PAYMENTS	2	-6	3	-6
	(11)	(6)	(14)	(6)
NET INTEREST RECEIPTS	0	16	4	6
	(8)	(4)	(6)	(2)
		B. Equity		
DIVIDEND RECEIPTS	-19	-11	-13	-7
	(9)	(6)	(8)	(4)
DIVIDEND PAYMENTS	25	8	5	-4
	(10)	(9)	(9)	(5)
NET DIVIDEND RECEIPTS	-2	-6	-2	-2
	(13)	(8)	(11)	(9)
		C. Foreign direct investment (FDI)		
RECEIPTS ON FDI RE.E.	10	-5	1	-4
	(11)	(7)	(9)	(5)
PAYMENTS ON FDI RE.E.	-3	-3	-7	-2
	(12)	(7)	(11)	(6)
NET REC. ON FDI RE.E.	6	-5	-1	-5
	(11)	(6)	(11)	(6)

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The OECD sample includes the EMU countries plus Canada, Japan, Korea, Norway, Switzerland and the US. FDI RE.E. denotes FDI REINVESTMENT EARNINGS. Standard errors are in parentheses. Income smoothing via interest receipts is the slope of the regression of $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + X)^i$ on $\Delta \log \widetilde{\text{GDP}}^+_{it}$ and $\Delta \log \widetilde{\text{GDP}}^-_{it}$, where X corresponds to a specific component reported in the table.

Table 5: Consumption smoothing via net factor income and its subcomponents (percent)

	1971–1980	1981–1990	1991–2000	2001–2009	2001-2007
	Panel A: EMU				
$(1 - \beta_c)$	64	55	59	58	61
	(10)	(10)	(11)	(12)	(11)
$(1 - \beta_c^+)$	60	53	62	62	64
	(11)	(10)	(10)	(10)	(11)
$(1 - \beta_c^-)$	60	55	60	66	62
	(12)	(11)	(10)	(11)	(10)
	Panel B: OECD				
	1971–1980	1981–1990	1991–2000	2001–2009	2001-2007
$(1 - \beta_c)$	61	55	54	58	62
	(12)	(9)	(8)	(8)	(9)
$(1 - \beta_c^+)$	60	58	61	64	60
	(10)	(12)	(10)	(10)	(11)
$(1 - \beta_c^-)$	60	59	62	67	63
	(11)	(11)	(12)	(10)	(12)

The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The OECD sample includes the EMU countries plus Canada, Japan, Korea, Norway, Switzerland and the US. Percentages describe the shocks absorbed at each level of smoothing. Standard errors are in parentheses. $(1 - \beta_c)$ is the amount of consumption smoothing via factor income flow channel where the coefficient β_c is the GLS estimate of the slope in the regression of $\Delta \log \widetilde{c}_t^i$ on $\Delta \log \widetilde{\text{GDP}}_t^i$. $(1 - \beta_c^+)$ is the amount of consumption smoothing via factor income inflow channel where the coefficient β_c^+ is the GLS estimate of the slope in the regression of $\Delta \log (\text{C} - \text{FACTOR INCOME INFLOW})_t^i$ on $\Delta \log \widetilde{\text{GDP}}_t^i$. $(1 - \beta_c^-)$ is the amount of income smoothing via factor income outflow channel where the coefficient β_c^- is the GLS estimate of the slope in the regression of $\Delta \log (\text{C} - \text{FACTOR INCOME OUTFLOW})_t^i$ on $\Delta \log \widetilde{\text{GDP}}_t^i$

Table 6: Consumption Smoothing via bonds, equity and foreign direct investment (percent): 1999–2009

	1999–2007		1999–2009	
	EMU	OECD	EMU	OECD
C	46	61	54	64
	(10)	(8)	(2)	(6)
	A. Bonds			
INTEREST RECEIPTS	62	73	70	78
	(12)	(10)	(11)	(10)
INTEREST PAYMENTS	46	58	49	63
	(11)	(8)	(8)	(11)
NET INTEREST RECEIPTS	55	65	58	72
	(10)	(9)	(10)	(12)
	B. Equity			
DIVIDEND RECEIPTS	46	60	47	60
	(12)	(9)	(11)	(10)
DIVIDEND PAYMENTS	51	68	63	72
	(9)	(7)	(7)	(10)
NET DIVIDEND RECEIPTS	44	64	60	70
	(10)	(8)	(9)	(8)
	C. Foreign direct investment (FDI)			
RECEIPTS ON FDI RE.E.	47	63	54	65
	(10)	(5)	(11)	(10)
PAYMENTS ON FDI RE.E.	49	67	55	71
	(10)	(5)	(9)	(11)
NET REC. ON FDI RE.E.	48	66	56	65
	(10)	(5)	(11)	(11)

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The OECD sample includes the EMU countries plus Canada, Japan, Korea, Norway, Switzerland and the US. Percentages describe the shocks absorbed at each level of smoothing. Standard errors are in parentheses. FDI RE.E. denotes FDI REINVESTMENT EARNINGS. Standard errors are in parentheses. Consumption smoothing via factor income component is the slope of the regression of $\Delta \log(\text{C} - X)^i$ on $\Delta \log \text{GDP}^i$, where X corresponds to a specific component reported in the table.

Table 7: Smoothing via net factor income and its subcomponents in new and old EU countries (percent): 1999–2009

	New EU		EMU	
	1999–2007	1999–2009	1999–2007	1999–2009
$1 - \beta_f$	4	4	5	9
	(1)	(2)	(3)	(3)
RECEIPTS ON FINANCIAL ASSETS	3	4	0	7
	(1)	(2)	(2)	(3)
PAYMENTS ON FINANCIAL LIABILITIES	-8	-1	4	2
	(1)	(3)	(3)	(2)
INCOME FROM NET FINANCIAL ASSETS	6	3	5	7
	(1)	(1)	(3)	(3)
NET COMPENSATION OF EMPLOYEES	-4	-3	-1	-1
	(1)	(1)	(1)	(1)

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The new EU sample includes Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland, Slovenia and Slovakia. Standard errors are in parentheses. $1 - \beta_f$ is the GLS estimation of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i$ on $\Delta \log \text{GDP}^i$. Smoothing via each sub-channel is calculated as $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + X)^i$ on $\Delta \log \text{GDP}^i$, where X corresponds to the various sub-channels reported in the table.

Table 8: Smoothing via net factor income and its subcomponents in new and old EU countries under asymmetric output shocks (percent): 1999–2009

	1999–2007		1999–2009	
	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$
	A. New EU members			
$1 - \beta_f$	0	3	1	2
	(2)	(4)	(1)	(3)
RECEIPTS ON FINANCIAL ASSETS	3	6	1	5
	(4)	(3)	(3)	(2)
PAYMENTS ON FINANCIAL LIABILITIES	10	4	-2	3
	(4)	(2)	(7)	(4)
INCOME FROM NET FINANCIAL ASSETS	8	6	1	6
	(3)	(3)	(3)	(2)
NET COMPENSATION OF EMPLOYEES	-1	-1	-2	0
	(1)	(1)	(1)	(1)
	B. Old EU members			
$1 - \beta_f$	12	4	12	8
	(6)	(3)	(10)	(3)
RECEIPTS ON FINANCIAL ASSETS	-18	9	15	16
	(11)	(5)	(8)	(10)
PAYMENTS ON FINANCIAL LIABILITIES	50	6	-13	11
	(22)	(14)	(9)	(13)
INCOME FROM NET FINANCIAL ASSETS	25	10	8	10
	(15)	(8)	(15)	(13)
NET COMPENSATION OF EMPLOYEES	-1	-1	-3	-3
	(9)	(13)	(3)	(12)

Note: The EMU sample includes Austria, Belgium, Finland, France, Germany, Italy, the Netherlands and Portugal. The new EU sample includes Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland, Slovenia and Slovakia. Standard errors are in parentheses. $1 - \beta_f$ is the GLS estimation of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i$ on $\Delta \log \widetilde{\text{GDP}}^+_{it}$ and $\Delta \log \widetilde{\text{GDP}}^-_{it}$. Smoothing via each sub-channel is calculated as $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + X)^i$ on $\Delta \log \widetilde{\text{GDP}}^+_{it}$ and $\Delta \log \widetilde{\text{GDP}}^-_{it}$, where X corresponds to the various sub-channels reported in the table.

References

Afonso, A., Furceri, D., 2007. Business cycle synchronization and insurance mechanisms in the EU. ECB Working Paper, 844.

Allard, C., 2011. More Europe, not less. Finance & Development 48, 52-54.

Artis, M., Marcellino, M., Proietti, T., 2004. Characterizing the business cycle for accession countries. CEPR Discussion Paper, 4457.

Baele, L., Ferrando, A., Hördahl, P., Krylova, E., Monnet, C., 2004. Measuring financial integration in the Euro area. ECB Occasional Paper, 14.

Balli, F., 2009. Spillover effects on government bond yields in Euro zone. Does full financial integration exist in European government bond markets? Journal of Economics and Finance 33, 331-363.

Balli, F., Basher, S.A., Balli, H.O., 2010. From home bias to Euro bias: disentangling the effects of monetary union on the European financial markets. Journal of Economics and Business 62, 347-366.

Balli, F., Basher, S.A., Balli, H.O., 2011. Income insurance and the determinants of income insurance via foreign asset revenues and foreign liability payments. Economic Modelling 28, 2296-2306.

Balli, F., Kalemli-Ozcan, S., Sørensen, B.E., 2012. Risk sharing through capital gains. Canadian Journal of Economics 45, 472-492.

Beine, M., Cosma, A., Vermeulen, R., 2010. The dark side of global integration: Increasing tail dependence. Journal of Banking and Finance 34, 184-192.

Bordo, M.D., Eichengreen, B., Irwin, D.A., 1999. Is globalization today really different than globalization a hundred years ago? NBER Working Paper, 7195.

Bracke, T., Schmitz, M., 2011. Channels of international risk-sharing: Capital gain versus income flows. International Economics and Economic Policy 8, 45-78

Cecchetti, S.G., Mohanty, M.S., Zampolli, F., 2011. The real effects of debt. BIS Working Paper, 352.

Christoffersen, P., Errunza, V., Jacobs, K., Hugues, L., 2012. Is the potential for international diversification disappearing? A dynamic copula approach. Review of Financial Studies 25, 3711-3751.

Darvas, Z., Szapáry, G., 2008. Business cycle synchronization in the enlarged EU. Open Economies Review 19, 1-19.

Davies, M., Ng, T., 2011. The rise of sovereign credit risk: Implications for financial stability. BIS Quarterly Review, September, 59-70.

Demyanyk, J., Ostergaard, C., Sørensen, B.E., 2008. Risk sharing and portfolio allocation in EMU. European Economy Economic Papers, 334.

Deutsche Bundesbank, 2009. Monthly Report. December.

European Central Bank (ECB), 2011. *Financial Integration in Europe.* May.

European Commission, 2006. Enlargement two years after: An economic evaluation. European Commission Occasional Papers, 24.

European Commission, 2011. Capital flows to converging European economies – from boom to drought and beyond. European Commission Occasional Papers, 75.

Fratzscher, M., Imbs, J., 2009. Risk sharing, finance and institutions in international portfolio. Journal of Financial Economics 94, 428-447.

Grauwe, P., Schnabl, G., 2011. EMU entry strategies for the new member states. Intereconomics 39, 241-246.

Hodrick, R.J., Prescott, E.C., 1997. Postwar U.S. business cycles: An empirical investigation. Journal of Money, Credit, and Banking 29, 1-16.

Ibragimov, R., Jaffee, D., Walden, J., 2011. Diversification disasters. Journal of Financial Economics 99, 333-348.

Jevčák, A., Setzer, R., Suardi, M., 2010. Determinants of capital flows to the new EU members states before and during the financial crisis. European Commission Economic Papers, 425.

Kahanec, M., Zimmermann, K.F., 2009. Migration in an enlarged EU: A challenging solution? European Commission Economic Papers, 363.

Kose, M.A., Prasad, E.S., Terrones, M.E., 2007. How does financial globalization affect risk sharing? Patterns and channels. IMF Working Paper, 07/228.

Kose, M.A., Prasad, E.S., Terrones, M.E., 2009. Does financial globalization promote risk sharing? Journal of Development Economics 89, 258-270.

Kutan, A.M., Yigit, T., 2004. Nominal and real stochastic convergence of transition economies. Journal of Comparative Economics 32, 23-36.

Lane, P.R., Milessi-Ferreti, G.M., 2007. The external wealth of nations Mark II. Journal of International Economics 73, 223-250.

Lojsch, D.H., Rodriguez-Vives, M., Slavik, M., 2011. The size and composition of government debt in the Euro area. ECB Occasional Paper, 132.

McKinsey Global Institute (McKinsey), 2009. Global capital markets: Entering a new era. September 2009.

McKinsey Global Institute (McKinsey), 2010. Debt and deleveraging: The global credit bubble and its economic consequences. January 2010.

McKinsey Global Institute (McKinsey), 2011. The emerging equity gap: Growth and stability in the new investor landscape. December 2011.

Mendoza, E.G., Quadrini, V., 2010. Financial globalization, financial crises and contagion. Journal of Monetary Economics 57, 24-39.

Pierucci, E., Ventura, L., 2010. Risk sharing: A long run issue? Open Economies Review 21, 705-730.

Savva, C., Neanidis, K.C., Osborn, D., 2010. Business cycle synchronization of the Euro area with the new and negotiating member countries. International Journal of Finance & Economics 15, 288-306.

Schmukler, S.L., 2004. Financial globalization: Gain and pain for developing countries. Economic Review, Second Quarter, Federal Reserve Bank of Atlanta, 39-66.

Sørensen, B.E., Yosha, O., 1998. International risk sharing and European monetary unification. Journal of International Economics 45, 211-238.

Sørensen, B.E., Wu, Y.T., Yosha, O., Zhu, Y., 2007. Home bias and international risk sharing: Twin puzzles separated at birth. Journal of International Money and Finance 26, 587-605.

Tasca, P., Battiston, S., 2011. Diversification and financial stability. CCSS Working Paper Series, 11-001.

Vermeulen, R., 2011. International diversification during the financial crisis: A blessing for equity investors? DNB Working Paper, 324.