



# Income insurance and the determinants of income insurance via foreign asset revenues and foreign liability payments<sup>☆</sup>

Faruk Balli<sup>a,\*</sup>, Syed Abul Basher<sup>b</sup>, Hatice Ozer Balli<sup>a</sup>

<sup>a</sup> School of Economics and Finance, Massey University, Private Bag 11-222, Palmerston North, New Zealand

<sup>b</sup> Department of Research and Monetary Policy, Qatar Central Bank, P.O. Box 1234, Doha, Qatar

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## ABSTRACT

We document that the net factor income smoothing channel in OECD countries is primarily driven by net financial asset income, while the other two sub-components (net compensation of employees and net taxes on imports) turn out to be ineffective. Once factor income inflows are distinguished from outflows, empirical evidence suggests a non-significant effect of inflows in terms of income smoothing as opposed to a positive and significant role of factor income outflows. Factor income outflows also appear to be robust with respect to positive output shocks, while neither factor inflows nor factor outflows provide insurance against negative output shocks. In terms of the determinants of income smoothing, results indicate that an increase in foreign equity and debt liabilities positively affect the extent of smoothing via factor income outflows. Whereas, contrary to the current literature, an increase in foreign asset holding does not have a positive impact on smoothing via factor income inflows. European investors' tendency of allocating a sizeable portion of their assets within the Euro zone is shown to undermine income smoothing.

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## 1. Introduction

In today's globalized world, in addition to the amount of risk sharing taking place via domestic channels,<sup>1</sup> households could also minimize their income/consumption risk by investing in foreign assets. By investing in foreign assets, that do not necessarily yield identical *timing* of returns, domestic investors can reduce the overall variance (a common metric of measuring risk) of their financial portfolios. Grubel (1968) pointed out that international diversification can improve mean-variance trade-off compared to holding a purely domestic portfolio. In spite of the supposed benefits from international diversification, investors during 1990s showed very little inclination towards holding foreign assets. Analyzing cross-border equity holdings, French and Poterba (1991) observe very high domestic ownership of shares in

world's five largest stock markets: United State (92.2%), Japan (95.7%), United Kingdom (92%), Germany (79%), and France (89.4%). The observation that investors hold too little of their wealth in foreign assets has been dubbed as (equity) "home bias" in the literature.<sup>2</sup>

In recent years, however, portfolio home bias has disproportionately declined. Table 1, adopted from Kang and Melas (2010), reports the extent of home bias reduction in selected OECD markets over the 1997–2007 period. The figures reveal significant reduction in home bias in several European markets (notably in the Netherlands), while Japan remains the most home-biased (83.7%), and the US and UK both exhibiting a level of home bias around 52% in 2007. "Such high levels of home bias represent a significant diversion from a market-cap-based global equity portfolio" (Kang and Melas, 2010, p. 3). Although European markets show a decline in home bias over the last decade, a closer look at the equity allocation patterns reveal that European asset owners have adopted a regional approach to equity allocation. That is, over the years, European Union (EU) investors' holdings of EU-originated assets (than other destinations) have tremendously increased. Demyank et al. (2008) (hereafter DOS) noticed that about 60% of total EU equity investments were invested within the EU. A similar pattern was observed in investments in debt securities. This recent phenomenon has been dubbed as portfolio Euro bias in the literature, see Balli et al. (2010b) and the references therein for related discussion.

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\* Corresponding author. Tel.: +64 6 356 9099x2330; fax: +64 6 350 5651.

E-mail addresses: F.Balli@massey.ac.nz (F. Balli), bashers@qcb.gov.qa (S.A. Basher), H.Ozer-Balli@massey.ac.nz (H.O. Balli).

<sup>1</sup> Within a country, risk sharing can be achieved in at least three ways: (i) by cross-ownership of productive assets facilitated by a developed capital market, (ii) through the tax-transfer system of the federal (central) government, and (iii) through lending and borrowing on national credit markets. For empirical applications of channels of risk sharing see, among others, Asdrubali et al. (1996) for U.S. states; Balli et al. (2011) for Canadian provinces; and Balli and Sørensen (2007), Balli et al. (2010a) for OECD nations.

<sup>2</sup> See Lewis (1999) and Karolyi and Stulz (2003) for excellent surveys of the home bias literature. Foad (2008) also offers various explanations to the home bias puzzle.

**Table 1**

Equity home bias in selected markets (percent).

Source: Kang and Melas (2010). Home bias is defined as  $1 - (\text{actual international equity allocation}/\text{market-cap based international equity allocation})$ .

Country	1997	2001	2004	2007
Denmark	79.7	56.1	51.4	48.5
Finland	94.1	74.4	51.3	48.8
France	83.5	69.4	59.5	62.7
Germany	NA	49.9	43.3	42.3
Japan	92.1	86.1	84.7	83.7
Netherlands	70.2	35.4	20.1	12.2
Norway	84.6	50.4	46.1	46.8
Sweden	79.2	51.1	50.8	49.7
Switzerland	NA	57.3	52.6	51.1
United Kingdom	75.9	64.0	56.1	52.2
US	79.0	69.6	59.1	52.3

NA: not applicable.

Since higher international diversification (or lower home bias) is presumed to generate higher income risk sharing, a large home bias likewise is associated with low risk sharing. Hence, home bias and risk sharing can be viewed as manifestations of the same underlying behavior. Sørensen et al. (2007) (hereafter SWYZ) empirically analyze this hypothesis for 24 OECD countries over the 1993–2003 period. To quantify income smoothing as a measure of risk sharing, SWYZ use the net factor income channel which is the difference between gross domestic product (GDP) and gross national income (GNI). Income smoothing via the net factor income flows primarily takes place through two ways. One way is from the proceeds on factor income flows via the asset side so that when receipts from foreign assets strongly counter-move with aggregate (or group) output growth, high income smoothing occurs. However, income dis-smoothing can be witnessed if foreign asset returns co-move one-to-one (or react more strongly to the changes in domestic output) with domestic output. The other way is through payments on foreign owned domestic assets via the liabilities side. A higher amount of income smoothing results when the payments on foreign liabilities are closely connected to domestic output growth. Taking this approach, the amount of income smoothing depends on the degree of co-movement between foreign payments and domestic output growth. SWYZ find that a high level of foreign portfolio assets is positively and robustly related to income risk sharing. For consumption risk sharing, SWYZ find that the equity and foreign direct investment (FDI) components of international assets holdings are more relevant than debt holding. SWYZ find no significant role for liabilities in income risk sharing, save for some evidence of consumption risk sharing through FDI liabilities. SWYZ, however, did not give much emphasis on the importance of financial liability payments on income smoothing. Interestingly, for the EU region, even though income smoothing via net factor income has recently increased (Balli and Sørensen, 2007), the connection between the level of financial asset holdings and smoothing via factor income flows is not strong enough, according to DOS. Both these statements suggest that the relation between the amount of foreign asset holdings and income smoothing via foreign asset revenues should be revisited again.

Taking SWYZ as our benchmark study, this paper makes two contributions to the literature. First, extending the GDP variance decomposition due to Asdrubali et al. (1996), we decompose the net factor income channel into *factor income inflows* and *factor income outflows* in order to examine the sole effect of revenues from foreign asset holdings on income smoothing.<sup>3</sup> Preliminary results indicate

<sup>3</sup> According to the IMF's fifth edition of its Balance of Payments Manual (BOPM5), net factor income flows are decomposed into the net income flows from non-immigrants living abroad (the net compensation of employees from rest of the world), net tax (subsidy) on imports and net income from foreign assets (net interest receivables, net dividend receipts, and net retained earnings).

that the net factor income channel in the OECD countries during 1999–2007 period is mainly driven by net financial asset income, while the other two sub-components (net compensation of employees and net taxes on imports) turn out to be ineffective. Once factor income inflows are distinguished from outflows, empirical evidence suggests a non-significant effect of inflows in terms of income smoothing as opposed to a positive and significant role of factor income outflows (18% of output shocks smoothed for the EMU and 16% for the EU). When shocks to income are decomposed into a positive and negative realization, results indicate that factor income outflows are statistically significant only to smooth the positive shocks to GDP, while neither inflows nor outflows channels are significant enough in attenuating negative output shocks. Furthermore, the factor income outflow channel appears robust to longer lasting shocks than factor inflows, whereas the latter is shown to play important role in consumption smoothing. Second, we present an analysis of the determinants of income smoothing in accordance with the empirical strategy first introduced by Mèlitz and Zumer (1999) and subsequently developed by other contributors (among others, SWYZ). Our findings can be summarized as follows: an increase in foreign equity and debt liabilities positively affects the extent of smoothing via factor income outflows. Whereas, contrary to the current literature, an increase in foreign asset holding does not have a positive impact on smoothing via factor income inflows.

The rest of the paper is organized as follows. Section 2 briefly outlines the theory underpinning the risk sharing. Section 3 describes the specification of models employed throughout in the paper. It also includes a short discussion on the construction of an index of diversification for foreign asset holdings, which we used as a potential determinant of income smoothing. Section 4 presents data and empirical results. Section 5 discusses empirical evidence on the determinants of income smoothing. Finally, Section 6 concludes the paper.

## 2. Theoretical framework

Risk sharing indicates that economic agents or countries can share risk with each other. In this section we briefly outline the basic ideas for endowment economies with one homogeneous tradable good. For a fuller discussion interested readers are referred to Obstfeld and Rogoff (1996).

Let us consider period  $t$  per capita output of country  $i$  as an exogenous random variable with a commonly known probability distribution. Each country's representative consumer is a risk averse expected utility maximizer. Consumers within each country are identical with Constant Relative Risk Aversion (CRRA) utility functions and we also assume that perfect Arrow–Debreu markets for contingent claims exist. When risk is fully shared among countries, the consumption of a country co-moves with world consumption but not with country-specific shocks.

A testable implication of perfect risk sharing is that consumption growth rates are identical for all countries, i.e.  $\Delta \log c_{it} = \text{constant} + \beta \Delta \log c_{wt} + \epsilon_{it}$ , where  $c_{it}$  is country  $i$ 's per capita consumption,  $c_{wt}$  is world per capita consumption in period  $t$ , and  $\epsilon_{it}$  is error term, due to either taste shocks or noise. The general intuition is that after controlling for aggregate consumption growth, the consumption growth rate of a country should not be a function of output growth of that country. Regression based tests for full risk sharing at the country level were studied by Obstfeld (1994), Canova and Ravn (1996), and Lewis (1996) (see Lewis, (1995) for a comprehensive survey of these literature).<sup>4</sup>

<sup>4</sup> Full risk sharing tests, using individual-level data, are first performed by Cochrane (1991), Mace (1991), and Townsend (1994). The International Real Business Cycle studies, most notably Backus et al. (1992), Baxter and Crucini (1993), and Stockman and Tesar (1995), examine the prediction that the correlation of consumption across countries should be equal to unity. The data are, however, far from confirming that prediction.

It is of practical interest to quantify the extent of risk sharing between countries rather than testing the abstract notion of perfect risk sharing. It is also useful to identify the exact channels through which risk is shared and to quantify the amount of risk sharing obtained via each channel. There are several mechanisms for sharing output risk. The most straightforward way of sharing risk internationally is through international income diversification, i.e. through cross-border ownership of financial assets. Net income from foreign assets is reflected in the national accounts data as the difference between gross domestic product (GDP) and gross national income (GNI).<sup>5</sup> Specifically, net factor income flows from abroad explain the difference between income earned by residents in foreign countries minus income earned by non-residents in the domestic economy. This type of risk sharing is termed income smoothing that is mainly an outcome of countries owning assets in other countries. The main idea behind income smoothing via net factor income is that if domestic economic agents have diversified their investments abroad, then foreign asset income will be facilitated in terms of smoothing income by partially detaching it from domestic output shocks.

**3. Model specifications**

The literature on income smoothing has shown that agents can insure their income against country-specific output risks by holding an internationally diversified portfolio. Holding of foreign financial assets may generate net factor income flows that might partially insulate against the idiosyncratic fluctuations in GDP. SWYZ apply the following regression to measure the level of factor income smoothing:

$$\Delta \log \widehat{GNI}_{it} = constant + \beta_f \Delta \log \widehat{GDP}_{it} + \epsilon_{it}, \tag{1}$$

where  $\Delta \log \widehat{GDP}_{it}$  is the annual change in GDP per capita in constant prices minus the union-wide counterpart ( $\Delta \log \widehat{GDP}_t$ ),  $\Delta \log \widehat{GNI}_{it}$  is the annual change in GNI per capita in constant prices minus the union-wide counterpart ( $\Delta \log \widehat{GNI}_t$ ), and  $\epsilon_{it}$  is error term, respectively.<sup>6</sup>  $\beta_f$  measures the average co-movement of the countries' idiosyncratic GNI growth with their idiosyncratic GDP growth.<sup>7</sup> The remaining amount,  $1 - \beta_f$ , measures the amount of income smoothing via net factor inflows. As  $\beta_f$  approaches to zero, GNI and GDP per capita growth rates will be less correlated, thereby resulting in higher income smoothing via net factor income flows. As the value of  $\beta_f$  approaching to 1 implies that GNI and GDP per capita growth rates are perfectly correlated, so that net factor income flows do not yield any meaningful income smoothing.

**3.1. Decomposition of income smoothing via the net factor income flows**

We decompose income smoothing via the net factor income channel into factor income *inflows* and factor income *outflows*. Dividing the differences between GDP and GNI into two parts (adding in the income inflow and then deducting the income outflow) leads to the following relationship:

$$\Delta \log \widehat{GDPIN}_{it} = constant + \beta_f^+ \Delta \log \widehat{GDP}_{it} + \epsilon_{it}^+, \tag{2}$$

$$\Delta \log \widehat{GDPOUT}_{it} = constant + \beta_f^- \Delta \log \widehat{GDP}_{it} + \epsilon_{it}^-, \tag{3}$$

where  $\widehat{GDPIN} = \widehat{GDP} + \text{FACTOR INCOME INFLOW}$ ;  $\widehat{GDPOUT} = \widehat{GDP} - \text{FACTOR INCOME OUTFLOW}$ .

<sup>5</sup> GNI was previously called gross national product (GNP).  
<sup>6</sup> "Union-wide" in this paper specifically corresponds either to EU-14 or to high income OECD members. For instance, in the case of EU-14,  $\Delta \log \widehat{GDP}_i$  is equal to the real GDP per capita growth rate of country *i* minus the aggregate real GDP per capita growth rate of EU-14.  
<sup>7</sup> "Idiosyncratic" refers to the deviation of a country's growth rate of some variable from its union-wide counterpart.

Adding these two equations together yields the following equation:

$$\beta_f \approx \beta_f^+ + \beta_f^-, \tag{4}$$

where  $\beta_f^+$  ( $\beta_f^-$ ) is the percentage of income smoothing via the factor income inflows (outflows) channel.

**3.2. Determinants of smoothing via factor income inflows and outflows**

In order to gauge the determinants of income smoothing via the factor income channels, we follow Mèlitz and Zumer (1999) in modeling income smoothing as a time-varying process and impose the following structure on the coefficient estimate of smoothing from factor income flows. Eqs. (2) and (3) can be rewritten as:

$$\Delta \log \widehat{GDPIN}_{it} = \gamma^+ \Delta \log \widehat{GDP}_{it} + \epsilon_{it}^+, \tag{5}$$

$$\Delta \log \widehat{GDPOUT}_{it} = \gamma^- \Delta \log \widehat{GDP}_{it} + \epsilon_{it}^-, \tag{6}$$

where  $\gamma^+$  ( $\gamma^-$ ) measures the co-movement of a country's idiosyncratic GDPIN (GDPOUT) growth and GDP per capita growth, and  $1 - \gamma^+$  ( $1 - \gamma^-$ ) measures income smoothing via the factor income inflows (outflows) channel.

Following Mèlitz and Zumer (1999) and SWYZ, we allow  $\gamma$  to change over time and include an interaction variable to explain the corresponding sub-channels. We extend the existing methodology to measure the income smoothing via factor income sub-components as follows:

$$\gamma^+ = \gamma_0^+ + \gamma_1^+ (\text{TREND} - \overline{\text{TREND}}) + \gamma_2^+ (X_{it} - \overline{X}_t), \tag{7}$$

$$\gamma^- = \gamma_0^- + \gamma_1^- (\text{TREND} - \overline{\text{TREND}}) + \gamma_2^- (X_{it} - \overline{X}_t), \tag{8}$$

where *X* is an interaction variable that is considered to explain the income smoothing via factor income inflow and outflow channels. TREND denotes the linear time trend. In Eq. (7),  $1 - \gamma_0^+ - \gamma_1^+ (\text{TREND} - \overline{\text{TREND}}) - \gamma_2^+ (X_{it} - \overline{X}_t)$  measures the extent of smoothing via factor income inflows. Specifically, the parameter  $\gamma_0^+$  measures the unweighted pooled average income smoothing via the factor income inflow channel;  $\gamma_1^+$  measures the average year-by-year increase in income smoothing; and  $\gamma_2^+$  measures the extent of linkage between interaction variables and income smoothing. Likewise, in Eq. (8),  $1 - \gamma_0^- - \gamma_1^- (\text{TREND} - \overline{\text{TREND}}) - \gamma_2^- (X_{it} - \overline{X}_t)$  measures the extent of smoothing via factor income outflows. The parameters  $\gamma_0^-$ ,  $\gamma_1^-$ , and  $\gamma_2^-$  have similar interpretation but from the perspective of factor income outflows.

**3.2.1. Index of diversification for foreign asset holdings**

As a possible determinant of income smoothing, we propose an index of diversification for foreign equity and bond holdings across different countries as follows:

$$DIV_{it} = \frac{FMC_{it}}{\sum_{j=1}^N |(\theta_{ijt} - \theta_{ij}^{max})|}, \tag{9}$$

where  $\theta_{ij}$  is the ratio of equity (bond) holdings of country *i* from country *j* over total foreign equity holdings of country *i*.  $\theta_{ij}^{max}$  is the maximum ratio of foreign equity holdings of country *i* from country *j*. *N* is the number of the countries that country *i* diversifies its foreign portfolio with. To have consistency with the calculations of the index, we set *N* as equal to 30.<sup>8</sup> FMC stands for ratio of the market (bond and equity) capitalization of country *i* to world market capitalization. The index gives larger weight to countries with highly diversified foreign equity (bond) portfolios with higher rate of stock market capitalization, and smaller weight to

<sup>8</sup> We used different values of *N* ranging from 20 to 35, the results did not change substantially.

those that hold equity (bond) from a limited number of foreign markets with lower rate of stock market capitalization.

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 short sample 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 regressions type estimation since the model contains identical regressors), and (ii) residuals from firststep are used to estimate variance for each country and corrected for heteroscedasticity and autocorrelation. Unless stated otherwise, we use differenced data at the yearly frequency.

#### 4. Empirical results

##### 4.1. Data

We use a broad sample of high-income OECD countries to investigate the relationship between international portfolio allocation and income smoothing.<sup>9</sup> We obtain the pair-wise volume of cross border-equity holdings in US dollars from the International Monetary Fund's Coordinated Portfolio Investment Surveys (CPIS) for the period 2001–2007. This survey data-set is known to be reliable, since the surveys were conducted using guidelines that are consistent in measuring bonds and equity holdings across countries. The financial assets and liabilities of each country were taken from IMF's International Financial Statistics (IFS) database. National accounts: GDP, GNI, factor income inflows, factor income outflows, population, and consumer price indices are obtained from OECD's National Accounts database (volume I), 1970–2007. We compute purchasing power parity (PPP) adjusted GDP, GNI, GDPIN, and GDPOUT by deflating all series with the implicit private consumption deflator. We do not use quantity indices for real GDP because we want to measure how the purchasing value of GDP is insured internationally. Growth rates of GDP, GNI, GDPIN, and GDPOUT are the growth rates of per capita PPP-adjusted variables. The PPP-adjusted series is aggregated to the EMU-wide, EU-wide, and non-EU OECD-wide series. The disaggregation of net factor income variable, i.e., net compensation of employees, net financial asset incomes, and net tax on imports are obtained from OECD's National Accounts Detailed Tables (volume II), 1999–2007.

##### 4.2. Income smoothing via factor income inflows and outflows

As a first step, we decompose the net factor income flows into three sub-channels, namely, net compensation of employees (short-term labor income), net taxes on imports (indirect business tax) and net financial asset income. The empirical model concerning income smoothing for the three sub-channels are specified as follows:

$$\Delta \log \left( \text{GDP} + \text{NET COMP.OF EMPLOYEE} \right)_{it} = \text{constant} + \beta_{cp} \Delta \log \overline{\text{GDP}}_{it} + \epsilon_{cp,it} \tag{10}$$

<sup>9</sup> The dataset include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Netherlands, Portugal, Spain, New Zealand, Norway, Sweden, Switzerland, the UK, and the US. We consider three sub-groups: EMU (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain), EU-14 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK), and Non-EU OECD (Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US). We exclude Luxembourg, since it is an outlier with its position.

**Table 2**

Decomposition of international income smoothing via components of net factor income channel (percent): 1999–2007.

	EMU	EU	OECD
NET COMP.OF EMPLOYEE(1 - β <sub>cp</sub> )	-1 (1)	-1 (0)	1 (0)
NET TAX ON IMPORT(1 - β <sub>tp</sub> )	1 (1)	1 (1)	0 (1)
NET FIN.ASSET INCOME(1 - β <sub>fa</sub> )	13 (3)	(12) (4)	7 (4)
Observations	88	112	176

Notes: EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

OECD: Australia, Austria, Belgium, Canada Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK, and the US.

Percentages describe the shocks absorbed at each level of smoothing. HAC (heteroscedasticity and autocorrelation consistent) standard errors are shown in brackets. The percentage of income smoothing from net compensation of channel is (1 - β<sub>cp</sub>), where β<sub>cp</sub> is the GLS estimate of the slope in the regression of Δ log (GDP + NET COMP.OF EMPLOYEE)<sub>it</sub> on Δ log GDP<sub>it</sub>. The percentage of income smoothing from the net tax on imports channel is (1 - β<sub>tp</sub>), where β<sub>tp</sub> is the GLS estimate of the slope in the regression of Δ log (GDP + NET TAX ON IMPORT)<sub>it</sub> on Δ log GDP<sub>it</sub>. The percentage of income smoothing from net revenue from financial assets is (1 - β<sub>fa</sub>), where β<sub>fa</sub> is the GLS estimate of the slope in the regression of Δ log (GDP + NET FIN.ASSET INCOME)<sub>it</sub> on Δ log GDP<sub>it</sub>.

$$\Delta \log \left( \text{GDP} + \text{NET TAX ON IMPORT} \right)_{it} = \text{constant} + \beta_{tp} \Delta \log \overline{\text{GDP}}_{it} + \epsilon_{tp,it} \tag{11}$$

$$\Delta \log \left( \text{GDP} + \text{NET FIN.ASSET INCOME} \right)_{it} = \text{constant} + \beta_{fa} \Delta \log \overline{\text{GDP}}_{it} + \epsilon_{fa,it} \tag{12}$$

The estimated coefficients of the above three equations are presented in Table 2. Results indicate that neither net compensation of employees nor net taxes on imports appear as a significant source of net factor income smoothing. The estimated percentages of income smoothing are small in magnitude and in some cases they indicate dis-smoothing, but these effects are not statistically significant. By contrast, the estimated percentages of income smoothing of net financial asset revenues is positive and strongly significant, particularly for the EMU and EU samples, suggesting that factor income smoothing in the OECD countries during 1999–2007 was primarily driven by income flows from net foreign asset holdings.<sup>10</sup>

Table 3 presents estimation results for income smoothing via aggregate factor income flows and its sub-components (factor income inflows and factor income outflows). Results are presented over four sub-periods for EMU, EU, and non-EU OECD countries. The topmost row in each panel presents the percentage amount of overall income smoothing via net factor income, indicated by (1 - β<sub>f</sub>). Results show that income smoothing via net factor income (1 - β<sub>f</sub>) has begun only in the most recent decade<sup>11</sup>, as indicated by the positive and statistically significant coefficient. The effect is unambiguously stronger for EMU countries compared with the EU and non-EU OECD countries. This is to be expected, as EMU countries enjoy the benefit(s) of monetary union in terms of increased cross-border portfolio holdings as well as the reduced costs of financial

<sup>10</sup> Nonetheless, compensation of employees contributed to consumption smoothing for the EU15 countries over the 1980–2005 period, while indirect taxes generated consumption dis-smoothing. Further discussion is available in Afonso and Furceri (2007).

<sup>11</sup> Over the 1966–1990 period, Sørensen and Yosha (1998) do not find any significant evidence of cross-country factor income flows to cross-country risk sharing. This is likely due to the small difference between GDP and GNI (as a ratio of GDP) in most industrial countries, as noticed by Atkeson and Bayoumi (1993) over the 1963–1986 period.

**Table 3**  
Income smoothing via net factor income and its subcomponents (percent).

	1971–1980	1981–1990	1991–2000	2001–2007
<i>Panel A: EMU</i>				
$(1 - \beta_f)$	0	0	4	8
	(1)	(3)	(3)	(2)
$(1 - \beta_f^+)$	4	1	-10	-9
	(2)	(3)	(3)	(6)
$(1 - \beta_f^-)$	-3	-2	14	18
	(1)	(1)	(7)	(8)
Observations	110	110	110	77
<i>Panel B: EU</i>				
$(1 - \beta_f)$	0	-2	0	7
	(1)	(2)	(3)	(4)
$1 - \beta_f^+$	3	4	-12	-6
	(1)	(2)	(3)	(7)
$(1 - \beta_f^-)$	-3	-7	14	16
	(1)	(3)	(6)	(10)
Observations	140	140	140	98
<i>Panel C: Non-EU OECD</i>				
$(1 - \beta_f)$	-1	-3	0	5
	(1)	(1)	(3)	(3)
$(1 - \beta_f^+)$	-1	1	-2	4
	(1)	(4)	(7)	(3)
$(1 - \beta_f^-)$	0	-4	2	3
	(1)	(3)	(2)	(1)
Observations	80	80	80	56

Notes: EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

Non-EU OECD: Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US.

We exclude Luxembourg, since it is an outlier with its position. Percentages describe the shocks absorbed at each level of smoothing. HAC standard errors are shown in brackets.  $(1 - \beta_f)$  is the percentage amount of income smoothing via the net factor income flow channel and the coefficient  $\beta_f$  is the GLS estimate of the slope in the regression of  $\Delta \log \widehat{GNI}_{it}$  on  $\Delta \log \widehat{GDP}_{it}$ .  $(1 - \beta_f^+)$  is the amount of income smoothing via factor income inflow channel where  $\beta_f^+$  is the GLS estimate of the slope in the regression of  $\Delta \log (\widehat{GDP} + \widehat{\text{FACTOR INCOME INFLOW}})_{it}$  on  $\Delta \log \widehat{GDP}_{it}$ .  $(1 - \beta_f^-)$  is the amount of income smoothing via the net factor income outflow channel, and the coefficient  $\beta_f^-$  is the GLS estimate of the slope in the regression of  $\Delta \log (\widehat{GDP} - \widehat{\text{FACTOR INCOME OUTFLOW}})_{it}$  on  $\Delta \log \widehat{GDP}_{it}$ .

transactions. For both the EU and non-EU OECD countries, it has a similar positive effect, with borderline significance (p-value around 0.10), which may be considered significant in view of the rather small sample size (7 years). Both SWYZ and DOS obtain similar results documenting net factor income as a significant channel of income smoothing for OECD countries. These findings are fully consistent with the recent decline in 'home bias' puzzle mentioned before.

We are also able to identify whether income smoothing occurred as a result of factor income inflows or factor income outflows, or both. The second row in each panel in Table 3 presents the estimated coefficients of income smoothing via factor income inflows,  $(1 - \beta_f^+)$ . An interesting result emerges. Factor income inflows caused income dis-smoothing in EU and EMU countries in the past two decades. Particularly, during the 1991–2000 period the extent of income dis-smoothing was relatively higher and strongly significant. Post-Euro, the effect declined in magnitude by 50% for the EU countries, although the impact is statistically insignificant. By comparison, the non-EU OECD countries experienced a lesser extent of dis-smoothing during 1991–2000, and some indication of positive income smoothing during 2001–2007 period (though it is not statistically significant). One possible explanation for this surprising result is the increased business cycle synchronicity across EU economies, which resulted in a higher exposure to mainly symmetric shocks by member countries. Thus, while higher correlation of business cycle was pursued in order to minimize the stabilization cost of giving up an independent

monetary policy, the adoption of the Euro has however prevented monetary policy from adjusting to shocks and has led to economic dislocation in some of its members (as became clear during the recent economic and financial crises). This result encompasses the finding by Afonso and Furceri (2007), where a staggering 63% of shock to GDP among the 15 EMU countries remained unsmoothed.<sup>12</sup> Furthermore, we suspect that the tendency of European asset owners in the post-Euro era to hold more intra-Euro portfolios than international portfolios worked unfavorably in achieving cross-country risk sharing from cross-country factor income (in)flows.<sup>13</sup>

The last row in each panel of Table 3 reports estimated coefficients of the extent of income smoothing via factor income outflows,  $(1 - \beta_f^-)$ . Income smoothing is unambiguously negative in 1970s and 1980s, thereafter it is positive with a strong and significant impact particularly for the EMU and EU countries. Why income smoothing is positively related with factor income outflows? Intuitively, the pro-cyclically between higher outflows from home country and higher output growth in home country drives this result. This mechanism of this channel is similar to the savings channel. As an example, consider France investing to Germany. A positive (negative) and strong output growth in Germany will result in higher (lower) dividend payments by German companies to French investors, causing positive income smoothing in Germany. Nevertheless, not all countries may simultaneously benefit from portfolio outflows, since much depend on domestic country's ability to channel capital inflows into productive investments. While out panel estimates show evidence of positive and significant income smoothing from factor income outflows, we cannot rule out the possibility of subdued effect on income smoothing at the individual country level due to differences in country size, labor market condition, and government policies. We hope to explore this issue in a future research.

It is worth stating if the sizes of overall asset portfolios are small relative to GDP, home bias may be of little importance for risk sharing. One could thus claim that the lack of risk sharing from factor income flows documented in this paper could be due to smaller overall size of inflows than outflows relative to GDP. To appreciate this point, in Fig. 1 we display the share of foreign asset receipt and foreign liability payments relative to GDP. As can be seen, save for Ireland and Korea, the two ratios track each other closely, implying that our results are not driven by lower asset portfolio to GDP ratio. Finally, Fig. 2a and b graphically illustrates the results presented above. The year-by-year coefficients are obtained after smoothing the time-variation using a Normal kernel with bandwidth (standard deviation) 2. The figures speak for themselves and are consistent with the results presented above.

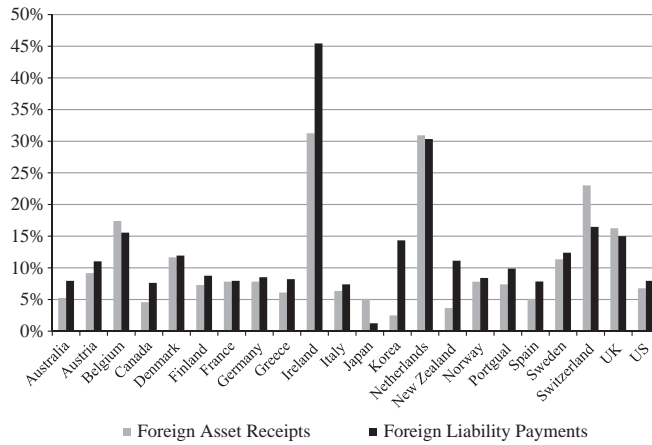
#### 4.3. Income smoothing via asymmetric output shocks and their persistence

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 over 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 from negative shocks might result in lack of recognition of these insurance capabilities (Pierucci and Ventura, 2010, p. 711).<sup>14</sup> To guard against this possibility, following Pierucci and Ventura (2010), we augment our

<sup>12</sup> Surprisingly, for an enlarged EMU with 25 members, the unsmoothed component rises to 69%.

<sup>13</sup> A recent study by Balli et al. (2010b) has demonstrated the rising trends in intra-Euro debt and equity holdings, they however did not relate their results to income smoothing.

<sup>14</sup> We thank an anonymous referee for bringing this point to our attention.



Source: U.N. Detailed National Accounts Database, and authors' own calculations. Both foreign asset receipts to GDP and foreign liability payments to GDP ratios are averaged over the 1970-2007 period.

Fig. 1. Foreign asset receipts to GDP and foreign liability payments to GDP ratios in OECD countries.

income insurance regressions by explicitly distinguishing between “positive” and “negative” realizations of the shock variable:

$$\Delta \log \widehat{GDPIN}_{it} = constant + \beta_{f1}^+ \Delta \log \widehat{GDP}_{it}^+ + \beta_{f2}^+ \Delta \log \widehat{GDP}_{it}^- + \epsilon_{it}^+ \quad (14)$$

$$\Delta \log \widehat{GDP}_{it} = constant + \beta_{f1} \Delta \log \widehat{GDP}_{it}^+ + \beta_{f2} \Delta \log \widehat{GDP}_{it}^- + \epsilon_{it}, \quad (13)$$

$$\Delta \log \widehat{GDP\overline{OUT}}_{it} = constant + \beta_{f1}^- \Delta \log \widehat{GDP}_{it}^+ + \beta_{f2}^- \Delta \log \widehat{GDP}_{it}^- + \epsilon_{it}^-, \quad (15)$$

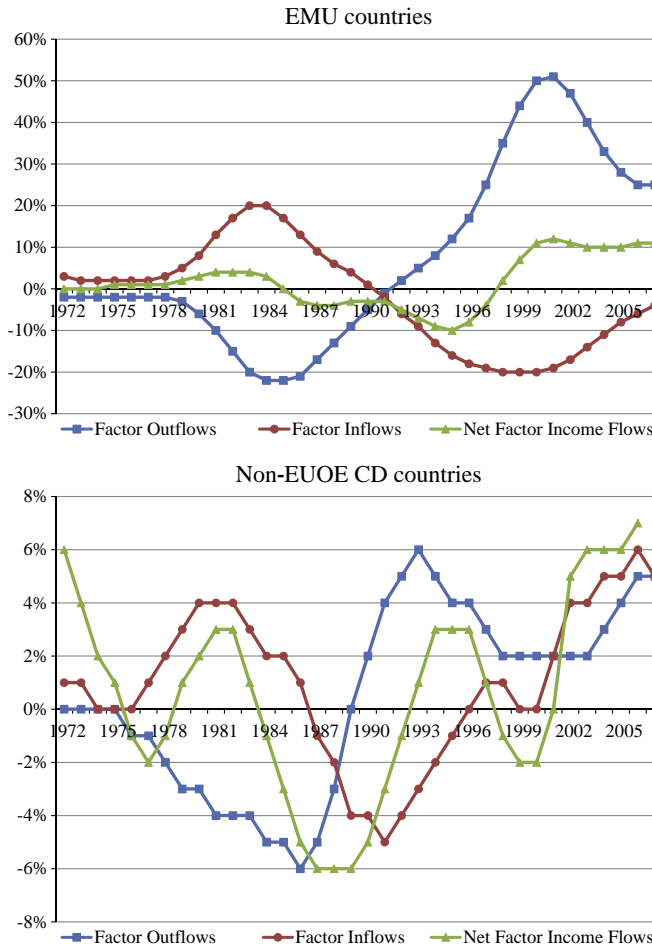


Fig. 2. Income smoothing via net factor income, factor income inflows, and factor income outflows channels in EMU and non-EU OECD economies, 1971–2007.

**Table 4**  
Income smoothing via net factor income and its subcomponents under asymmetric shocks (%).

	1971–1980		1981–1990		1991–2000		2001–2007	
	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$	$\Delta \log \text{GDP}^+$	$\Delta \log \text{GDP}^-$
<i>Panel A: EMU</i>								
$(1 - \beta_f)$	0	2	6	1	9	-3	13	3
	(2)	(2)	(4)	(4)	(3)	(6)	(6)	(3)
$(1 - \beta_f^+)$	4	4	-1	7	-9	-10	-19	1
	(2)	(2)	(6)	(3)	(2)	(5)	(11)	(15)
$(1 - \beta_f^-)$	-3	0	2	-11	24	4	17	11
	(2)	(1)	(7)	(5)	(6)	(3)	(8)	(16)
<i>Panel B: EU</i>								
$(1 - \beta_f)$	-2	2	-1	0	-9	9	10	0
	(1)	(1)	(2)	(4)	(3)	(3)	(5)	(9)
$(1 - \beta_f^+)$	1	4	8	4	-5	-9	-18	-1
	(2)	(1)	(3)	(2)	(3)	(3)	(11)	(10)
$(1 - \beta_f^-)$	-3	0	-4	-11	12	7	18	16
	(1)	(1)	(5)	(5)	(3)	(8)	(10)	(16)
<i>Panel C: non-EU OECD</i>								
$(1 - \beta_f)$	-5	6	-6	-9	1	3	4	0
	(3)	(2)	(3)	(5)	(4)	(5)	(3)	(10)
$(1 - \beta_f^+)$	-2	-3	-4	0	-5	3	-8	-4
	(1)	(1)	(3)	(3)	(3)	(5)	(4)	(3)
$(1 - \beta_f^-)$	-3	4	2	10	7	8	10	9
	(3)	(2)	(3)	(5)	(4)	(5)	(4)	(4)

Notes: See Table 2 for country lists. Percentages describe the shocks absorbed at each level of smoothing. HAC standard errors are shown in brackets.  $(1 - \beta_f)$  is the amount of income smoothing via the net factor income flow channel and the coefficient  $\beta_f$  is the GLS estimate of the slopes in the regression of  $\Delta \log \overline{\text{GNI}}_{it}$  on  $\Delta \log \overline{\text{GDP}}_{it}^+$  and  $\Delta \log \overline{\text{GDP}}_{it}^-$ .  $\Delta \log \overline{\text{GDP}}_{it}^+$  and  $\Delta \log \overline{\text{GDP}}_{it}^-$  are positive and negative realizations of GDP shocks, respectively. See the text for the definitions of these variables.  $(1 - \beta_f^+)$  is the amount of income smoothing via factor income inflow channel where  $\beta_f^+$  is the GLS estimate of the slopes in the regression of  $\Delta \log (\text{GDP} + \text{FACTOR INCOME INFLOW})_{it}$  on  $\Delta \log \overline{\text{GDP}}_{it}^+$  and  $\Delta \log \overline{\text{GDP}}_{it}^-$ .  $(1 - \beta_f^-)$  is the amount of income smoothing via the net factor income flow channel, and the coefficient  $\beta_f^-$  is the GLS estimate of the slopes in the regression of  $\Delta \log (\text{GDP} - \text{FACTOR INCOME OUTFLOW})_{it}$  on  $\Delta \log \overline{\text{GDP}}_{it}^+$  and  $\Delta \log \overline{\text{GDP}}_{it}^-$ .

where  $\text{GDP}_{it}^+$  and  $\text{GDP}_{it}^-$  are the positive and negative output shocks respectively. Following Pierucci and Ventura (2010), we use an output gap process to distinguish between positive and negative realizations of the GDP. Assuming that trend output<sup>15</sup> is the level of output that a country wishes to secure, negative GDP component is defined as those corresponding to periods of negative output gap (actual GDP minus trend GDP), and positive GDP components to those corresponding to periods of positive output gap.

The panel regression results are reported in Table 4. Consistent with the results shown in Table 3, the estimated coefficients of positive domestic output shocks  $\Delta \log \overline{\text{GDP}}_{it}^+$  are positive and statistically significant for factor income outflow and net factor income flow channels during the 2001–2007 period for all three groups of countries. Moreover, the extent of income smoothing over the 1991–2007 period from outflow and net factor channels are clearly higher for EMU and EU countries reflecting the increase in output growth correlations across these economies. Whereas over the same time period, although negative output shocks  $\Delta \log \overline{\text{GDP}}_{it}^-$  have not been significantly smoothed by these two channels (excluding the factor income outflow channel for non-EU OECD countries), overall the estimated coefficients are positive indicating an improvement in risk-sharing mechanism to deal with negative idiosyncratic shocks when compared with previous decades. Noticeably, factor income outflow channel has contributed to a persistent smoothing of negative output shocks for non-EU OECD countries over the entire sample period. This underscores the insurance capabilities of the non-EU OECD economies in dealing with negative idiosyncratic shocks to output.

A closer look at the coefficients of factor income inflows reveals the relevance of splitting the idiosyncratic shocks into positive and negative components. Quite surprisingly, factor income inflows have resulted in dis-smoothing with respect to both positive and negative output shocks

over the 1991–2007 period, but these effects are statistically insignificant for the negative realization of idiosyncratic risk. Ironically, both EMU and EU countries appear to be benefitted from factor income inflows during the pre-1990 period than the post-1990 period. This is clearly seen from the positive and significant coefficients of  $(1 - \beta_f^+)$  attached to negative shocks and in two incidents with respect to positive shocks. This finding appears to contradict with the objectives of the European monetary union where member nations are expected to benefit from increased financial integration with each other, in which factor income inflow is one of the means of insuring against idiosyncratic risk. In retrospect, it is easy to see why the financial crisis of 2007–2008 has taken a heavy toll on European economies (particularly the PIIGS<sup>16</sup> countries). As evident from our results, post-Euro factor income inflows didn't contribute to risk sharing at all in EMU/EU countries. All in all, our findings suggest that income smoothing via net factor income flows or factor income outflows are significant only to smooth the positive shocks, these channels are not significant enough in attenuating negative output shocks.

We now examine in what way the channels of income smoothing are affected by the persistence of idiosyncratic shocks. As pointed by Asdrubali et al. (1996, p. 1098): “highly persistence shocks can be insured through advance purchase of securities on capital markets but are difficult to smooth ex post on credit markets since those who wish to borrow are unable to repay.” That's exactly what some PIIGS countries have faced in recent years when borrowing became much harder once the financial crisis intensified after the failure of Lehman Brothers in mid-September 2008. We have followed Asdrubali et al. (1996) and re-estimated Eqs. (1)–(3) with a three-year difference interval in order to capture the response of changes in income/consumption to longer lasting shocks to GDP. Shorter term fluctuations in income/consumption have small welfare implications

<sup>15</sup> We use the Hodrick and Prescott (1997) filter to extract the time-varying trend from the original data.

<sup>16</sup> PIIGS: Portugal, Ireland, Italy, Greece, and Spain.

**Table 5**  
Income smoothing via net factor income and its subcomponents with three-year frequency of the data (percent).

	1971–1980	1981–1990	1991–2000	2001–2007
<i>Panel A: EMU</i>				
(1 - β <sub>f</sub> )	-3	-9	8	14
(2)		(5)	(3)	(4)
(1 - β <sub>f</sub> <sup>+</sup> )	-3	-1	-16	-7
(3)		(2)	(3)	(4)
(1 - β <sub>f</sub> <sup>-</sup> )	2	-9	25	21
(1)		(4)	(9)	(8)
Observations	110	110	110	77
<i>Panel B: EU</i>				
(1 - β <sub>f</sub> )	-2	-6	4	13
(2)		(3)	(3)	(4)
(1 - β <sub>f</sub> <sup>+</sup> )	0	4	-12	-1
(2)		(2)	(3)	(5)
(1 - β <sub>f</sub> <sup>-</sup> )	-1	-11	17	14
(3)		(4)	(4)	(6)
Observations	140	140	140	98
<i>Panel C: non-EU OECD</i>				
(1 - β <sub>f</sub> )	5	1	1	-2
(2)		(3)	(2)	(3)
(1 - β <sub>f</sub> <sup>+</sup> )	1	-6	-4	-12
(1)		(2)	(3)	(4)
(1 - β <sub>f</sub> <sup>-</sup> )	3	8	7	11
(2)		(3)	(3)	(4)
Observations	80	80	80	56

Notes: EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

Non-EU OECD: Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US.

We exclude Luxembourg, since it is an outlier with its position. Percentages describe the shocks absorbed at each level of smoothing. HAC standard errors are shown in brackets. (1 - β<sub>f</sub>) is the percentage amount of income smoothing via the net factor income flow channel and the coefficient β<sub>f</sub> is the GLS estimate of the slope in the regression of Δ log GN<sub>it</sub> on Δ log GDP<sub>it</sub>. (1 - β<sub>f</sub><sup>+</sup>) is the percentage amount of income smoothing via factor income inflow channel where β<sub>f</sub><sup>+</sup> is the GLS estimate of the slope in the regression of Δ log (GDP + FACTOR INCOME INFLOW)<sub>it</sub> on Δ log GDP<sub>it</sub>. (1 - β<sub>f</sub><sup>-</sup>) is the percentage amount of income smoothing via the net factor income outflow channel, and the coefficient β<sub>f</sub><sup>-</sup> is the GLS estimate of the slope in the regression of Δ log (GDP - FACTOR INCOME OUTFLOW)<sub>it</sub> on Δ log GDP<sub>it</sub>.

compared to longer lasting fluctuations and hedging against longer-term fluctuation is therefore important. Results are displayed in Table 5. The amount of income smoothing via factor income outflow and net factor income channels over the 1990–2007 period is slightly higher with the differing frequency<sup>17</sup>, compared to those presented in Table 3. This finding is in line with Sørensen and Yosha (1998), who found that smoothing from cross-ownership of assets is much more “permanent.” Echoing earlier results, factor income inflows generated significant income dis-smoothing with longer lasting shocks.<sup>18</sup>

4.4. Consumption smoothing via factor income inflows and outflows

The discussion so far has ignored consumption smoothing. Following DOS, consumption smoothing here captures risk sharing from all sources including income smoothing. The basic panel regression specification that is used to quantify the amount of consumption smoothing via factor income flows is given by:

$$\Delta \log \tilde{C}_{it} = constant + \beta_c \log \overline{GDP}_{it} + \epsilon_{it}, \tag{16}$$

<sup>17</sup> Although results are less encouraging for the non-EU OECD economies, particularly with respect to the net factor income channel.

<sup>18</sup> We have also estimated Eqs. (14) and (15) using a longer differencing period. The results are quite similar to those reported in Table 4, and therefore not presented here to conserve space. These unreported results are available on request.

where Δ log  $\tilde{C}_{it}$  is the difference between country *i*'s per capita final consumption and aggregate per capita final consumption for the group at time *t* and  $\epsilon_{it}$  is the error term. The coefficient β<sub>c</sub> measures the average comovement of a country's idiosyncratic consumption growth with its idiosyncratic GDP growth in year *t*. The lower the comovement, the higher the amount of consumption is buffered against GDP fluctuations, therefore a lower β<sub>c</sub> is expected, and 1 - β<sub>c</sub>, measures the total consumption smoothing. To quantify the effect of the factor income inflows and outflows on consumption smoothing, we estimate the following panel regressions:

$$\Delta \log (C + \text{FACTOR INCOME INFLOW})_{it} = constant + \beta_c^+ \log \overline{GDP}_{it} + \epsilon_{it}^+, \tag{17}$$

$$\Delta \log (C - \text{FACTOR INCOME OUTFLOW})_{it} = constant + \beta_c^- \log \overline{GDP}_{it} + \epsilon_{it}^-. \tag{18}$$

The coefficients β<sub>c</sub><sup>+</sup> (β<sub>c</sub><sup>-</sup>) measure the average comovement of a country's idiosyncratic consumption with factor income inflow (outflow) growth with respect to its idiosyncratic GDP growth in period *t*, and 1 - β<sub>c</sub><sup>+</sup> (1 - β<sub>c</sub><sup>-</sup>) measures the amount of consumption smoothing via factor income inflows (outflows).

Results are presented in Table 6. It is clear that from 1971 to 1990 factor income inflows or outflows did not positively affect consumption smoothing in any of the three country groups. Since 1990s,

**Table 6**  
Consumption smoothing via net factor income flows and its subcomponents (percent).

	1971–1980	1981–1990	1991–2000	2001–2007
<i>Panel A: EMU</i>				
(1 - β <sub>c</sub> )	61	39	55	62
(8)		(8)	(7)	(9)
(1 - β <sub>c</sub> <sup>+</sup> )	47	28	76	68
(6)		(9)	(9)	(8)
(1 - β <sub>c</sub> <sup>-</sup> )	50	35	48	68
(7)		(7)	(6)	(14)
Observations	110	110	110	77
<i>Panel B: EU</i>				
(1 - β <sub>c</sub> )	50	38	54	58
(7)		(6)	(6)	(7)
(1 - β <sub>c</sub> <sup>+</sup> )	43	32	74	65
(5)		(8)	(8)	(13)
(1 - β <sub>c</sub> <sup>-</sup> )	48	37	52	58
(5)		(7)	(6)	(12)
Observations	140	140	140	98
<i>Panel C: non-EU OECD</i>				
(1 - β <sub>c</sub> )	56	51	54	59
(7)		(4)	(10)	(6)
(1 - β <sub>c</sub> <sup>+</sup> )	49	50	68	61
(5)		(5)	(5)	(14)
(1 - β <sub>c</sub> <sup>-</sup> )	44	44	47	57
(5)		(11)	(5)	(9)
Observations	80	80	80	56

Notes: EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

Non-EU OECD: Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US.

We exclude Luxembourg, since it is an outlier with its position. Percentages describe the shocks absorbed at each level of smoothing. HAC standard errors are shown in brackets. (1 - β<sub>c</sub>) is the percentage amount of consumption smoothing. β<sub>c</sub> is the GLS estimate of the slope in the regression of Δ log  $\tilde{C}_{it}$  on Δ log GDP<sub>it</sub>. (1 - β<sub>c</sub><sup>+</sup>) is the percentage amount of consumption smoothing via factor income inflow channel where β<sub>c</sub><sup>+</sup> is the GLS estimate of the slope in the regression of Δ log (C + FACTOR INCOME INFLOW)<sub>it</sub> on Δ log GDP<sub>it</sub>. (1 - β<sub>c</sub><sup>-</sup>) is the percentage amount of income smoothing via the net factor income outflow channel, and the coefficient β<sub>c</sub><sup>-</sup> is the GLS estimate of the slope in the regression of Δ log (C - FACTOR INCOME OUTFLOW)<sub>it</sub> on Δ log GDP<sub>it</sub>.

**Table 7**

Determinants of income smoothing via net factor income inflows: stock of foreign assets (percent), 2001–2007.

	EU			Non-EU OECD		
Constant( $\gamma_0^+$ )	11 (15)	19 (17)	9 (16)	13 (11)	19 (11)	9 (16)
TREND( $\gamma_1^+$ )	-5 (5)	-6 (1)	-3 (4)	-5 (5)	-6 (3)	-3 (4)
EQUITY ASSETS	-7 (3)			-5 (1)		
DEBT ASSETS		11 (11)			-1 (2)	
FDI ASSETS			-7 (11)			-2 (2)
Observations	98	98	98	56	56	56

Notes: EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

Non-EU OECD: Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US.

HAC standard errors are given in parenthesis. The amount of income smoothing via factor income flow is:  $100 * (1 - \gamma_0^+ - \gamma_1^+ - \gamma_2^+)$ . The parameters,  $\gamma_0^+$ ,  $\gamma_1^+$ , and  $\gamma_2^+$  are estimated from the following regression model:  $\Delta \log(\text{GDP} + \text{FACTOR INCOME INFLOW})_{it} = \gamma^+ \Delta \log \text{GDP}_{it} + \epsilon_{it}$  where  $\gamma^+ = \gamma_0^+ + \gamma_1^+ (\text{TREND} - \overline{\text{TREND}}) + \gamma_2^+ (X_{it} - \overline{X}_t)$ .  $\gamma_0^+$  is the average amount of income smoothing via factor income inflows. TREND is the time trend variable.  $X_{it}$  is either EQUITY ASSETS<sub>it</sub>, or DEBT ASSETS<sub>it</sub>, or FDI ASSETS<sub>it</sub>.  $\overline{X}_t$  is the (un-weighted) average across countries of variable  $X_{it}$ . EQUITY ASSETS<sub>it</sub> is the stock of foreign equity assets (in logarithms) that country  $i$  has at time  $t$ . DEBT ASSETS<sub>it</sub> is the total stock of foreign debt assets (in logarithms) that country  $i$  has at time  $t$ . FDI ASSETS<sub>it</sub> is the total stock of foreign direct investments (in logarithms) that country  $i$  has at time  $t$ .

however, factor income inflows contributed considerably to consumption smoothing. Between 1991 and 2000, consumption smoothing, on the back of capital income inflows, increased by 21% (= 76% – 55%), 20%, and 14% respectively in EMU, EU, and non-EU OECD countries. Although in the recent decade the extent of smoothing has significantly declined, one can still observe positive amount of consumption smoothing via factor income inflows during 2001–2007. By comparison, factor income outflows caused positive consumption smoothing only for the EMU nations.

## 5. Determinants of income smoothing

To shed light on the underlying factors explaining income smoothing via factor inflows and outflows, we estimate Eqs. (5) and (6), which incorporate the amount of foreign assets and liabilities, and an index of diversification of foreign assets constructed earlier. The estimation results are presented in Table 7, which includes the impact of the stocks of foreign assets (debt, equity, and FDI) on income smoothing via factor income inflows for the EU and non-EU OECD samples. It is immediately clear that, and contrary to SWYZ, the amount of foreign assets via factor income inflows causes income dis-smoothing across EU and non-EU OECD countries.<sup>19</sup> While most of the effects are statistically insignificant, particularly for the EU members an increase in foreign asset holdings (i.e., equity inflows) is shown to generate significant income dis-smoothing. Comparable results for factor income outflows are reported in Table 8. Both equity and debt liabilities generate significant amount of income smoothing for the EU countries, whereas the effect of FDI liabilities on income smoothing is although positive but statistically insignificant. Surprisingly, the impact of equity, debt, and FDI liabilities on income smoothing is negative in non-EU OECD countries.

Next, we examine to what extent the patterns of allocation of cross-border investments affect income smoothing via factor income inflows. In particular, we test whether allocating portfolios within the Euro region undermines risk sharing via factor income inflows and,

<sup>19</sup> The estimations for EU and EMU sub-samples are very similar, we decide to skip the tables for EMU sub-sample accordingly.

**Table 8**

Determinants of income smoothing via net factor income outflows: stock of foreign liabilities (%), 2001–2007.

	EU			Non-EU OECD		
Constant( $\gamma_0^-$ )	24 (27)	20 (22)	11 (18)	11 (11)	10 (5)	12 (8)
TREND( $\gamma_1^-$ )	1 (7)	-5 (5)	-4 (4)	-6 (6)	-7 (4)	-5 (3)
EQUITY LIABILITIES	29 (13)			-6 (2)		
DEBT LIABILITIES		70 (44)			-2 (2)	
FDI LIABILITIES			12 (24)			-4 (3)
Observations	98	98	98	56	56	56

Notes: EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the UK.

Non-EU OECD: Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and the US.

HAC standard errors are given in parenthesis. The amount of income smoothing via factor income flow is:  $100 * (1 - \gamma_0^- - \gamma_1^- - \gamma_2^-)$ . The parameters,  $\gamma_0^-$ ,  $\gamma_1^-$ , and  $\gamma_2^-$  are estimated from the following regression model:  $\Delta \log(\text{GDP} - \text{FACTOR INCOME OUTFLOW})_{it} = \gamma^- \Delta \log \text{GDP}_{it} + \epsilon_{it}$ , where  $\gamma^- = \gamma_0^- + \gamma_1^- (\text{TREND} - \overline{\text{TREND}}) + \gamma_2^- (X_{it} - \overline{X}_t)$ .  $\gamma_0^-$  is the average amount of income smoothing via factor income inflows. TREND is the time trend variable.  $X_{it}$  is either EQUITY LIABILITIES<sub>it</sub> or DEBT LIABILITIES<sub>it</sub> or FDI LIABILITIES<sub>it</sub>.  $\overline{X}_t$  is the (un-weighted) average across countries of variable  $X_{it}$ . EQUITY LIABILITIES<sub>it</sub> is the stock of foreign equity liabilities (in logarithms) that country  $i$  has at time  $t$ . DEBT LIABILITIES<sub>it</sub> is the total stock of foreign debt liabilities (in logarithms) that country  $i$  has at time  $t$ . FDI LIABILITIES<sub>it</sub> is the total stock of foreign direct investments (in logarithms) outflows that country  $i$  has at time  $t$ .

more importantly, whether diversification of the portfolio equally between all countries matters for income smoothing via foreign asset revenues. The results are reported in Tables 9 and 10 respectively for EU and non-EU OECD countries. The third and fourth rows in Table 9 indicate whether risk sharing is more correlated with the amount of assets invested in EMU countries (where returns are likely to be more synchronized). The third row reports the estimated coefficient of Euro countries' share of foreign debt holdings, which is negative with respect to income smoothing. This is not surprising given the remarkable degree of convergence achieved among government bond yields as well as corporate bond returns across Euro markets.<sup>20</sup> The observed high extent of convergence has in turn diminished the scope of risk sharing from debt instruments. On the contrary, cross-border equity investment provided positive (but statistically insignificant) income smoothing. The last two rows report the estimated coefficients of the diversification index created for foreign debt and equity portfolios respectively. As can be seen, both debt and equity provided significant positive smoothing, indicating that when countries diversify their portfolios equally across different markets, risk sharing improves. Turning to non-EU OECD countries, we observe that holding debt and equity assets from Euro region caused income dis-smoothing (see Table 10). By comparison, both diversification indices for equity and bond assets have positive and significant coefficients. Similar to the results in Table 9, as countries have more diversified foreign portfolios risk sharing via revenues from those portfolios increases.<sup>21</sup>

<sup>20</sup> See, e.g., Baele et al. (2004), Pagano and von Thadden (2004), Balli (2009), Balli et al. (2010b), and Fuss et al. (2010).

<sup>21</sup> As a check of robustness, we also employed the alternative measures of diversification proposed by Lane and Milesi-Ferretti (2007). Our proposed measure of diversification shows a strong positive correlation with that of Lane and Milesi-Ferretti (2007): 0.73 for the entire sample, and 0.82 for the EU sample. Not surprisingly, empirical results presented in Tables 9 and 10 are significantly affected when using the Lane and Milesi-Ferretti's (2007) measure. These unreported results are available on request.

**Table 9**  
Determinants of income smoothing via net factor income inflows: diversification index and Euro portfolio shares (EU countries, percent).

	(1)	(2)	(3)	(4)
Constant( $\gamma_0^+$ )	23 (27)	18 (8)	26 (18)	24 (11)
TREND( $\gamma_1^+$ )	-10 (7)	-12 (6)	-12 (5)	-11 (5)
EURO SHARE DEBT ASSETS	-24 (7)			
EURO SHARE EQUITY ASSETS		8 (8)		
DIVERSIFICATION OF DEBT PORTFOLIO			31 (14)	
DIVERSIFICATION OF EQUITY PORTFOLIO				29 (8)
Observations	98	98	98	98

Notes: EU: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain, Sweden, and the UK.  
HAC standard errors are given in parenthesis. The amount of income smoothing via factor income flows is:  $100(1 - \gamma_0^+ - \gamma_1^+ - \gamma_2^+)$ . The parameters,  $\gamma_0^+$ ,  $\gamma_1^+$ , and  $\gamma_2^+$  are estimated from the following regression model:  $\Delta \log(\text{GDP} + \text{FACTOR INCOME INFLOW})_{it} = \gamma^+ \Delta \log \overline{\text{GDP}}_{it} + \epsilon_{it}$ , where  $\gamma^+ = \gamma_0^+ + \gamma_1^+(\text{TREND} - \text{TREND}) + \gamma_2^+(X_{it} - \bar{X}_t)$ .  $\gamma_0^+$  is the average amount of income smoothing via factor income inflows. TREND is the time trend variable.  $X_{it}$  is either EURO SHARE DEBT ASSETS<sub>it</sub> or EURO SHARE EQUITY ASSETS<sub>it</sub> or DIVERSIFICATION OF DEBT PORTFOLIO<sub>it</sub> or DIVERSIFICATION OF EQUITY PORTFOLIO<sub>it</sub>.  $\bar{X}_t$  is the (un-weighted) average across countries of variable  $X_{it}$ . EURO SHARE DEBT ASSETS<sub>it</sub> is the share of Euro countries in the foreign debt assets of country  $i$  at time  $t$ . EURO SHARE EQUITY ASSETS<sub>it</sub> is the share of Euro countries in the foreign equity assets of country  $i$  at time  $t$ . DIVERSIFICATION OF DEBT PORTFOLIO is a diversification index created to measure the extent of the diversification of the foreign debt assets of country  $i$  at time  $t$ . DIVERSIFICATION OF EQUITY PORTFOLIO is a diversification index created to measure the extent of the diversification of the foreign equity assets of country  $i$  at time  $t$ .

**6. Conclusions**

In this paper we decompose the net factor income flows into factor income inflows and factor income outflows in order to examine the sole effect of revenues from foreign asset holdings on income smoothing. We find that net factor income channel in the OECD countries during 1999–2007 period is mainly driven by net financial asset income, while the other two sub-components (net compensation of employees and net taxes on imports) turn out to be ineffective. Once factor income inflows are distinguished from outflows, empirical evidence suggests a non-significant effect of inflows in terms of income smoothing as opposed to a positive and significant role of factor income outflows (18% of the output shocks smoothed for the EMU and 16% for the EU). We find that (i) the tendency of European investors to allocate a sizeable portion of their assets with the Euro zone (Euro portfolio bias) and (ii) the increasing business cycle synchronization among EU economies have lead to pro-cyclical movements between the foreign asset revenues and domestic output shocks, thereby undermining risk sharing mechanism. When shocks to income are decomposed into positive and negative realizations, results reveal that factor income outflows are statistically significant only to smooth the positive shocks to GDP, while neither inflows nor outflows channels are significant enough in attenuating negative output shocks. Furthermore, the factor income outflow channel appears to be robust to longer lasting shocks than factor inflows, while the latter play an important role for consumption smoothing in recent years. We go on to explore the determinants of income smoothing and document that an increase in foreign equity and debt liabilities positively affects the extent of smoothing via factor income outflows. Whereas, contrary to the current literature, an increase in foreign asset holding does not have a positive impact on smoothing via factor income inflows. We also notice that the diversification of foreign equity and bond holdings across various markets leads to an improvement in risk sharing through factor income inflows.

**Table 10**  
Determinants of income smoothing via net factor income inflows: diversification index and Euro portfolio shares (non-EU OECD countries, percent).

	(1)	(2)	(3)	(4)
Constant( $\gamma_0^+$ )	-29 (12)	-31 (12)	25 (17)	17 (11)
TREND( $\gamma_1^+$ )	8 (3)	6 (3)	11 (7)	-6 (6)
EURO SHARE DEBT ASSETS	-36 (18)			
EURO SHARE EQUITY ASSETS		-23 (15)		
DIVERSIFICATION OF DEBT PORTFOLIO			25 (13)	
DIVERSIFICATION OF EQUITY PORTFOLIO				69 (26)
Observations	56	56	56	56

Notes: Non-EU OECD: Australia, Canada, Japan, Korea Republic, New Zealand, Norway, Switzerland, and the US.  
HAC standard errors are given in parenthesis. The amount of income smoothing via factor income flows is:  $100(1 - \gamma_0^+ - \gamma_1^+ - \gamma_2^+)$ . The parameters,  $\gamma_0^+$ ,  $\gamma_1^+$ , and  $\gamma_2^+$  are estimated from the following regression model:  $\Delta \log(\text{GDP} + \text{FACTOR INCOME INFLOW})_{it} = \gamma^+ \Delta \log \overline{\text{GDP}}_{it} + \epsilon_{it}$ , where  $\gamma^+ = \gamma_0^+ + \gamma_1^+(\text{TREND} - \text{TREND}) + \gamma_2^+(X_{it} - \bar{X}_t)$ .  $\gamma_0^+$  is the average amount of income smoothing via factor income inflows. TREND is the time trend variable.  $X_{it}$  is either EURO SHARE DEBT ASSETS<sub>it</sub> or EURO SHARE EQUITY ASSETS<sub>it</sub> or DIVERSIFICATION OF DEBT PORTFOLIO<sub>it</sub> or DIVERSIFICATION OF EQUITY PORTFOLIO<sub>it</sub>.  $\bar{X}_t$  is the (un-weighted) average across countries of variable  $X_{it}$ . EURO SHARE DEBT ASSETS<sub>it</sub> is the share of Euro countries in the foreign debt assets of country  $i$  at time  $t$ . EURO SHARE EQUITY ASSETS<sub>it</sub> is the share of Euro countries in the foreign equity assets of country  $i$  at time  $t$ . DIVERSIFICATION OF DEBT PORTFOLIO is a diversification index created to measure the extent of the diversification of the foreign debt assets of country  $i$  at time  $t$ . DIVERSIFICATION OF EQUITY PORTFOLIO is a diversification index created to measure the extent of the diversification of the foreign equity assets of country  $i$  at time  $t$ .

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