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## Article

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## A Review of International Risk Sharing for Policy Analysis

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This paper offers a comprehensive view of international risk sharing and of related policy issues from the perspective of the European Union. The traditional analyses contemplate three risk-sharing channels: the capital markets channel (through cross border portfolio investments), international transfers and the credit markets channel (via savings). Comparative analyses reveal that, on average, about 80% of the shock remains unsmoothed in Europe while only about 18% of the shock is transmitted to consumers within the US. From aggregated figures, there is space for improving, particularly, the cross-border investments channel in Europe. In this sense, the completion of the Banking and Capital Markets Union are expected to boost risk sharing across European member states. We also review new additional issues usually not contemplated by the traditional literature as depreciation, migration and the role of sovereigns and two new additional channels recently considered in the literature: government consumption and the real exchange rate. Finally, we also examine recent analysis related to the geographic distribution of risk sharing.

*Keywords:* International Risk Sharing, Monetary Union, Policy Analysis,  
Consumption Smoothing, Cross-border Investments

*JEL Classification:* F01, F40, F45

## I. INTRODUCTION

The topic of risk sharing has recently attracted the interest of policy makers and the specialised literature. The debate on risk sharing has been particularly lively within the European Union where *sharing risks* is related to the stabilization role of the Monetary Union (the Euro area) and the need to increase economic convergence (ECB, 2018b). The Five Presidents' Report (Juncker, 2015) remarks that risk sharing is an effective mechanism at work to cushion output shocks and to detach consumption from output dynamics. This implies that risk sharing helps **smoothing consumption** patterns in case of economic downturns. The policy relevance of the issue is also witnessed by the European Central Bank (ECB) that started to compute an indicator for monitoring the evolution of risk sharing in the Euro area (ECB, 2018a).

This section will introduce the concept of risk sharing, identifying some of the institutions and policy actions able to foster risk sharing within the EU. Finally, we will review several general aspects of the functioning of risk sharing.

### *1. Risk Sharing: What Is It?*

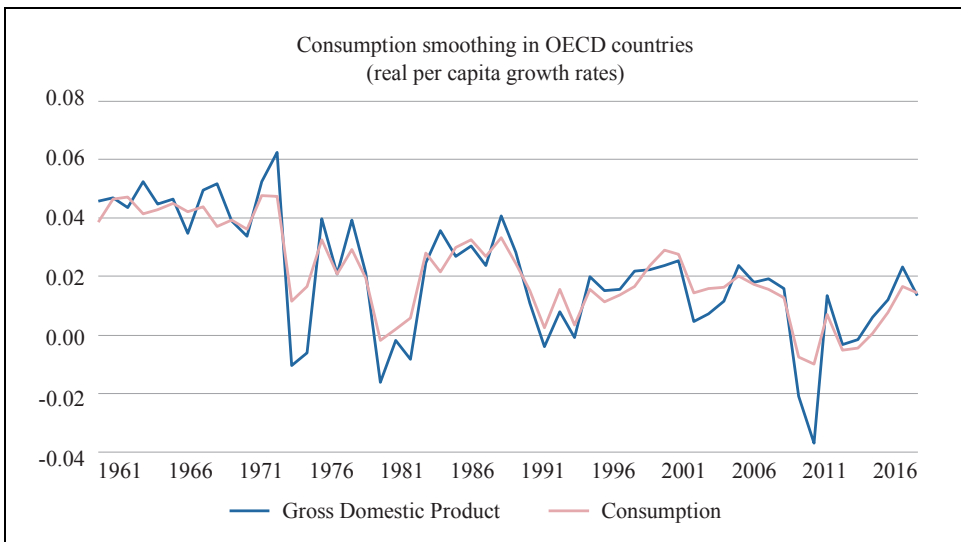
The key idea in international risk sharing is to sustain/smooth consumption when the domestic economy experiences economic down- or upturns by means of inflows/outflows of money from abroad. This is the case when, for instance, households in a specific country receive income flows from investments held abroad. If the home country experiences an economic downturn but the foreign country does not, then, income flows from the latter actually mitigate the domestic output drop. As a result, with risk sharing, fluctuations of consumption should be unrelated to fluctuations of GDP. Figure 1 illustrates the point plotting the growth rates of both GDP and consumption in OECD countries.<sup>1</sup> Fluctuations in consumption growth rates are smoother than those of GDP (the ups and downs on consumption are usually of a lower magnitude of those in GDP) and, therefore, not all GDP movements are passed into consumption. Notice, for instance, the plunge during the period 2008-2009 when both

<sup>1</sup> More precisely, the data plotted are growth rates of average real GDP and consumption per capita of a set of OECD countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and United Kingdom, Australia, Canada, Japan, New Zealand, Norway and US. Sample 1960-2016.

GDP and consumption growth rates became negative, with the latter dropping less than the former. Even during the worst crisis period, the shock to GDP was not entirely passed into consumption.

In this report we deal with the portion of risk sharing that can be obtained through cross-border channels, i.e. international markets. A higher risk sharing achieved through international channels would, other things being equal, soften the need for domestic fiscal and monetary policy interventions attenuating country-specific GDP shocks. This is especially relevant in a currency union where the monetary policy is in the hands of a central monetary authority. International risk sharing can act as a quick and flexible channel to face adverse output shocks, minimizing the risk of recession and stabilizing consumers' welfare.

Figure 1. Growth Rates of Average GDP and Consumption in OECD Countries



Source: Authors' calculations on AMECO database

## 2. Risk Sharing and the EU

EU institutions recognize the importance of improving risk sharing as a way to increase the resilience of the European economy. The launch of Banking Union in 2012 has been the most important policy initiative to advance euro area integration since the adoption of the common currency in 1999. The Banking Union can help

making the capital of local banks independent from regional or national availability of credit supply thus reducing the probability and the intensity of a recession. However, the Banking Union is not still complete; banks operate mainly on a national basis, in particular for retail credit markets (in 2017 domestic institutions accounted for 86% of loans to euro area non-financial institutions) and the foreign-owned banks' share of domestic banking system is about 17% (see Committee on the Global Financial System, 2018). One of the purposes of the Banking Union is to make European banking unified "by treating national and cross-border banking activities equally and by delinking the financial health of banks from the countries in which they are located".<sup>2</sup> Therefore, the link goes bi-directionally. On the one hand, a complete banking union would foster risk sharing and, on the other hand, the Banking Union can only work if risk sharing is at play. In the aftermath of the financial crisis among the instruments put in place to assure permanent firewalls to the Eurozone, the European Stability Mechanism<sup>3</sup> (ESM) has been the major example of public risk sharing mechanism. Although not created with the specific purpose of risk sharing, ESM actually serves as an instrument to mitigate economic downturns by inflows of money helping countries experiencing financial stress due to severe downturns (e.g. ESM granted international loans to Cyprus and Greece as part of a macroeconomic adjustment programme).<sup>4</sup>

Starting from 2015 another Commission initiative, the Capital Markets Union, put in place measures to diversify and amplify sources of finance to ensure the removal of obstacles to free capital movements across borders. The development of a more integrated financial market would allow a reduction of the extent of home bias and, therefore, a reshuffling of international portfolios more balanced, and more effective for international risk sharing. The Commission has proposed a number of initiatives to improve capital market access. Examples are approved measures such as the Prospectus Directive that reduces burdens for companies issuing shares and bonds, or the tabled initiatives on common rules for insolvency procedures, common consolidated

<sup>2</sup> European Central Bank. <<https://www.bankingsupervision.europa.eu/about/bankingunion/html/index.en.html>> (accessed June 20, 2019)

<sup>3</sup> See, for instance, Cimadomo et al. (2018) for an estimation of the risk sharing achieved through loans provided by ESM.

<sup>4</sup> Previously, a similar task was performed by the the European Financial Stability Facility (EFSF) that provided financial assistance to Ireland, Portugal and Greece by issuing EFSF bonds and other debt instruments on capital markets contributing to the cross-border flow of capital.

corporate tax base, improved passporting rules for the cross-border distribution of investment funds, and legal certainty for cross-border securities' ownership rights.<sup>5</sup> Whether these initiatives will actually play a role in fostering cross-border capital markets strictly depends on their timely adoption and implementation. Within the Capital Markets Union (CMU) initiative, the European Investment Bank (EIB) group and the European Commission established the European Fund for Strategic Investments (EFSI) in 2015. EFSI provides a form of public risk sharing as it contributes to the financing of projects if private capital is not available or does not reach spontaneously. Jaillet and Vidon (2018) point out that enhancing macroeconomic stability through new proposed instruments will help to facilitate private risk sharing by the reduction of macroeconomic risk.

### *3. General Aspects Regarding Risk Sharing*

Besides the “public” risk sharing that can be achieved with a common fiscal policy or with the aid of public institutions, “private” risk sharing channels play a crucial role too. Indeed, risk sharing can be achieved by economies through portfolio diversification: when agents buy foreign assets, they take advantage of foreign business cycle dynamics not perfectly correlated with the domestic ones, thus diversifying risk. This increases the resilience of residents with respect to income shocks through international income flows (dividends, interests) distributed on international financial markets. There are also other private factors at work and potentially capable of affecting risk sharing opportunities: the analysis by Cole and Obstfeld (1991), for example, highlights the role played by international trade of commodities.

Second, not all mechanisms related to risk sharing work at the same time. Some risk sharing mechanisms work ex-ante, meaning that their functioning is put in place before the shock takes place. This is, for example, the case of an economic agent who receives dividends, as this monetary flow is defined independently from the shock hitting the economy. On the contrary, there are ex- post risk sharing mechanisms that work after the shock takes place. This is, for instance, the case when – due to an economic downturn – an economic agent loses her job and borrows money from a foreign bank to stabilize her consumption path. This classification is important for policy makers,

<sup>5</sup> European Commission. <[https://ec.europa.eu/info/sites/info/files/180308-communication-cmu-fact-sheet\\_en.pdf](https://ec.europa.eu/info/sites/info/files/180308-communication-cmu-fact-sheet_en.pdf)> (accessed June 20, 2019)

as ex-ante mechanisms do not require discretionary policy interventions. On the opposite, ex-post mechanisms can require policy intervention to be effective. The economic analysis has identified a standard decomposition of overall risk sharing into three main channels: the capital markets, the international transfers, and the credit markets channels. The role played by these channels is analyzed in depth in paragraph II.2.

Finally, consumption smoothing can take place along several dimensions: at a specific point in time across the economies (interspatial risk sharing) or through time (intertemporal consumption smoothing).

Although the basic facts and intuitions are valid for any form of risk sharing both from the micro and macro points of view, our focus is international risk sharing, keeping in mind the policy perspective. Risk sharing can also take place at the national level, among regions or states of a country or even at the micro level. The issue of regional risk sharing has been analysed – among others – in Asdrubali et al. (1996) for interstate risk sharing in the US or by Buettner (2002) for Germany. We, instead, focus on **international risk sharing**, as we are interested in cross-border channels at work both among EU member states and among member states and third countries.

#### *4. Structure of the Paper*

In Section II we present the classical channels approach usually employed in the empirical analysis and review actual measures for the US and EU. In Section III we review the recent research that has been carried out to have a geographical description of risk sharing, country by country, instead of average values for a set of economies as it is usually done in standard analyses. In Section IV, we provide new optics to the traditional channels pointing out additional ways for risk sharing, especially stressing the role played by national governments. Finally, in Section V, we draw some conclusions and give some policy recommendations.

## II. ON RISK SHARING MEASUREMENT: THE RATIONALE

Measuring risk sharing essentially means assessing what fraction of an economic shock is transmitted to citizens who see reduced their consumption prospects, and which part is instead taken in charge by different channels corresponding to public support policies or private insurance mechanisms.

In this section, we will review how international risk sharing is measured. Starting with the ideal case of perfect or total risk sharing, that is, when zero percent of GDP idiosyncratic shocks are transmitted into consumption, we will deviate to the scenario found in real-world economies, where a percentage of the shocks is transmitted from GDP to consumption. In doing so, we are measuring how domestic consumption reacts to output shocks.<sup>6</sup>

Consider, first, an ideal world of perfect risk sharing where agents are completely insured against every diversifiable risk by trading state-contingent assets on complete markets. This makes their consumption stream linked only to global consumption, but completely detached from personal income. This theoretical economy is taken as the benchmark, and the distance from it is used to measure risk sharing. Within this approach, which is dominant in the specialized literature, the elasticity of domestic consumption to domestic income is employed as a measure of the percentage of shocks that are passed to consumption and its complement to 1 is the measure of risk sharing. Indeed, the higher is the link between domestic consumption and income, the lower will be individuals' insurance capability, i.e. the poorer risk sharing will be. Consider, for example, the case of unemployment insurance. If a worker is insured, she can continue to consume also when not employed, as she receives benefits from the insurance scheme. In this way, the link (i.e. elasticity) between personal income – before benefits – and consumption is weakened. This represents a signal of better risk sharing, as the worker's consumption is – with insurance – more resilient to changes in the conditions of the labour market.

On the opposite end of the spectrum – when risk sharing is absent – the elasticity of domestic consumption to domestic income is equal to one. In this case, consumption choices are fully conditioned by current income. In all intermediate cases, with an elasticity between zero and one, the impact of a change in income will be only partially transmitted to consumption. It follows that, *ceteris paribus*, the higher is risk sharing, the higher will be the consumers' welfare, as individuals will be able to isolate the dynamics of their consumption stream from shocks originated from diversifiable risks.

<sup>6</sup> In the literature on risk sharing the following terms are equivalent: idiosyncratic GDP, GDP shocks or idiosyncratic GDP shocks. They all refer to the deviation of a country's GDP growth rate from the global average GDP growth rate. Shocks are constructed by subtracting the global average from the own country growthrate.



In synthesis, risk sharing is measured by the fraction of income changes which are not converted by agents into changes in consumption, and it is measured by the complement to one of the elasticity of agent's consumption to income. The lower the correlation between the two variables, the higher risk sharing.

### *1. Transmission of Shocks from GDP to Consumption*

The theoretical model for risk sharing under complete markets has been originally developed for microeconomic agents. However, the interest of the empirical literature has progressively shifted toward macroeconomic units, such as geographical areas, individual countries or regions within a given country. Following the same approach as for microeconomics, in macroeconomics the lack of risk sharing is measured using elasticity of *aggregate* domestic consumption to *aggregate* domestic GDP (as mentioned for the micro level, the measure of risk sharing is its complement to 1). Indeed, the higher the elasticity, the lower the risk sharing.

Risk sharing is a concept related to the amount of risk shared – on average – *among* a set of countries and, consequently, its extent depends on how the countries are chosen. In order to obtain sensible results, it is necessary to select a group of macroeconomic units characterized by a high level of economic integration. Examples could be the countries members of the Euro Area, the federal states of the US or the group of OECD countries. In this paper we focus on the EU. This choice has been dictated by its policy relevance. Indeed, for European policy-makers, the understanding and the improvement of risk sharing mechanisms at work constitute a way to increase financial and economic integration among member states.

To give a concrete example of how risk sharing works in real-world economies, let us consider two economies with developed financial markets, and with business cycles that are not perfectly synchronised. If citizens of these two economies hold foreign assets, as for example bonds and equities, their income is linked to the business cycle of the foreign economy through the flow of dividends and interests received on foreign assets, which implies smoother dynamics of their disposable income with respect to the case of no cross-border trade of assets. In this way, a negative shock to the domestic economy is attenuated by the flow of income received from foreign financial markets that is not correlated with domestic income.

When dealing with international risk sharing, its measurement relies almost exclusively on national accounts data. Indeed, the empirical counterpart of the notion

of income is GDP, while the empirical counterpart of consumption is Final Consumption Expenditure. Raw figures are usually expressed in real terms (deflating them by the Consumer Price Index), and converted in per-capita real terms dividing by population. After converting them into stationary, cross-sectional averages of real per-capita figures are subtracted from real per-capita variables to get real per-capita idiosyncratic GDP and consumption growth rates (simply GDP and consumption hereinafter). The last step of the analysis consists in running the regression of the growth rate of consumption (the left-hand side variable) on GDP (the right-hand side variable), to get an estimate of the (short- run) elasticity between the two variables, a standard measure of the lack of risk sharing *among* the countries included in the analysis. The regression that reflects this is

$$\Delta \log(C) = \beta_0 + \beta_U \Delta \log(\text{GDP}) + u_U$$

where in this regression variables are idiosyncratic, i.e taken as difference with respect to the cross-sectional average. This is done to ensure consistency with the testable implications of complete markets theory. The degree of risk sharing is measured as  $1 - \beta_U$ . If  $\beta_U = 0$ , there is full risk sharing. On the contrary, if  $\beta_U > 0$ , GDP shocks are, at least, partially passed to consumption. In the extreme case of  $\beta_U > 1$ , GDP shocks are amplified rather than smoothed and the measure of risk sharing becomes negative.

The seminal paper by Asdrubali et al. (1996) has spurred a vast empirical literature on measuring risk sharing. They found that around 3/4 of GDP shocks were smoothed in the US by virtue of intrastate risk sharing. Later updates of these measures due to the European Commission (2016) corroborate these figures nowadays, although the ECB finds a slightly lower amount of GDP shocks smoothed.

Risk sharing in Europe has drawn a lot of attention at least in two occasions: in the proximity of the introduction of the euro, and more recently, after the Great Recession and the subsequent sovereign debt crisis, when the European authorities considered it as a mechanism to mitigate the impact of idiosyncratic shocks. The early studies in the EU (before the euro) concluded that risk sharing was low in all channels for several groups of countries (Sørensen and Yosha, 1998). However, a few years later, Kalemli-Ozcan et al. (2005) found that risk sharing within the EU improved over the 90's due to increased cross-border ownership of assets. Méлитz and Zumer (1999) found that about 75-80% of idiosyncratic output shocks remain unsmoothed in the EU countries

although they argued that markets would increase their smoothing capacity in the monetary union due to augmented credit availability and openness.

Demyanyk et al. (2008) used panel regressions for the subsamples 1995-1999 and 2000-2006 for different groups of EU countries. They found that income risk sharing had been higher in the 5 years following the introduction of the euro, but consumption smoothing generally decreased. Furceri and Zdzienicka (2015) estimated risk sharing in 15 countries of the Euro Area (EA) for the period 1979-2010 and found that 66% of the shocks in the EA are not smoothed. Poncela et al. (2016) computed average measure of risk sharing and found that 3/4 or more of GDP idiosyncratic shocks remain unsmoothed in the European Union (a sample of the results is in Table 1).

Table 1. Percentage of Risksharing for Different Groups of Countries<sup>7</sup>

	European Union		Euro Area		OECD (21 countries)	
	1960-1998	1999-2014	1960-1998	1999-2014	1960-1998	1999-2014
Capital	<b>-0.66</b> (-0.76)	<b>0.45</b> (-1.84)	<b>0.19</b> (-0.88)	<b>1.13</b> (-1.95)	<b>-1.11</b> (-0.52)	<b>3.95</b> (-1.85)
Gov	<b>0.21</b> (-0.55)	<b>0.11</b> (-0.44)	<b>0.45</b> (-0.64)	<b>-0.03</b> (-0.47)	<b>0.17</b> (-0.34)	<b>-0.49</b> (-0.32)
Credit	<b>28.69</b> (-2.46)	<b>14.18</b> (-2.78)	<b>31.12</b> (-2.89)	<b>13.07</b> (-2.84)	<b>25.10</b> (-1.85)	<b>23.99</b> (-2.83)
Unsmoothed	<b>72.18</b>	<b>85.26</b>	<b>69.52</b>	<b>85.83</b>	<b>75.78</b>	<b>72.56</b>

Note: 'Capital' stands for the capital markets channel; 'Gov' for the government channel; 'Credit' for the credit markets channel; 'Unsmoothed' is the percentage of unsmoothed shocks.

Source: Poncela et al. (2016)

## 2. Standard Decomposition of Overall Risk Sharing into Channels

To dig into the factors at work in smoothing the transmission of shocks from GDP to consumption, the standard approach of the literature (Asdrubali et al., 1996) has been to decompose the overall measure of risk sharing into the following channels:

<sup>7</sup> EU includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and UK. EA includes Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. OECD includes the same countries as those on footnote 1. Results are from a panel VAR (on impact).

- Capital markets
- International transfers
- Credit markets or savings

This methodology relies on the structure of national accounts where

$$\text{Gross Domestic Product (GDP) - Final Consumption Expenditure (C)} \\ = \text{Net Factor Income (NFI) + Net International Transfers (NIT) + National Savings (S)}$$

The deviation of GDP from consumption must be reflected in the three terms of the right-hand side of the identity, Net Factor Income, Net International Transfers and Savings. In other terms, this decomposition allows to disentangle how much risk sharing is due to: NFI, mainly dividends and interests perceived from foreign assets (capital markets channel); NIT, international aids received from other countries (international transfers channel); national savings, (credit markets channel).

For clarifying the way the three channels work, consider the case of a negative country-specific shock, and how these three channels can contribute to smooth its final impact on consumers' welfare. If residents hold equities on foreign markets, the dividends distributed on these assets will depend on the economic situation of foreign economies. To the extent that the business cycles of the domestic and foreign economies are not perfectly synchronized, if national income (that includes net foreign income) experiences a fall, it will be lower than the original GDP shock (capital markets channel). Similarly, if following a negative shock to GDP a country receives an international aid, the fall in national disposable income will be less severe than the fall in GDP (international transfers channel). Lastly, economies can compensate the fall in GDP borrowing on international financial markets that is de-cumulating the stock of aggregate national saving (credit markets). The following subsections describe each channel in more detail.

### 1) Capital markets channel

Following the structure of national accounts, three regressions can be used to estimate the amount of smoothing achieved through the three channels introduced before. All variables are expressed in real per capita terms, and after computing the growth rates, in deviations from the cross-sectional average.

The percentage of shocks that are smoothed through the capital markets channel can be estimated from the coefficient  $\beta_K$  of the regression

$$\Delta \log(\text{GDP}) - \Delta \log(\text{GNI}) = \beta_{0,K} + \beta_K \Delta \log(\text{GDP}) + u_K \quad (1)$$

which is based on the difference between GDP and Gross National Income. It corresponds to national accounts' Net Factor Income category and accounts for two types of income generated abroad for a given country: income from work and income from property or investments. The first one refers to compensations to national employees working abroad for less than a year. Migrants are excluded if living in the foreign country for more than one year. This first component is residual and hardly considered in empirical analysis. The second component represents around 98% of the smoothing that takes place through this channel. It includes factor income from abroad gained from properties (e.g. buildings, shops, factories, financial assets like bonds and shares in foreign countries) and earnings, thereby, rents and interests. The item also includes profits earned from entrepreneurial activities of goods and services production. It covers income from foreign direct investments, portfolio investment incomes and other investment incomes, and includes payments on debt securities (interests) and on equity securities (dividends). Notice that capital gains and losses coming from buying or selling activities/securities do not pertain to this channel since, in national accounts, they are classified as part of the value of the investments (and, therefore, included in the credit markets or savings channel). Risk sharing achieved through this channel is also known as income smoothing.

The seminal paper by Asdrubali et al. (1996) found for US that intrastate risk sharing due to the capital markets channel was around 40%. Twenty years later, Parsley and Popper (2018), for the sample 1997-2015, have found a similar percentage, about 43%. Estimates for Europe are much lower, usually less than 5%, depending on the countries in the sample, years and the estimation technique.

## 2) International transfers: fiscal (Government) channel

The percentage of shocks smoothed through International Transfers can be estimated from the  $\beta_F$  coefficient of the regression:

$$\Delta \log(\text{GNI}) - \Delta \log(\text{GDI}) = \beta_{0,F} + \beta_F \Delta \log(\text{GDP}) + u_F \quad (2)$$

that is based on the difference between Gross National Income and Gross Disposable Income, i.e. Net International Transfers. It is usually named as the fiscal or government channel, or **public risk sharing**. The name comes from the original study of intra-national risk sharing applied to US states where the channel included fiscal transfers among US states. In international risk sharing, the role of governments is a different way as, for instance, through government savings.

When applied to international risk sharing, it picks up the percentage of GDP shocks smoothed through International Transfers. It includes transfers made by a resident entity to a non-resident entity without an economic counterpart, such as general government transfers (transfers between governments and international cooperation entities); cash transfers between governments for financing current expenditures; gifts of food, international aids for earthquakes or natural disasters; gifts of military equipment and regular contributions paid by governments to international organizations and vice versa. Included here are also transfers between governments and non-residents other than governments and international organizations. For instance, current taxes on income or social security contributions between a government and non-residents are also classified as international transfers. Some categories of cross-border private transfers are also recorded in this category, like workers' remittances by migrants (living in the foreign country for more than one year) and international transfers between private entities aimed to alleviate poverty and the consequences of natural disasters. A European Unemployment Benefit Scheme, if in place, would fit into this channel. Beblavý et al. (2017) claim that such an automatic stabilizer would be able to smooth asymmetric small or medium shocks but not symmetric shocks or large asymmetric shocks through geographical redistribution of resources that have been previously put in common.

Asdrubali et al. (1996) found for US that intrastate risk sharing was around 13% for the fiscal or federal channel. The update given in Parsley and Popper (2018) for 1997-2015 estimates that 16% of GDP shocks are smoothed through taxes and transfers. For Europe, this channel does not contribute to risk sharing, according with all estimations. However, this does not mean that public risk sharing does not exist in practice. The EFSF and the ESM have performed the role of public risk sharing in the EU during the crisis period, although it was not their initial goal. Since their financial assistance is, basically, in the form of loans, they contribute to the credit markets channel.

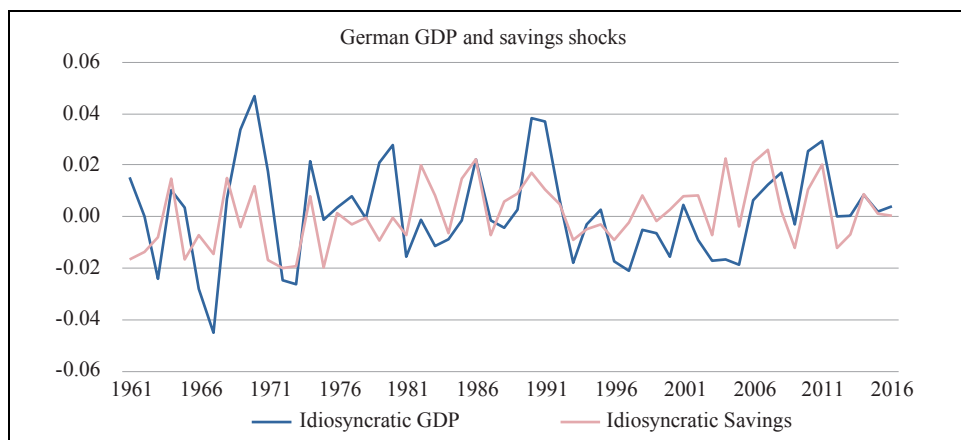
### 3) Credit markets or savings channel

The channel that is responsible for the bulk of risk sharing – according to the empirical literature, both in the EA and the EU, is the credit markets or savings channel. It can be estimated by means of the  $\beta_c$  parameter in the regression:

$$\Delta \log(\text{GDI}) - \Delta \log(\text{C}) = \beta_{0,c} + \beta_c \Delta \log(\text{GDP}) + u_c \quad (3)$$

and is based on the difference between Gross Disposable Income and Final Consumption. This difference is the balancing item in the system of national accounts that corresponds to gross savings. It comprises not only household savings, but also corporate and government savings. This item corresponds to the sum of net lending/borrowing to/from the rest of the world plus gross capital formation and net capital transfers to the rest of the world. Capital transfers include transfers of asset ownership (other than inventories and cash), or the cancellation of a liability by a creditor without an economic counterpart, capital taxes, investment grants and other capital transfers. In Figure 2 we report GDP and savings shocks for Germany. Notice that, on average, positive (negative) movements of idiosyncratic GDP correspond to positive (negative) movements in idiosyncratic savings, showing that the latter is absorbing a large part of income fluctuations instead of passing them into consumption.

Figure 2. GDP and Savings Shock for Germany



Note: The series are defined with respect to the cross-sectional average of the set of OECD countries defined in footnote 1. Sample 1960-2016.

Source: Authors' calculations on AMECO database.

The saving channel has also a domestic connotation, through gross capital formation, since agents can smooth consumption not only by borrowing and lending on international markets but also, for instance, by investing less. **This channel therefore covers both national and international smoothing effects.** Separating the two is very difficult and strictly depends on data availability (poor for the time being).

Once equations (1) to (3) are estimated, the overall degree of risk sharing is computed as  $1 - \beta_K - \beta_F - \beta_C$ .

Asdrubali et al. (1996) found that intrastate US risk sharing was around 23% for the credit markets channel. More recent estimates given in Parsley and Popper (2018), place risk sharing via credit markets channel at 17% (19% with durables included) and Milano (2017) at 12%.

This channel is responsible for the bulk of international risk sharing in the EU as well. It collapsed during the Great Recession and the subsequent sovereign crisis in peripheral European countries. However, it recovered and returned recently to its pre-crisis levels (at around 25%, Nardo et al., 2017). For several countries (among them, Italy and Portugal), the savings channel acted as shock amplifier during and in the aftermath of the recession started in 2008, provoking a significant amount of dis-smoothing, as already highlighted by Kalemli-Ozcan et al. (2014).

### 3. *Comparison US-Europe*

The actual amount of risk sharing depends on a number of factors: first, on the chosen set of countries as it captures the amount of interlinkages across these countries; second on specific institutional factors that shape the functioning of the risk sharing channels; lastly consumption and saving choices of households and individuals reflect not only economic incentives but also cultural aspects not always easy to identify or measure.

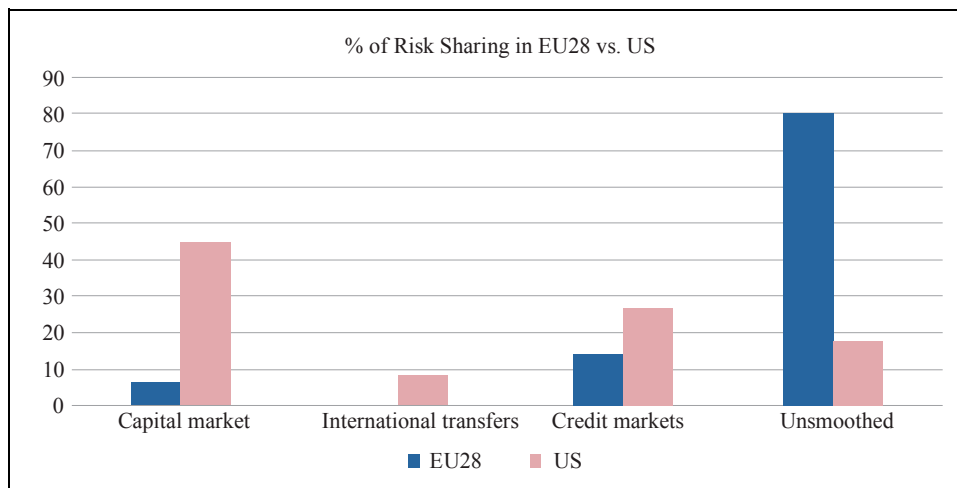
When paralleling Europe with US one has to be aware that the measures of risk sharing are not totally comparable between them for several reasons. First, the institutional framework is different. While the US is a common currency area with a common fiscal policy, the European Monetary Union (EMU) is a common currency area without a common fiscal policy and the EU is neither a common currency area, nor share the common fiscal policy.



Second, the data definitions are not equivalent. For instance, the capital markets channel in the US includes depreciation and retained earnings of the corporate sector. In Europe, depreciation, if computed as a channel of risk sharing, goes on a separate basis and retained earnings of the corporate sector are classified into the credit channel. However, Alcidi et al. (2017) point out that these differences do not jeopardise the overall message: risk sharing in Europe is smaller than in the US, particularly that associated to the capital markets channel.

The European Commission (2016) confirms this finding by comparing risk sharing estimates in the EU and the US (Figure 3). It concludes that the Eurozone lags behind the US and that there is room for increasing shock smoothing, especially through the capital market channel. The report estimates that the direct impact of output shocks on consumption is almost four times bigger in the Eurozone than it is in the US. Ioannou and Schäfer (2017) also present a literature review for the EA and collect the comparisons between US and the EA corroborating the previous results.

Figure 3. Contribution of Different Risk Sharing Channels in EU28 and in US



Source: US figures are from the European Commission (2016), EU28 figures are from Nardo et al. (2017).

Milano (2017) finds that only 1/4 of GDP shocks are smoothed in the EA while this number goes up to 60% when considering only core countries.<sup>8</sup> This figure (60%) is comparable to the smoothing achieved in the US. Surprisingly, she also finds that the credit markets in the US only smoothed between 10 and 15% depending on the time span while this is basically the only channel at work in the EA. The ECB (2018) also points out the difference between the US and EA, smoothing the first (60%) as much as three times (20%) what is achieved in the EA.

Even correcting for measurement differences, Alcidi et al. (2017) find that the main part of the divergence between US and EU is explained by two factors: a higher persistence of shocks in the euro area as compared to the US and a small shock absorption capacity of EU peripheral countries. Hoffmann et al. (2018a) add, as differentiating feature, the nature of the banking system in Europe. European firms, especially small and medium enterprises, live on the credit from local banks. This is not the case in the US after the banking deregulation that took place in the 80s. The completion of the banking and the capital markets unions – in the agenda of the EU institutions – should therefore contribute to foster risk sharing opportunities of EU countries. Actually, Sørensen et al. (2007) find that financial integration and risk sharing are two closely related phenomena. Using panel data for years 1993-2003 they show that more financial integration – achieved through international portfolio diversification - is associated to more international risk sharing.

The link between risk sharing and integration is a complex one. Leibrecht and Scharler (2012) show that the overall development of the financial system does not necessarily imply an improvement in risk sharing. Instead, risk sharing depends on how the market is organized: bank-based financial systems, like the European ones, can be more vulnerable to shocks.

#### *4. OECD Developed Countries*

When looking at risk-sharing in OECD countries the main findings of the empirical literature are the following:

<sup>8</sup> Milano (2017) considers Austria, Belgium, Finland, France, Germany, Italy, and the Netherlands as the core countries.

- The credit channel represents the bulk of risk sharing for OECD countries. This channel alone cushions around one third of GDP shocks
- The capital market and the international transfers channels do not contribute significantly to risk sharing
- Cross-country heterogeneity is, again, a remarkable phenomenon

Sørensen and Yosha (1998) find that during the period 1966-90, around 40% of shocks to GDP are smoothed in a set of OECD countries. Becker and Hoffman (2006) are able to disentangle between risk sharing in the short and in the long run. With regards to the short run, their finding is in line with previous studies, OECD countries smooth 36% of GDP shocks. However, risk-sharing capabilities decrease significantly in the long run: OECD countries do not share their idiosyncratic permanent risk. Besides macroeconomic variables, Balli et al. (2012) focus on the role played by capital gains, finding that for OECD countries they play an increasing role due to financial globalization.

### *5. Developing and Emerging Economies*

The empirical literature on risk sharing in developing countries is rather limited. There is however consensus on the fact that non-developed countries achieve a lower amount of risk sharing with respect to what has been found for OECD, as richer consumers are more capable of exploiting insurance opportunities and thus implementing strategies toward intertemporal smoothing. Kose et al. (2009) find that emerging market economies are characterized by a lower degree of risk sharing and this can be partially explained by the fact that they experience generally procyclical capital inflows. Moreover, emerging economies have not been able to attain benefits from the process of financial globalization. The authors conclude that this comparative disadvantage is probably due to their composition of foreign liabilities. In detail, emerging countries have a large fraction of liabilities under the form of portfolio debt, which does not necessarily favor an improvement in risk sharing capabilities. The same idea is pursued in Maggiori (2017) who concluded that the most financially developed countries are able to achieve higher shares of consumption smoothing and points out that the financial net worth plays a crucial role in understanding this asymmetric risk sharing.

Along the same line of research, Gardberg (2019) finds that financial liberalization and integration did not improve risk sharing in emerging market economies. On the opposite, she shows that for poor countries financial integration has a positive impact on international risk sharing. Part of the difference between risk sharing in less developed and advanced economies can be attributed to the relatively higher fraction of hand to mouth consumers.

### III. HETEROGENEITY IN RISK SHARING

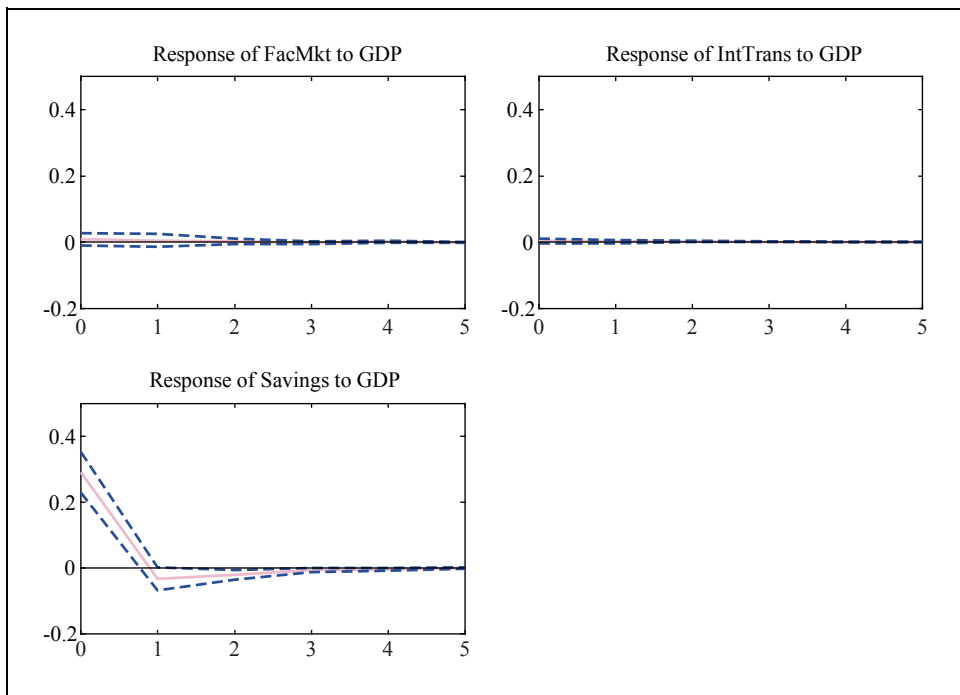
The standard approach in the literature provides measures of the amount of international risk sharing recorded – on average – for a group of countries. However, the capability of the different countries to achieve risk sharing has shown to be heterogeneous. For example, Dolls et al. (2012) suggest that in the euro area income and unemployment shocks are absorbed by automatic stabilizers to a larger extent than in the US. Kalemli-Ozcan et al. (2014) also suggest that heterogeneity across European states is considerable, pointing out the difference between core and peripheral European countries, and the difficulties of the latter to borrow on international markets.

Asdrubali et al. (2018) and Nardo et al. (2017) disentangle the geographical distribution of risk sharing providing country-specific measures of risk sharing for the main OECD countries and for all countries in the EU. Their approach is dynamic, computing impulse responses to idiosyncratic output shocks of different absorption mechanisms (channels) of risk sharing. In particular, Asdrubali et al. (2018) conclude that OECD countries smooth on average in the years 1960-2014 around 40% of GDP shocks. However, this measure is the average from highly heterogeneous figures. The overall degree of risk sharing computed with respect to total consumption ranges from values higher than 60% (Norway, Finland and Belgium) to less than 20% in peripheral European countries (Greece, Italy, Portugal and Spain). The previous analyses taking into account country heterogeneity lead to the following common results both for OECD countries and for the EU:

- The bulk of risk sharing takes place through the credit markets that cushions around 1/3 of GDP shocks.
- Risk sharing through international public transfers is almost non-existent.
- The contribution to risk sharing of the capital market channel is very low, even though it increased during recent times.

Figure 4 shows on the vertical axis the amount of *average* risk sharing achieved through each channel for the set of OECD countries. The horizontal axis represents time,  $t=0$  (the period when shocks hit the economy),  $t=1$  (the subsequent period) and so on.

Figure 4. Impulse Response Functions of the Mean Group Estimator from a Heterogeneous Panel VAR Model



Note: The impulse response functions (IRFs) in the pictures have been generated averaging the IRFs obtained from VAR estimation for each OECD country. Sample 1960-2014. Countries are those in footnote 1.

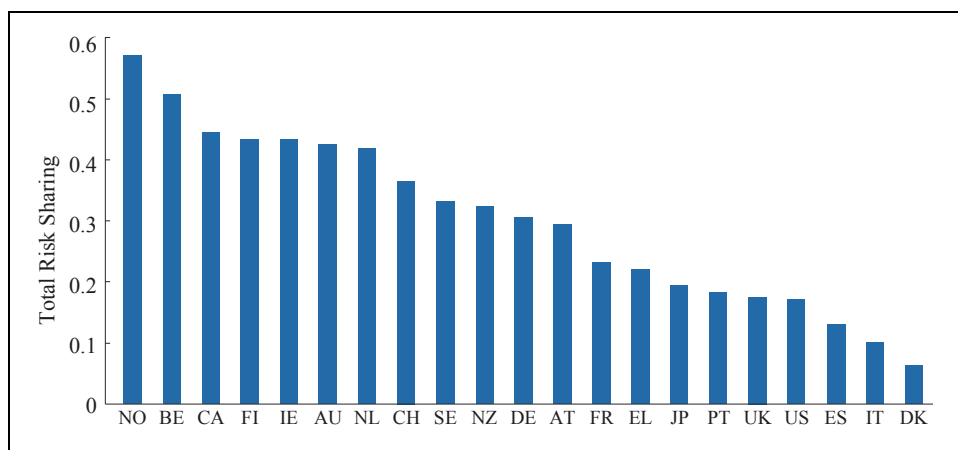
Source: Authors' calculations on AMECO database.

The graphs show the average shock absorption capacity of each channel cushioning GDP shocks. The top left panel shows the weak response, on average, of the capital market channel. The country by country detailed analysis shows that a notable exception to this is Ireland (see Nardo et al., 2017 and Asdrubali et al., 2018). The top right panel shows that public risk sharing is practically non-existent through international transfers. The bottom left panel shows that most of the smoothing takes

place through the savings channel: around 30% of the shocks can be smoothed through this channel, although some dis-smoothing takes place starting the year after the shock, when what borrowed in international markets is paid back.

The previous graph, though, hides the heterogeneity behind the mechanism, being some countries well above the average while others barely reaching that average or scoring well below. Figure 5 shows the amount of total international risk sharing achieved on impact by each country in the set.

Figure 5. Total Amount of Risk Sharing Achieved on Impact by a Set of OECD Countries



Note: The bars represent total risk sharing obtained summing up risk sharing through each channel computed from the individual impulse response functions (IRFs) from a VAR estimation for each OECD country. Sample 1960-2016. Countries are the same of those of footnote 1.

Source: Authors' calculations on AMECO database

Figure 5 shows that some countries are more resilient than others to cope with GDP shocks through risk sharing, with the southern countries lagging behind. Overall, we observe that small and open economies actually benefit more from international risk sharing. US is placed at the lower tail as the great amount of risk sharing is achieved internally through the link between the federal and local governments rather than in international markets.

By applying the methodology developed in Asdrubali et al. (2018), Nardo et al. (2017) give the geographic distribution of risk sharing in the EU. Table 2 shows that although the credit channel works for every country, the capital markets channel seems

to work mainly in the Baltic countries, Finland, Portugal and Ireland. When Luxembourg and Malta are also included in the analysis, they emerge as achieving high quotas of risk sharing, especially through the capital and credit markets channels, reflecting their roles as financial hubs.

Table 2. Percentage of Risk Sharing to Shocks to Domestic Output

Country	EU28 1995-2016			
	Total	Capital	Gov	Credit
Austria	3	-2	-1	7
Belgium	4	1	-1	4
Bulgaria	38	17	8	13
Croatia	6	-1	-5	12
Cyprus	-2	22	3	-26
Czech Republic	46	-3	-1	49**
Denmark	12	-3	-2	17
Estonia	32	18***	1	13
Finland	58	10**	-3**	51***
France	-3	0	1	-4
Germany	40	4	0	37
Greece	17	-1	-4**	22**
Hungary	6	-13	-6	25
Ireland	80	27***	0	53***
Italy	-14	3	2	-20
Latvia	3	42***	6	-46**
Lithuania	31	24***	-2	8
Luxembourg	82	64	-28	46**
Malta	92	28	-6	69
Netherlands	14	9	-3	8
Poland	47	21	10	15
Portugal	8	16**	5	-13
Romania	6	5	1	0
Slovakia	37	-11	11	37**
Slovenia	46	12	-3	37**
Spain	39	3	3	33
Sweden	29	-8	-2	39**
UK	8	5	0	3

Note: Analysis per country, target group EU28. Total refers to the percentage of total risk sharing (% of domestic consumption smoothed). Capital, Gov and Credit refer to risk sharing achieved via capital markets, government and credit channels, respectively. Sample: 1995-2016. The symbols \*\* and \*\*\* indicate significant at 5 and 1% level.

Source: Nardo et al. (2017).

### *1. Evolution of Risk Sharing Along Time*

When looking at risk sharing, it is also important to take into account **dynamics**. For instance, risk sharing achieved through international lending cannot have a permanent nature. Indeed, if one country borrows on international markets to compensate a negative income fluctuation, in the following periods it will have to repay back his debt, and this will have an opposite impact on income dynamics. Therefore, it is important to look not only at contemporaneous risk sharing, but also at its temporal pattern.

Asdrubali and Kim (2004) exploited the time series nature of the data to get a flavour of the dynamics for each channel. Overall, they found that the smoothing effect of a shock is basically contemporaneous and always positive with regards to the capital and fiscal channels. The pattern of the credit markets channel is more complex. After an initial positive smoothing effect, in the following years, a dis-smoothing effect takes place, due e.g. to the repayment of the loan. Therefore, the overall amount of smoothing achieved through this channel (estimated, for example, with a window of 5 years) can be different from that estimated on impact that is only considering the contemporaneous effect.

Although – in principle – most empirical analyses only focus on the amount of shocks smoothed in the short run, Becker and Hoffman (2006) and Corona et al. (2018), among others, analyse the amount of risk sharing smoothed in the **long run**. The issue is not only a theoretical point but has to do with the welfare of individuals. Smoothing purely transitory fluctuations in consumption will result in small welfare benefits compared to the benefits originated smoothing persistent shocks (Artis and Hoffman, 2012).

Sørensen et al. (2007) propose a time-varying measure of risk sharing based on the model specification proposed by Méltitz and Zumer (1999) who interact risk sharing with time-varying controls in the standard regression framework. Their empirical analysis shows that international risk sharing increased for OECD countries and this can be partly explained by the reduction of home bias in the financial portfolio of investors. They found that risk sharing increased from around 20% in the 90's to values higher than 40% at the beginning of the 2000s.

Kose et al. (2009) show that since the beginning of the 2000s it emerges a clear tendency toward a positive trend in the overall amount of risk sharing for a subset of



OECD industrial countries. On the opposite, it is detected a long-run negative slope in the trend of risk sharing achieved by developing and emerging market economies.

#### IV. NEW OPTICS IN RISK SHARING

Apart from the traditional three channels in risk sharing, in recent times new avenues for measuring consumption smoothing have been analysed. Some of the traditional channels, as the capital markets channel or savings, have been further decomposed in an attempt to understand the precise mechanisms that are at work within each channel. Additionally, new channels have been introduced.

##### *1. Capital Markets Channel*

The performance of the capital markets channel, as described in previous sections, is measured by the amount of risk sharing that is achieved through NFI. In National Accounts, NFI includes two types of transactions: (i) compensations to non-resident employees and (ii) investment income receipts and payments on foreign financial assets and liabilities. The bulk of risk sharing within this channel is carried out through investment income. The literature on risk sharing has paid further attention to this channel as, for instance, in the US it accounts for up to 40% of risk sharing. On the contrary, its role is significantly lower in Europe. Balli et al. (2014) take a new avenue and divide the factor income net flows (interests, dividends and retained earnings) into inflows and outflows. They analyse a subset of 22 OECD countries generally used in the literature and a subset of EU countries, and conclude that income smoothing is achieved significantly only through interest receipts (5% and 7% for OECD and EU, respectively) and through equity dividend payments (6% both for OECD and EU). The behaviour of dividend payments seems to be pro-cyclical, as companies pay more (less) dividends during economic booms (downturns), and this smooths income along the business cycle.

Balli et al. (2013) find that during the recent Great Recession, the income inflow channel was a better cushion for output shocks than the corresponding outflow. As regard the type of asset (debt or equity), receipts originated from debt securities holdings were more effective than receipts on equity holdings. For a set of high-income OECD countries including several EU member state, Balli et al. (2011) find that factor

income outflows smooth positive output shocks, while neither factor income inflows nor outflows were able to smooth negative output shocks.

## *2. The Role of Governments*

The literature on the role of sovereigns in risk sharing has initially focused on the US, where federal transfers constitute the bulk of the government or fiscal channel. In this sense, risk sharing represents the aid received from the central US government useful to smooth business cycle fluctuations of federal states. In an international setting, the equivalent concept of federal transfers is the item net international transfers in the balance of payment. However, this item plays a tiny role if compared to the relevance of federal transfers, and its effect in risk sharing is usually not statistically significant. International transfers hardly account for any risk sharing in studies for OECD, EU or EA countries (see, for instance, European Commission, 2016; Poncela et al., 2016; Nardo et al., 2017 and Asdrubali et al., 2018).

Besides the role of international transfers, which is residual in the EU, the domestic behaviour of governments can affect risk sharing through public savings and consumption. This is a domestic source of risk sharing, and does not refer to international risk sharing mechanisms. However, the behavior of governments can be relevant for palliating the impact of GDP shocks on consumption. Notice that the decision of a government on how much to consume is not independent from the choice regarding the amount of public savings.

In what follows we will analyse each of these government decisions: how much to consume and how much to save and their consequences on risk sharing, placing the decision within the appropriate framework (channel).

### *1) Government savings*

Government savings is part of the savings channel, which has been traditionally identified as the most relevant channel for consumption smoothing in the EU (see, for instance, Soresen and Yosha, 1998, for an early assessment or Poncela et al., 2016 and Nardo et al., 2017, for more recent estimations). The overall amount of savings of an economy is given by the sum of households', corporations', and government's savings. However, the role played by public savings notably decreased in several European countries during the Great Recession and the sovereign debt crisis that followed in

Europe (see, for instance, Kalemli-Ozcan et al., 2014). Therefore, it is crucial to understand how government savings affect the performance of the channel.

Decomposing the saving channel in sub-channels, it is possible to assess the relative importance of government savings. The savings channel can be subdivided according to **who saves**. Kalemli- Ozcan et al. (2014) decompose savings into public (government) savings and private (households and corporate) savings. They conclude that government savings cannot provide prolonged smoothing when public finances are imbalanced. This sub-channel would only work in economies with healthy public accounts, while countries with high debts might need a fiscal consolidation processes forcing governments to save independently from business cycle conditions. The interest- debt spiral thus removes any degree of flexibility in government choices: high sovereign debt leads to an increase in the risk of a sovereign default that triggers higher interest expenditure, and further contributes to increase the stock of public debt.

An alternative division of savings, not focused on who saves but rather on **how savings is used**, also comes through the decomposition of savings in official statistics. National accounts divide overall national savings into net lending/borrowing to/from the rest of the world (i.e. credit from abroad), gross capital formation (physical investments) and net capital transfers to the rest of the world. This latter item comprises transfers of assets ownership, and cancellations of liabilities made from a creditor, without any counterpart. The relative weight of each sub-channel has been measured by Kalemli-Ozcan et al. (2014) for Europe who found that domestic investments acts pro-cyclically, and are the main buffer for consumption smoothing in healthy economies (46% before the Great Recession for a group of EU countries). They also conclude that a significant role is played by the current account surpluses (an additional 14%). With data regarding the Great Recession and/or the European sovereign crisis these authors found that risk sharing collapsed in Greece, Ireland, Italy, Portugal and Spain in 2010 since positive government savings induced dis-smoothing, (the shock not only was transmitted to consumption but the channel induced an additional consumption drop). Furceri and Zdzienicka (2015), estimated risk sharing in 15 countries of the Euro Area (EA) for the period 1979-2010 and found that 66% of the shocks in the EA are not smoothed, and that smoothing is mainly achieved via private saving (around 22%).

## 2) Government consumption

Government consumption is usually included in the empirical analyses on risk sharing as a component of Final Consumption Expenditure and, therefore, as the target on which to measure the extent of risk sharing, rather than a tool for fostering risk sharing. However, Asdrubali et al. (2018) change the focus and look at the amount of private consumption (rather than total consumption) that is smoothed. From this new perspective, government consumption is transformed from a target into a new vehicle or channel for smoothing private, instead of overall consumption. From this point of view, the analysis focuses on how fluctuations in government expenditures affect the way GDP shocks are shifted in private consumption changes. For a set of OECD countries the empirical analysis reveals that public consumption – instead of reducing – amplifies the transmission of shocks by 4% on average. It is worth noticing that the role played by a government in risk sharing should not be confused with the role played in stabilizing business cycle fluctuations. Indeed, even if a counter-cyclical government consumption pattern might contribute to output stabilization, it can be detrimental to risk sharing. For example, if governments increase consumption when facing a negative GDP shock, this can reduce resources available for private consumption, given the reduced output growth thus worsening risk sharing.

## 3. *Exchange Rates and/or Valuation Effects*

Asdrubali et al. (2018) look at how GDP shocks transmits onto private consumption deflated with international prices, that is, on the possibilities of consumption offered to private agents on the global market. To this aim, the authors include in the analysis the real exchange rate channel that is the conversion factor to be applied to convert real consumption in domestic prices, into real consumption at international prices. This valuation effect can be decomposed into two sub- channels: a **relative price** effect and a **nominal exchange rate** effect. The authors find a positive role of price adjustments (around 18%) for OECD countries while the effect of the nominal exchange rate following a positive GDP shock is more volatile and harder to estimate. Corsetti et al. (2008) also find real exchange rate appreciations following US technology shocks. These results are in line with the Backus-Smith puzzle or consumption – real exchange rate anomaly, i.e. the finding that consumption and real exchange rates are not positively correlated. This is at odds with the economic theory, which foresees a positive link between relative consumption and real exchange rate. Indeed, the consumer

should prefer to consume more where goods are cheaper, and this would also be in favour of the risk sharing hypothesis. ECB (2017) also includes valuation effects in the so called price channel, that is, via changes in prices. For the US states, Parsley and Popper (2018) found a 3% of shocks smoothed via this channel.

#### *4. Depreciation*

Depreciation has been rarely considered in the literature as a factor of consumption smoothing, Kalemli-Ozcan et al. (2014) and Milano (2017) being notable exceptions. The latter estimates a small dis-smoothing effect about 5% (sample 1970-2014) for this channel.

#### *5. Migration*

Risk sharing generated from working in a foreign country is hardly computed in empirical analyses. National accounts record the inflows of money from foreign workers in two different places (as two different items), depending on the duration of the working time spent abroad. If the worker is abroad from less than one year (as in the case of seasonal activities), she is not considered a national resident and the remittance is registered as compensation to non-resident employee, and will be recorded in the item Net Factor Income. In this way, the effect of these flows will be included into the capital markets channel. Its small incidence in consumption smoothing is confirmed – with regards to the Euro Area – by the European Commission (2016).

On the contrary, if the worker is abroad from more than one year, she is considered as a foreign resident, and these flows of money are considered as workers' remittances by migrants and recorded as International Transfers. In OECD and EA countries, the role played by these flows is residual. However, the picture changes for the US and developing countries. In particular, for the US, Del Negro (2002) found that labour income generated abroad results in an amount of risk sharing between 4 and 12%. An updated figure is due to Parsley and Popper (2018) that found that migration smooths almost 8% of states' idiosyncratic income growth. Although not too high, it is higher than the numbers found in Europe, due to the higher mobility of labour force of the US as compared to Europe.

At the international level, Balli and Rana (2015), using a large sample of 86 developing countries for 1990-2010, find that risk sharing from remittance inflows is around 5% and that far away countries facilitate more risk sharing compared to neighbours.

## *6. Caveats and Way Forward*

The national accounts system provides a complete and consistent statistical framework for estimating the overall amount of risk sharing, and for identifying the contribution of risk sharing channels. There are, however, factors that need to be taken into account for understanding the limits and the range of applicability of the analysis.

The main limit of an approach based on national accounts lies in the way national accounts are constructed. When using the difference between Gross Domestic Product and National Income to estimate the importance of the capital market channel for European countries, one should consider that these variables measure the income of investments made abroad regardless the location of the investments (both in other EU countries and in the rest of the world). This holds true not only for net foreign income, but also for international transfers and international net lending. Consequently, the econometric estimate of risk sharing could be biased, and this bias will be proportional to the importance of the countries of the rest of the world not included in the study. This bias would disappear if one were able to include in the analysis all the countries, which is actually not possible.

Due to data limitations, it is impossible to have a single channel representing all income flows with a cross-border nature. Income from dividend on foreign equities goes in the Current Accounts (and ends up in the capital market channel), while the income obtained selling equity and debt securities is recorded in the Capital Accounts and ends up in the credit channel, where it is mixed with purely national items (such as capital taxes and investment grants).

The current literature also forgets to analyse the links among channels. A domestic policy implemented to foster one channel could decrease – as a secondary effect – the performance of another channel if the two happens to behave as substitute, thus offsetting part of the improvement.

Finally, some econometric tips need to be taken into account when performing an empirical analysis to measure risk sharing. The standard regression-based approach to risk sharing described above has some pros and cons. On the positive side: it is easy to

implement; results are well understood and easy to communicate; it can be easily generalized when having several years of data to take into account the bulk of dynamics by modelling appropriately the dynamics. As for the cons side: with the standard approach, one only gets a flavour of contemporaneous risk sharing. Actually, dynamics is equally important as it affects welfare. Moreover, the standard approach is more vulnerable to the critique of being affected by endogeneity. Indeed, in the system of national accounts, consumption is a component of aggregate GDP, meaning that not only GDP causes consumption choices, but also consumption determines the level of GDP. This complicates the estimation and requires additional assumptions rarely checked in practice.

## V. CONCLUSIONS

Public and private mechanisms of risk sharing can be at work to mitigate the consequences of GDP shocks. The literature has developed a robust methodology for measuring the effectiveness of this phenomenon, as well as for disentangling the main channels through which it takes place: the capital markets channel, the government channel (international transfers in international or cross-border risk sharing), and the credit channel. The first one operates through international portfolio diversification. The second is only activated by international transfers to attenuate, for example, the economic consequences of natural disasters. The credit channel operates, for instance, through borrowing/lending on international markets, and almost always explains the largest fraction of total risk sharing. A further decomposition of the credit channels into the institutional sectors originating savings shows that government and corporate savings are generally the two most effective sub-channels through which economies cushion shocks. From a dynamic point of view, it is worth noticing that international risk sharing is to a large extent a short-run phenomenon.

The main implication of risk sharing is a reduction in the cross-sectional as well as in the intertemporal variance of consumption, which implies – *ceteris paribus* – an increase of welfare. With regards to the link between development and risk sharing, from the empirical literature it emerges that advanced economies are able to cushion around 40% of their idiosyncratic risk, while non-developed economies are characterized by much lower risk sharing capabilities.

An improvement of risk sharing can be considered as an intermediate policy objective, if the final objective is resilience. Under this perspective, governments can directly operate through public risk sharing mechanisms (like, for example, the ESM), or can create the conditions for a greater effectiveness of private risk sharing mechanisms.

Several comparative analyses (see, for instance, European Commission, 2016) reveal that risk sharing in the Euro Area is remarkably lower than in the US, and this is mainly due to the very low contribution of the capital markets channel. The room for increasing private risk sharing in the Euro Area goes through financial markets integration and more balanced and internationally diversified portfolios. Crucial is therefore the completion of both the Banking and the Capital Markets Union. Hoffmann et al. (2018b) point out that a deeper banking union needs a deeper capital markets union since they claim both unions are complements.

Additional policy discussions are taken place about how to raise risk sharing in the EU and the EA. According to Hoffmann et al. (2018a) fiscal transfers absorb only about 10-15% of shocks among US regions while the share of the private capital markets is much higher (at least 40%). While these authors argue that completing the capital and banking unions is politically easier and can foster private risk sharing in the euro area, there are other voices arguing that markets risk sharing cannot work in the EU or EA without a supranational fiscal authority (Buti and Carnot, 2018). Additionally, some initiatives that have been studied like the European Benefit Unemployment Scheme (EBUS) would reinforce the international transfers channel.

As regards public risk sharing, there are some institutions providing public risk sharing (like the ESM). Additionally, should a wide political consensus be found, cross-border transfers of funds (via e.g. EBUS) or any other policy that is nowadays taken at the national level, when translated to the EU level, would foster public risk sharing, with the advantage that the amount that could be insured by the pool of countries would be higher.



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