

Fiscal Risk Sharing and Resilience to Shocks: Lessons for the euro area from the US

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Abstract

The classic argument for a euro area (EA) fiscal capacity revolves around the need to “dampen the effects of asymmetric shocks”. According to authors who expound this conventional wisdom, the euro area (EA) needs a common fiscal capacity along the lines of the ‘US federal fiscal system’ because it lacks automatic stabilisers to deal with asynchronous output fluctuations. This paper provides empirical evidence to indicate that the abovementioned view largely overstates the stabilising role of US federal transfers to states. Despite the absence of a centralised EA stabiliser, the automatic stabilisers in the EA bring about a larger degree of insurance against asymmetric shocks (about 20%) than that provided by the US federal budget (11%). To some extent, this is attributable to the higher degree of market-based risk sharing in the US and to the existence of other public institutions enhancing financial stability and private risk sharing in the US. Yet we show that US federal fiscal policy appears to be primarily a stabiliser of US-wide shocks, rather than idiosyncratic shocks.

Keywords: Asymmetric shocks, fiscal capacity, euro area, US monetary union, fiscal risk sharing.

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1. Introduction

The mainstream argument for a euro area ‘fiscal capacity’, understood here as an EA centralised automatic stabiliser as opposed to a system of permanent transfers, revolves around the need to “dampen the effects of asymmetric shocks”. This conventional wisdom is based on Optimal Currency Area theories (Kenen, 1969) and suggests that a common fiscal stabiliser designed along the lines of the US federal tax-transfer system would have stabilised incomes in member states hit the hardest, thereby avoiding the divergence that unfolded between the south and north in the aftermath of the financial crisis.

It is against this background that the role of the US federal budget - and in particular the unemployment insurance (UI) system – has attracted the increasing attention of researchers (e.g. Dullien, 2007) and EU institutions (e.g. Four and Five Presidents’ Reports). The US UI system carries theoretically powerful features, which at the current economic and political juncture, are considered to be one of the most promising proposals for a common fiscal capacity (Andor 2016 and Beblavý and Lenaerts, 2017). First, because unemployment benefits are generally considered to be the prime automatic stabiliser: it is a highly cyclical and timely spending source by nature, with potentially significant stabilising features. Second, it carries political advantages, namely because inter-state risk sharing is a form of insurance that does not (theoretically) require a joint borrowing capacity, and hence no treaty change. Third, it also embeds a social protection element that is important to the supporters of a social Europe (Andor, 2016).

This article sets out to contribute to the debate by questioning the abovementioned hypothesis, namely that the euro area (EA) needs a fiscal capacity to improve its capacity to deal with asymmetric shocks. Without disputing the need for further fiscal integration in the EA, this analysis takes a critical look at the actual insurance role of the US federal budget. The main argument that we seek to develop is that euro area policymakers could learn important lessons from the stabilising role of fiscal institutions in the United States, but they are not what policymakers typically envision.

This contribution first quantifies the risk-sharing properties of the US federal tax-transfer system, including the unemployment insurance system and compares it to the insurance capacity of euro area’s decentralised fiscal policies in the face of asymmetric shocks. We provide a unique and detailed update and extensions of two important studies carried out in the late 1990s, namely the work of Asdrubali et

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al. (1996) on the channels of fiscal risk sharing in the US, and of Arreaza et al. (1998) on the smoothing effect of government budgets in EU countries.

We show that the macroeconomic insurance role of US federal fiscal stabilisers against asymmetric shocks - and most prominently the role of UI, is largely overstated in the current debate. EA member states feature a higher degree of smoothing of asymmetric shocks (about 20%) than provided by the US federal budget insurance through inter-state fiscal risk sharing (11%). Likewise, the role of UI in the US barely attains 1 percent against 3 percent in the EA, on average. The larger budgets of euro-area member states do not explain this trend alone: in terms of 'efficiency' relative to total spending, euro-area member states also slightly outperform the US.

We then seek to reconcile these results with the better resilience of the US economy by considering two strands of explanations. First, we show that US fiscal policy, due to its largely discretionary character, provides non-negligible stabilisation against common shocks as well, most particularly during large recessions, which allows internalising externalities related to cross-border demand spill overs.

Second, we stress that it is crucial to better understand potential interaction effects across private and public risk-sharing channels. On the one hand, substitution effects between private and public risk-sharing channels may prevail. In particular, the high degree of market risk sharing in the US may cause a weakening of the insurance role of US fiscal transfers if market mechanisms spread out the effect of a state-specific output shock onto other states, thereby protecting state income, consumption, and unemployment from output fluctuations. Conversely, possible reinforcing effects across channels are likely to be significant as well, for instance through the US Banking Union, and the role of the Federal Deposit Insurance Corporation (FDIC). This points to the need to better understand the different interaction dynamics at work across insurance channels in successful and resilient monetary unions like the US dollar area in order to derive pertinent policy prescriptions for the EA.

Finally, we show that contrary to the commonplace assumption, the US UI institutional set-up provides limited scope for true inter-state risk sharing. As regards the permanent basic UI programme, the crucial role of the federal level lies in the credit line granted to states, which must be repaid with interest. True one-way transfers from the federal government only occur through emergency benefit programmes which finance *ad hoc* extensions of the duration and generosity of the basic UI during crises. These programmes are discretionary rather than automatic as they require congressional approval. The crucial point is that, historically, such transfers have only been activated in the face of US-wide recessions (symmetric shocks).

The rest of the paper is organised as follows. Section 2 introduces the empirical strategy and provides a detailed comparative analysis of the capacity of US and EA11 to buffer asymmetric shocks through government budgets. Section 3 extends the results from section 2, including the insurance against common shocks, and discusses possible interaction effects across risk-sharing channels. Section 4 sheds light on the functioning of the US UI and makes the crucial distinction between federal loans to states and outright transfers, and section 5 concludes and draws implications for the euro area.

2. Quantifying the capacity of fiscal policy to absorb asymmetric shocks: EA vs US

2.1 Methodology

This section empirically gauges the contribution of US and EA fiscal policies in providing insurance against asymmetric macroeconomic shocks. Obviously, while fiscal policy remains a domestic prerogative in the EA, in the US it embeds a multi-tier dimension across different government levels. Since the vast majority of cyclically sensitive fiscal policy items is administered by the US federal budget, we assume that the smoothing effects of state and local government budgets is nil and focus exclusively on the role of US federal institutions. As such, the entire system of unemployment insurance (UI) is treated as purely federal in our empirical exercise, although we will later show that this is technically not a fully accurate description of the system. Past studies have shown that the stabilisation capacity of states and local government budgets is negligible or even destabilising (eg. Follette & Lutz, 2010, Sorensen et al. 2001).¹ Conversely, the structural nature of inter-state transfers from the EU budget implies that they have negligible stabilising properties in the EA, although their size amount to several GDP percentage points in some peripheral countries (e.g. Greece and Portugal).

In order to measure the insurance role of US and EA government budgets against asymmetric shocks, we update the work of Asdrubali et al. (1996) on the channels of risk sharing in the US, and extend the study of Arreaza et al. (1999) on the smoothing effect of government budgets in EU countries. In this respect, the empirical novelty of the present research is thus to provide updated and further detailed estimates of the role of fiscal policy instruments in the US and EA.

As described in further detail in Annex A, the methodology consists of a simple variance decomposition of shock to GDP relative to the average GDP growth in the sample. The advantage of this approach is that it allows us to quantify the smoothing effect of different components of the tax and transfer systems, and in particular unemployment benefits.

The empirical analysis is based on the four equations displayed below. As customary in the literature (e.g. Afonso and Furceri, 2009, Kalemli-Ozcan et al., 2014), they are estimated through OLS, correcting for panel heterogeneity and first-order auto correlation. In order to capture the asymmetric nature of output shocks, regressions include time fixed (not reported):

Euro-area – Member state's budgets

- 1) **Gov. budget:** $\Delta \log DNI_{i,t} - \Delta \log(DNI_{i,t} - Gov\ Saving)_{i,t} = \alpha_t^{time\ FE} + \beta^{gov\ budget} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$
- 2) **Gov. budget item(x):** $\Delta \log DNI_{i,t} - \Delta \log(DNI_{i,t} \pm x)_{i,t} = \alpha_t^{time\ FE} + \beta^{budget\ item\ x} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$

US - Net federal transfers to states

- 3) **Federal tax and transfers:** $\Delta \log SI_{i,t} - \Delta \log DSI_{i,t} = \alpha_t^{time\ FE} + \beta^{gov\ budget} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$
- 4) **Federal budget item (x):** $\Delta \log SI_{i,t} - \Delta \log (SI \pm x) = \alpha_t^{time\ FE} + \beta^{budget\ item\ x} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$

DNI stands for Disposable National Income in the euro area, SI for US State Income, DSI for Disposable state income, and the difference between SI and DSI is net transfers from the federal budget. In the EA,

¹ Since most US states have some kind of balanced budget requirement, a decline in state revenues must be matched by a reduction in public spending.

government saving is the public sector balance. The fiscal policy items (x), either from states or federal budgets, take on a positive sign for expenditure, and a negative sign for revenue components.

What we refer to as the fiscal policy capacity to smooth the impact of output shocks – regardless of the level of government involved – is a measure of how fiscal policy attenuates the volatility of consumption and income around the average consumption growth at every observed point of time, in response to a shock in states' GDP growth relative to the average. Note that the degree of smoothing by EA national policies is measured through member states' government contribution to the 'net savings' of the whole economy – i.e. the government budget balance, whereas the overall role of the US federal tax-transfer system is measured by the difference between state income and state disposable income.

The main empirical contribution of this article is to offer a detailed and up-to-date treatment of the different fiscal risk-sharing channel in the US – for the first time since the original study of Asdrubali et al. (1996), and channels of smoothing through national fiscal policy in the EA.

2.2 Data description

The US dataset covers the 50 US states over the period 1960-2013, and all the variables are expressed in real and per capita terms. Data have been collected and constructed following the methodology used in Asdrubali et al. (1996). For the sake of brevity, this section simply presents the main sources of data and the methodology to construct the key variables to this study.²

Gross state product (GSP) comes from the Bureau of Economic Analysis (BEA) and is composed of sales or receipts and inventory changes, minus the amount of goods and services consumption from other industries or imported from other states.

State income (SI) is estimated starting from personal income (PI) figures available from the BEA, adding personal and employer social contributions and subtracting social security and transfers. Non-personal state taxes and state revenues on the state trust funds are also added. Conceptually, state income includes all incomes generated within each state, as well as cross-border flows of factor income such as wages, dividend, interests and all forms of capital income from abroad. Thus, state income measures the amount of resources available for consumption to the residents and the state government in the absence of intervention from the federal government.

Disposable state income (DSI) is the sum of state income plus net federal transfers to the state and individuals. Federal transfers include direct transfers to individuals in a state plus federal grants to the state government minus the total federal taxes raised in the state (i.e. social security contributions, corporate taxes, etc.). Federal grants data are extracted from United States Statistical Abstract, federal personal taxes from the BEA, and the different types of federal transfers.

State consumption includes resident and state government consumption (defined as state revenues minus state expenditure). Private consumption is calculated by using per capita annual retail sales by state as proxy, which is rescaled to match total private consumption in the US.

Federal tax and transfers data, obtained from the National Income and Product Accounts (NIPA) tables produced by the BEA, sum up to the difference between DSI and SI. Since data on tax collected at the state level are generally not available at a disaggregated level, the allocation of most federal taxes is

² See the annex to Asdrubali et al (1996) for a detailed description of the data sources.

made following the tax foundation weights, as in Asdrubali et al. (1996). We also follow Asdrubali in that we treat the entire system of unemployment insurance as if it were fully funded by the federal level. Since unemployment insurance trust funds are managed by the Treasury, and largely governed by federal legislation (minimum contributions and benefits), they consider unemployment benefit pay-outs as negative federal tax, and the unemployment insurance contributions as a federal tax. As discussed in the next section, however, this may well overstate the amount of federal risk sharing provided for by the federal budget.

We consider a panel of 11 euro-area countries³ over 1995-2014, using data from the OECD national account database. The key variables are GNI, NI, DNI, C and G, which are used to estimate the relative effectiveness of the main consumption- and income-smoothing channels. Fiscal variables are also extracted from the same dataset, namely: indirect and direct taxes, social contributions, capital taxes, subsidies, social benefits, social transfers, government consumption, and employee compensation. They roughly add up to net public savings (see Arreaza et al. 1998 and Afonso and Furceri, 2008). In a similar vein to Afonso and Furceri (2008) and Darby and Melitz (2008), the analysis of the components of fiscal policy is complemented by social expenditure data from the SOCX database collected from the same institution. These data are used in order to provide a more comprehensive picture of the role of the different components of fiscal policy in smoothing output shocks in the EA. Note that for consistency, all variables are deflated using the HICP index since most of the abovementioned aggregates do not have a deflator.

2.3 The role of government budgets over time and across budget items

We estimate the portion of asymmetric output shocks that is absorbed by domestic fiscal policy in the euro area and compare it to the role of the federal budget in the US.⁴ The LHS bars represent the estimates from the full sample. While the subsequent sub-periods are estimated through one single equation, time dummy variables are interacted with GDP (the independent variable).

Our estimates (Figures 1 and 2, LHS bars) appear to disprove the widespread view that EA member states lack the capacity of the US federal fiscal institutions to stabilise asymmetric output fluctuations. On the contrary, EA member states smoothed nearly twice as much of an asymmetric shock (19.8%) as the US federal budget did through inter-state risk sharing (11%) between 1995 and 2013.

Although no previous study (to the best of our knowledge) provided such comparative analysis on the respective role of US and EA fiscal policies as asymmetric shock stabilisers, these results are actually in line with earlier estimates on the EU and US (e.g. Arreaza et al., 1998 and Asdrubali et al. 1996, respectively).⁵ Hence, although these results appear surprising in light of the debate about the need to

³ We leave out the Baltic States, Slovakia and Slovenia since data are missing for most of the period, as well as Luxembourg, Cyprus and Malta, given their size and atypical financial sector.

⁴ It is worthwhile stressing that evaluating the consumption and income insurance provided by governments, we implicitly regard market-based income-smoothing as exogenous, which may not be the case. As will be argued later, this calls for great caution in the comparative interpretation of the results, and in particular of the benefits from fiscal risk sharing in the US.

⁵ Our results for the US are about 2 percentage points lower than in Asdrubali et al. (1996), who consider the period 1963-1990. Our findings are similar to those of the European Commission (2016) regarding the total role of the federal budget. Note that they do not provide estimates for the different sub-components of the budgets.

further the EA's insurance capacity against 'asymmetric shocks', they simply confirm that older empirical findings are still valid.

Figure 1. Fiscal risk sharing over time, US

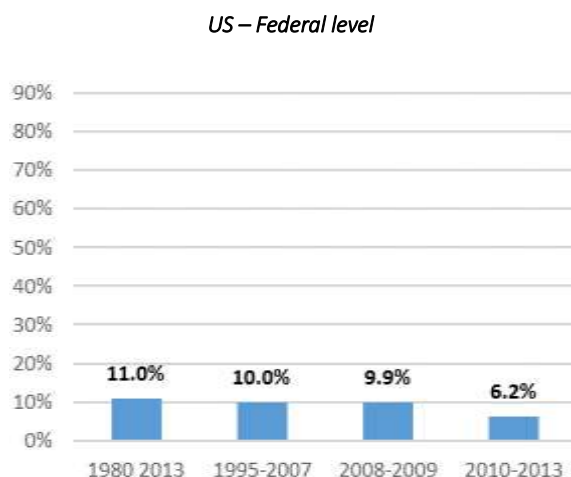
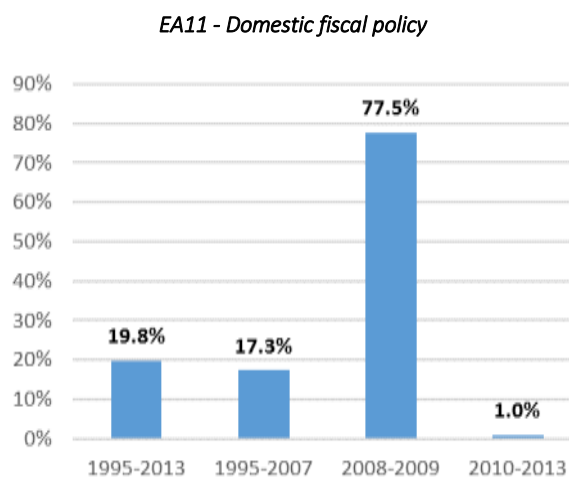


Figure 2. Fiscal risk sharing over time, EA11



Note: The bars represent the percentages of states' output shocks absorbed through the government budget; federal in the US and domestic in the EA. Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term. Standard errors are corrected for panel heteroscedasticity.

Source: Authors' calculation based on data from AMECO and BEA (see section 2.1 and Annex A for more details).

In order to measure the role of fiscal policy as an asymmetric shock absorber during the global financial crisis and the sovereign crisis, respectively, and to compare them to 'normal times', we provide coefficient estimates for three sub-periods.

Results indicate that fiscal policy played out differently across the Atlantic upon the eruption of the global financial crisis in 2008. In the EA, government budgets smoothed 77% of asymmetric shocks during the financial crisis in 2008-09, while it remains stable at 10% in the US. On the one hand, the high coefficient estimate in the EA must be taken with a pinch of salt given the small size of observations in the period 2008-09 combined with a larger variance in output growth. On the other hand, this finding is in line with the fact that automatic stabilisers and a joint fiscal stimulus (the European Recovery Act) were enacted promptly. As shown in Alcidi et al. (2017a), such a fiscal policy role was particularly important as, during the same period, household savings increased, driven by precautionary behaviour, and tended to amplify the effect of the GDP shock on the most adversely hit member states.

This trend reversed dramatically in 2010-13, as the sovereign debt crisis spilled over the entire EA. Fiscal-smoothing neared zero and was at about 6% in the US. In both cases, asymmetric shocks were poorly buffered through the action of fiscal policies. Yet, it is precisely during that period that the fate of the US economy and EA started to diverge.

Overall, the low level of fiscal smoothing in the EA in 2010-13 is consistent with the narrative stating that budget consolidation measures in EA member states facing a deep recession have led to a collapse of fiscal policy-smoothing (Kalemli-Ozcan et al., 2014). Findings for the US, on the other hand, appear at odds with the received wisdom that the US federal budget is significantly more effective in smoothing asymmetric shocks than EA countries' national fiscal policies.

However, there is a crucial difference between the US and EA that tends to be underplayed in the debate on the role of fiscal policy across the Atlantic, namely the lack of market risk-sharing mechanisms in the

EA. In the US, about 40 percent of an output shock is absorbed through cross-state capital market income flows (Asdrubali et al., 1996). The quasi absence of market risk sharing in the EA may have multiple implications, some of which are further discussed in section 3.2.

First, this means that unplugging fiscal policy in economies hit the hardest can be potentially more damaging in the EA than would be the case in the US given the lack of alternative risk-sharing adjustment tools. This implies that the relative importance of fiscal policy during crises is larger in the EA. Second, in addition to the different degrees of balance between the respective role of public and market risk sharing in the US and EA, one must take into consideration potential interaction effects among private and public insurance channels. Thus far, research has largely ignored the question of **the interaction between private and public risk sharing**, with the exception of the theoretical accounts offered by Farhi and Werner (2015) who point to mutually reinforcing forces between public and private insurance. Thus, it may well be the case that the large degree of market risk-sharing results from the existence of federal fiscal institutions. Conversely, the large degree of private risk sharing, bolstered by strong federal fiscal back up, may also take the burden of smoothing asymmetric shocks away from fiscal policy to some extent.

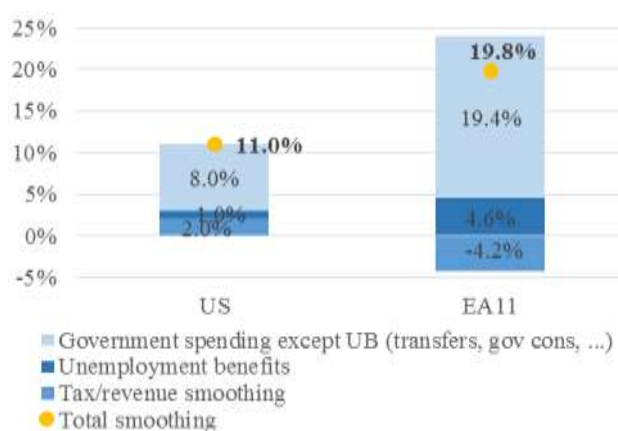
In Figure 3 we further decompose the channels through which the impact of shocks can be absorbed, considering the role of the main governmental budget components. Based on the same approach as above, we quantify the response to shocks through tax/revenues, and expenditure (for even more detailed regression results, see table B4 and B5 in the annex). In order to single out the effect of unemployment benefits, the prime automatic stabiliser, we estimate it separately from the role of other government expenditure (i.e. other personal transfers, subsidies, and government consumption).⁶

It turns out that government budgets smooth asymmetric shocks through the expenditure side of the budget rather than through progressive taxation. Contrary to the commonplace view, unemployment benefits are far from being the dominant shock absorber. In fact, they seem to play a negligible role in the US, cushioning barely 1% of the effect of an output shock. As can be observed in Table B5 (annex), UI contribution are mildly (-0.2 percent) but significantly pro-cyclical. In the EA11, this is relatively much larger as unemployment benefits provide 5% of insurance.⁷

⁶ A more detailed breakdown is reported in Annex B, Tables B4 and B5.

⁷ This fact is well-documented in Deroose et al. (2009), who argue that the bulk of automatic stabilisation does not stem from progressive tax codes and unemployment benefits but rather “work through the inertia of discretionary expenditure with respect to cyclical swings in output: their share in GDP increases ‘automatically’ in downturns and declines in upturns”.

Figure 3. Government budget breakdown: revenue, unemployment benefits, and other spending (1995-2013)



Note: The bars represent the percentages of states' output shocks absorbed through the different government budget items. Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term.

Source: Authors' own calculations based on data from AMECO, SOCEXP (OECD) and BEA (see section 2.1 for more details).

A number of additional factors can help to explain the larger smoothing role of EA fiscal policy over the US federal fiscal system. First and foremost, most federal fiscal transfers to states, and in particular grants, are **structural** (and often pro-cyclical) rather than cyclical in nature and have little to do with buffering state-specific macroeconomic fluctuations (Kirkegaard, 2015). Second, fiscal policy in the US has historically relied more heavily on **discretionary fiscal policies** than on automatic stabilisation compared to the EA.

Finally, the argument could be made that comparing the insurance effects of fiscal policy in the US and the EA to asymmetric shocks requires taking into account the size of fiscal spending. Most EA member states are characterised by large welfare state and larger automatic fiscal stabilisers. Direct transfers to individuals are twice as large in EA11, at about 20% (AMECO 2017, see annex B1-3)) as they are in the US, about 10% in the US⁸ (BEA, 2017). As it turns out, the more minimalist character of the US welfare state compared to EA welfare states only partially accounts for the lower level of asymmetric shock absorption through fiscal policy in the US. In effect, when adjusting the coefficient estimate of fiscal policy by spending size, we find that the larger budgets of euro area member states do not explain this trend alone. Indeed, the 'efficiency' of euro area member states' and the U.S federal budgets are broadly in line. Nevertheless, the EA outperforms the US when it comes to the effect of individual transfers and in particular unemployment benefits, which are significantly more effective in dealing with shocks in the EA.

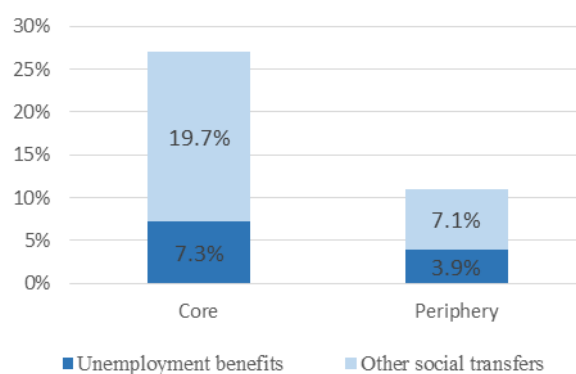
Core vs periphery

Since the lack of a euro area fiscal stabiliser is often cited as having fostered north-south (or surplus vs. deficit) divergences (Andor, 2016) this section provides separate estimates for core and periphery member states. In order to measure the difference in the two groups of countries (periphery vs core), we used two dummies for each group of countries that we interact with the independent variable. This allows us to obtain two coefficients (for a similar methodology, see Kalemli-Ozcan et al., 2014).

⁸ See Tables B1 through B3 in Annex B for stylised facts on the different elements of the US and EA11 budgets.

Not surprisingly: our estimates reveal that fiscal insurance is weaker in the periphery of the EA: direct fiscal transfers stabilise twice as much in the core (27%) as in the periphery (11%). Unemployment benefits smooth out about 7% of an asymmetric shock in the core, which is about twice as much as in the periphery, and is seven times larger than in the US. More detailed results (not reported) suggests that this gap was widened dramatically during the sovereign debt crisis, most likely due to the fiscal adjustment in the periphery as a result of the sudden stop and resulting loss of market access.

The large exacerbation in the differential between periphery estimates prior to the crisis and during the sovereign crisis suggest that, as far as macroeconomic stabilisation is concerned, what is primarily needed in the EA is an insurance mechanism against ‘catastrophic shocks’ that can potentially impair access to financial markets (Gros, 2014).



Note: The bars represent the percentages of states' output shocks absorbed through the different government budget items. Equations are estimated using OLS with time fixed effects. Core countries are Belgium, Austria, Germany, the Netherlands, Finland, and France. Periphery countries are Greece, Italy, Portugal, Spain, and Ireland.

Source: Authors' calculation based on data from AMECO, SOCEXP (OECD). See data description in section 2.1 for more details.

US states: rich vs poor, and net recipients vs contributors

In contrast to the large gap between the periphery and the core, the amount of fiscal inter-state risk sharing in the US appears highly homogenous across rich/poor as well as net recipient/contributor of federal funds (not reported). In other words, poorer states, defined as those below the median GSP per capita, feature similar degrees of smoothing through the federal budget than 'richer' states. The same observation holds when distinguishing between net recipients and net contributors of federal transfers. This reflects the fact that most transfers are not designed to achieve fiscal risk sharing or stabilise asynchronous output fluctuations. The latter are rather driven by the structural nature of the transfer system, whereby variables such as state income level, demographics, or the presence of US military bases and other federal institutions are the main determinants of federal transfers. As far as the unemployment insurance (UI) system is concerned, findings suggest that the US system does not disproportionately benefit the poorer states in terms of stabilisation capacity, despite different levels of structural unemployment and output growth rates.

3. Fiscal insurance from the US federal budget: beyond 'asymmetric shocks'

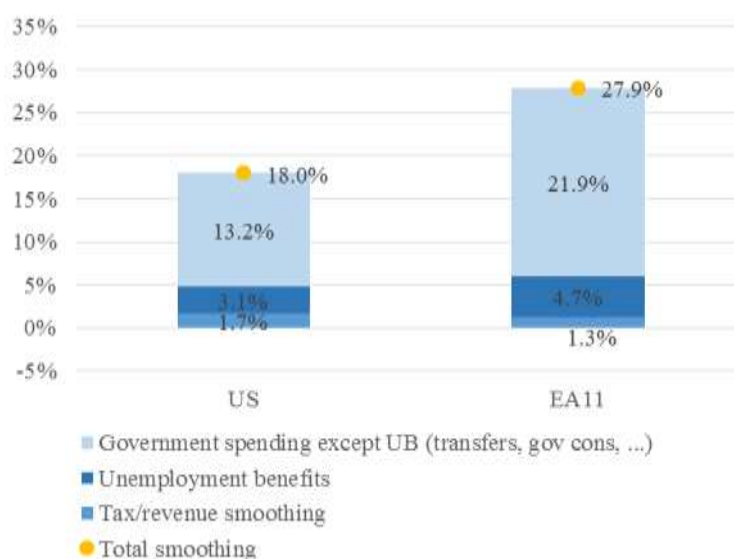
The empirical results presented in section 2 prompt us to rethink the function of fiscal institutions in monetary unions beyond their individual role in buffering asymmetric shocks. In order to test the possibility that the US federal tax-transfer system mainly serves as common insurance, section 3.1

measures the degree of insurance against ‘common shocks’ and compares it to insurance against asymmetric shocks. In section 3.2 we discuss potential interaction effects between private risk sharing and fiscal risk sharing in the US through unemployment insurance.

3.1 Fiscal policy and common shock insurance

In order to account for the degree of fiscal insurance against output fluctuations across all states, we adapt the econometric specification used in the previous sections in the vein of Poghosyan et al. (2015), except that here we go one step further and quantify the effect of the different government tools such as the US unemployment insurance. Specifically, to identify the common stabilisation effect of the US federal budget, we estimate similar equations to those presented previously without controlling for the effect of shocks affecting all states simultaneously. We interpret these new regression coefficients as the amount of insurance to protect against asymmetric *and* symmetric shocks altogether. The difference between these estimates and those with time fixed effect (presented earlier) should thus correspond to a measure of the response to the *common shock*. This strategy is particularly interesting in the case of the US to identify the stabilisation capacity at federal level against common shocks as opposed to inter-state risk sharing against asymmetric shocks.

Figure 4. Government budget breakdown: asymmetric and symmetric shock absorption, US vs EA (1995-2013)



Note: The bars represent the percentages of state’s output shocks absorbed through the different government budget items. Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term.

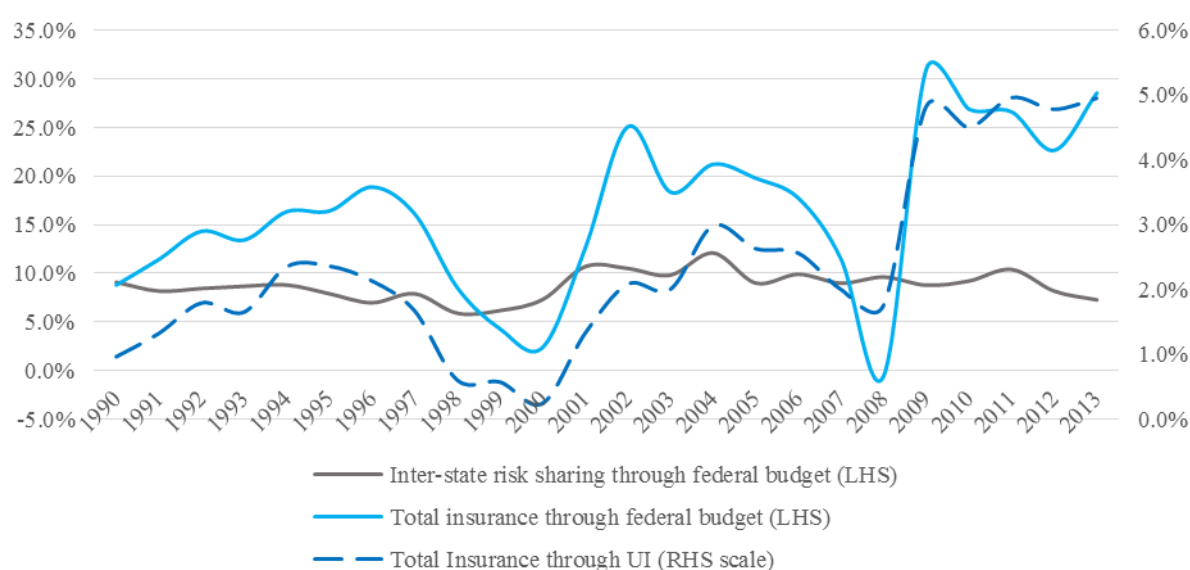
Source: Authors’ calculations based on data from AMECO, SOCEXP (OECD), and US bureau of Economic Analysis, BEA (see section 2.1 for more details).

Comparing figures 4 and 3 (previous section) reveals that, on average, insurance increases from 11% to 18% in the US and from 20% to 28% in the EA when time fixed effects no longer control for the portion of shocks affecting all states simultaneously. Insofar as unemployment benefits are concerned, the degree of insurance increases from 1% to 3% in the US, suggesting that most of the effect of the US UI is felt in the common portion of the shock. On the other hand, the measured smoothing effect of unemployment benefits in the EA11 remains unaltered.

Since insurance against (total) output shocks is associated with business-cycle movements, the stabilising effect of US fiscal policy against common fluctuations is likely to vary significantly over time. In order to capture the patterns of inter-state risk sharing and total fiscal smoothing - i.e. including common shocks - over time, Figure 5 reports 5-year rolling window estimates measuring:

- Federal inter-state risk sharing (as measured in the previous section, grey line on the LHS scale)
- Total federal fiscal insurance to shocks⁹ (light blue line, LHS scale),
- Total Insurance of the UI system to shocks (dashed blue line, RHS scale).

Figure 5. US smoothing via federal budget over time (5-year rolling window): inter-state risk sharing vs total shock absorption (1990-2013)



Note: The lines represent the percentages of states' output shocks absorbed through the different government budget items using a 5-year rolling-window approach. Thus, 1990 corresponds to the coefficient for the period 1986-1990, and so forth. Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term. Inter-state risk sharing is estimated controlling for common shocks (time FE), whereas the total insurance is estimated without controlling for shocks hitting all states simultaneously.
Source: Authors' calculations based on data from BEA (see section 2.1 for more details).

The evidence in Figure 5 points to two dynamic features of US fiscal policy: a strong association between total fiscal insurance and the business cycle – i.e. booms and busts – and a steady, yet declining degree of fiscal risk sharing across states. The latter finding runs counter to our expectation. In particular, the decreasing trend in fiscal risk sharing throughout the crisis indicates that the role of fiscal policy was increasingly towards common stabilisation rather than transferring resources to the most distressed states in order to smooth asymmetric shocks.

The discretionary fiscal stimuli enacted by Congress during periods of recessions (e.g. 2001-02 and 2008-09) stabilised US-wide fluctuations rather than asymmetric shocks. Stimulus packages also typically extend the duration and coverage of unemployment benefits. As a result, the total smoothing effect (dashed blue line) of US unemployment benefits is on average three times larger (from 1 to 3%) when common output fluctuations in the US are included, and fluctuates at around 5% during episodes of crisis. As can be observed by comparing the two blue lines, the degree of insurance provided through

⁹ By that we mean insurance against the asymmetric *and* symmetric portion of output changes.

unemployment insurance features a remarkably similar dynamic to the one of the total US budget, driven by episodes of boom and bust.

The bottom line is that this fact contradicts one of the most enduring myths about the US fiscal union, namely that the US fared better during the financial crisis as a result of the capacity of the US federal tax-transfer system to transfer resources to states most hit during the financial crisis. Rather, it seems that fiscal reactions to crises in the US carry an important element of insurance against common shocks. It is important to stress that joint fiscal expansion is not a zero-sum game on aggregate: it also allows cross-border fiscal policy externalities to be internalised, namely the effect of demand stimulus on states that are trade partners (Thirion, 2017).

3.2 Market and public risk-sharing mechanisms: Substitutes or mutually reinforcing?¹⁰

Another feature that tends to be overlooked in the debate on the respective merits of fiscal and private risk sharing mechanisms is that the US Dollar area is characterised by much larger degrees of private risk sharing through asset portfolio diversification across states. Although often neglected, this distinction is likely to be just as important as the existence of a federal tax-transfer system when it comes to understanding how certain features of the US monetary union enhance its resilience compared to the EA.

As mentioned previously, the variable development of private risk-sharing mechanisms in the EA and US is substantial: about 40% of an output shock in the US is shared through capital market diversification in the US (Asdrubali et al., 1996)) for about 5% in the EA (Furceri and Zdzienicka 2013, Alcidi et al., 2017a). This means that the losses of failing businesses in one state are systematically borne out by investors in other states. This raises the question of how far the demand for fiscal insurance against asymmetric shocks is influenced by the existence of private risk-sharing mechanisms.

Figure 6 displays the standard deviation in real GDP growth rates for the US and the EA. It indicates that growth rate dispersion is larger among US states than in the EA11, with the exception of the sovereign debt crisis (2011-12) and 2003. Interestingly, in 2008-11, dispersion declined, whereas it sharply increased in the EA. The underlying message behind these stylised facts, and in particular the larger output dispersion observed across US states, is that diversity in a monetary union is not necessarily a weakness as long as there are a number of insurance mechanisms to deal with risks. One can thereby turn economic diversity into an opportunity to diversify and share risks in a mutually beneficial way (Schelkle, 2017).

Interestingly, the opposite pattern prevails when considering the dispersion of changes in unemployment rates in the US and the EA.¹¹ Dispersion is consistently lower in the US than in the EA. In addition, with the exception of 2008-09, it has remained remarkably stable over time in the US, contrary to the double-dip surge in the dispersion of unemployment rates among EA11 countries during the crisis.

¹⁰ The rest of the article partly draws from Alcidi and Thirion (2017), “The stabilising role of US federal fiscal institutions: What lessons for the euro area”, *Intereconomics Forum*, May.

¹¹ We opt for changes in unemployment rates to eliminate differences in the level of structural unemployment, which are probably higher in the EA than the US due to greater diversity in labour market structures.

Figure 6. Real GDP growth standard deviation

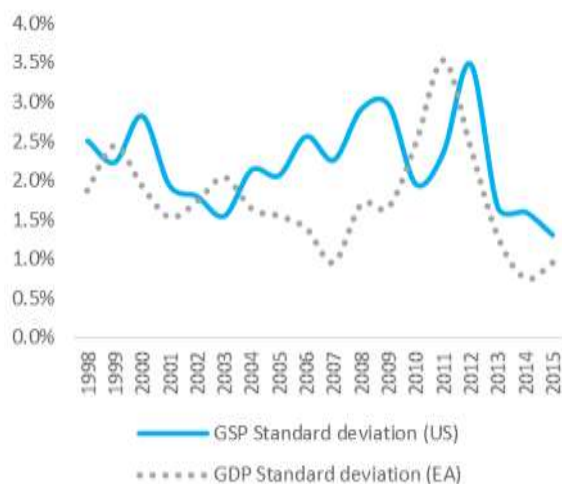
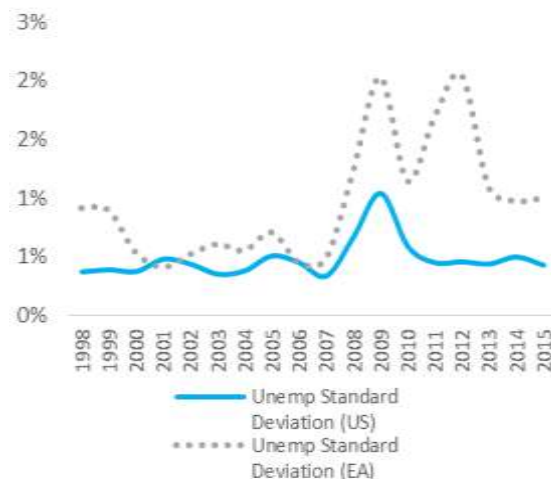


Figure 7. Unemployment rate change standard deviation



Sources: Authors' compilation based on Eurostat and the Bureau of Economic Analysis (BEA).

The combination of high output growth dispersion and low dispersion of unemployment rate changes in the US can appear puzzling at first sight. Indeed, the lower degree of employment protection in the US labour markets compared to the EA should lead to higher cyclical unemployment movements (Bertola, 2009), and hence to a higher dispersion in changes in unemployment. However, the large amount of inter-state risk sharing through capital and credit markets in the US may as well help buffer income and consumption from idiosyncratic output fluctuations, thereby explaining why output shocks do not necessarily translate into a surge in unemployment.¹²

In addition to the better capacity to share risks, possible differences in the *nature of shocks* hitting the US and EA may also explain divergences. Risk-sharing mechanisms are typically more effective in the face of transitory shock. Hence, if shocks are more persistent in the EA than in the US (Alcidi et al., 2017b), output shocks typically materialise in unemployment and the real economy. This would explain higher dispersion in unemployment growth rates in the EA. Labour mobility may also play a more favourable role in the US than in the EA. This is the classical adjustment mechanism to asymmetric shocks in the OCA theory, and historically mobility has been much stronger in the US than in the EA.

Overall, there are relevant reasons to believe that there is a causal link between high market risk sharing and low public risk sharing in the face of asymmetric shocks. In other words, they may be substitutes. Nevertheless, there may also be mutually reinforcing dynamics between market and public risk sharing. Surprisingly, the extent and nature of these interactions have thus far been the subject of little scrutiny in the debate, which tends to consider the different risk-sharing channels in isolation.

Yet, federal fiscal institutions can reinforce the market's willingness to share risks, hence further contributing to stability. In this sense, by evaluating fiscal insurance provided by the US federal

¹² The idea that US risk-sharing institutions buffer employment from output shocks is supported by the fact that state unemployment rates are weakly correlated with states output growth (-0.15) whereas national output and unemployment changes are significantly and negatively correlated (-0.4).

government against asymmetric shocks, we implicitly regard market-based income smoothing as exogenous to other institutions (fiscal or not) that help managing markets. It is however largely implausible that such outcome can be considered as exogenous due to likely positive non-measurable benefits from fiscal risk-sharing institutions (e.g. Federal Deposit Insurance Company – FDIC) on private risk sharing in the US.

4. The US unemployment insurance: A semi-automatic stabiliser with limited risk pooling?

The idea that the US federal budget is on average better equipped than EA member states to smooth out idiosyncratic output fluctuations is not the only myth about the US fiscal union. Another one concerns the idea that the US unemployment insurance (UI) system is a unitary and centralised insurance scheme with significant and permanent inter-state solidarity. As will be shown in this section, in reality, by treating all unemployment benefit spending as ‘federal’ in nature, the estimates of the insurance effects of the US UI against asymmetric are likely to overestimate the true level of *inter-state risk sharing*.

Contrarily to what is often assumed, the semi-decentralised nature of the US UI system limits the scope for true inter-state risk sharing by leaving most of the funding prerogatives to states. In fact, mechanisms for true federal risk sharing in the US are essentially deployed in the face of large common shocks. This section discusses the most relevant features of the US UI system. For an overview of the different US UI programmes and their triggers, see Annex B6.

For starters, the US UI institutional setup was deliberately chosen and designed to limit the degree of risk pooling and to allow states freedom over the design of UI schemes, unlike the fully centralised UI system introduced by its Canadian neighbour under roughly the same circumstances (Beramendi, 2008). Compared to a fully centralised system, the US system embeds two relevant particularities. First, UI programmes are administered at the federal level by the US Department of Labor, which sets broad guidelines and minimum common standards that state programmes must follow. Hence, the ultimate design and implementation is left to the discretion of states, which results in important differences in the prerequisites, duration, and generosity of benefits among states.¹³

The hybrid nature of the scheme is reflected in its funding structure, which significantly restricts the scope for inter-state solidarity. The system is normally funded by state and federal payroll taxes collected from employers, which are both channelled into the relevant accounts of the federal Unemployment Trust Fund by the US Treasury. The federal tax rate (Federal Unemployment Tax Act, FUTA) is 6% of the first \$7,000 paid to each employee, but a tax credit of 5.4% is granted to states that comply with federal rules (i.e. have implemented a UI system),¹⁴ Thus the effective rate is a meagre 0.6%.

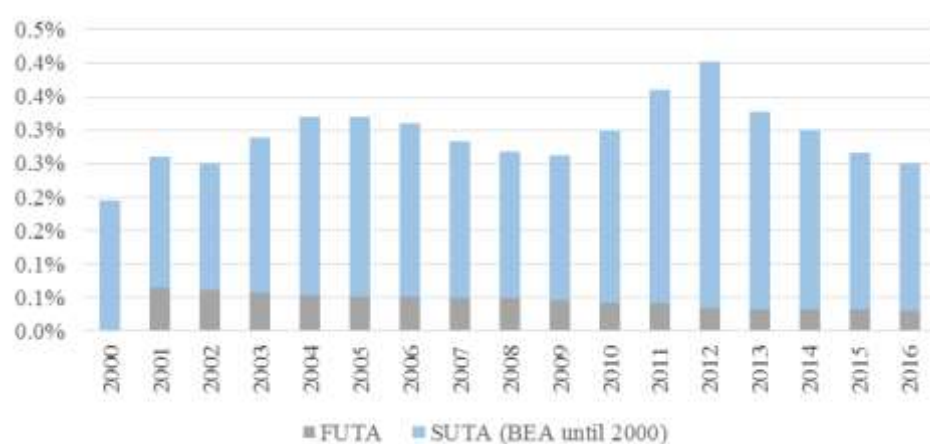
Hence, as can be inferred from Figure 8 (below), the bulk of the **basic US UI system**, which covers up to 26 weeks of unemployment, is financed through the state tax (SUTA). The state tax collection tends to fluctuate along the business cycle, with some degree of pro-cyclicality in the collection of state taxes,

¹³ Note that workers only receive unemployment benefits from the state where they used to be employed. The maximum state-provided benefits range from \$235 in Mississippi to \$679 in Massachusetts.

¹⁴ The tax credit was initially created as an incentive to encourage states to set up unemployment insurance schemes. If a state refused to implement UI, it would result in all the firms based in that state paying a 6% tax while not receiving any federal transfers.

which increased in the years following the dotcom crisis, and the outbreak of the financial crisis. This points to the pro-cyclical bias of loan repayment after state's funds borrowed from the federal level in order to finance spending on basic unemployment insurance during periods of crisis.

Figure 8. UI contributions: FUTA, SUTA and additional net federal contributions



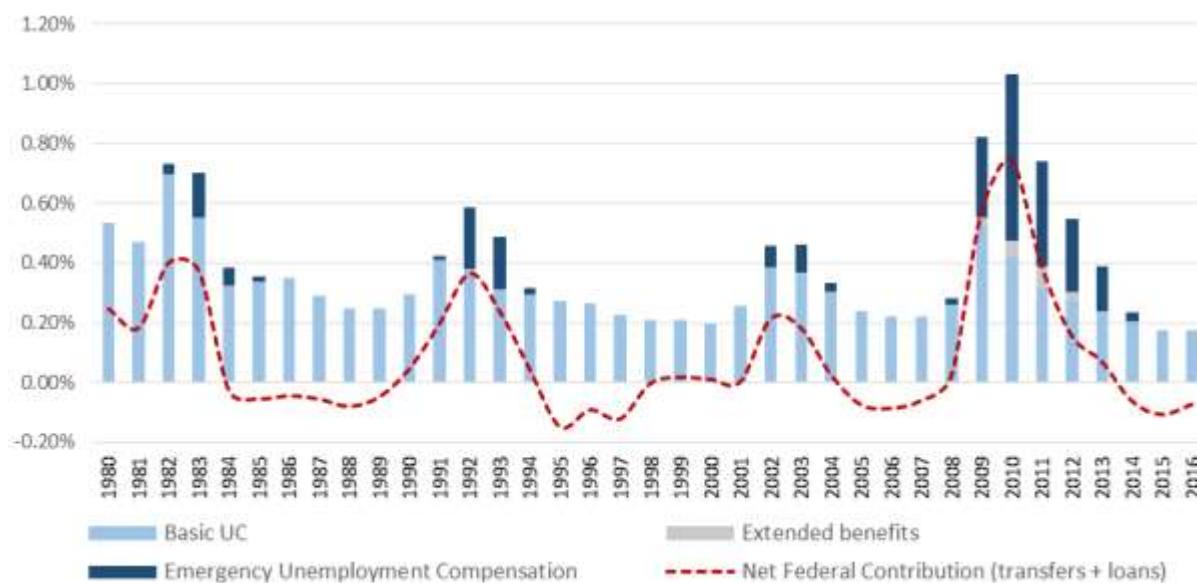
Data source: US Department of Labor (<https://fas.org/sgp/crs/misc/R44527.pdf>).

On average, unemployment benefit spending accounts for about 0.2-0.3 % of US GDP during ‘non crisis’ times. However, the cost rises to 0.5- 1% of GDP in the wake of recessions. As a point of comparison, spending on unemployment benefits amounted to about 1.5% of GDP in 1995-2013 in the euro area (OECD), and 2% of GDP in 2008-2013 on average (see Annex B1-3).¹⁵ The large variations in UI spending reflect the responsiveness of the system to large economic recessions, which tends to increase spending proportionally more than in the euro area. Spending on basic unemployment compensation, the permanent unemployment benefit program, virtually accounts for the total amount of expenditure when no significant symmetric shock affects the US economy. What is crucial is that the payment of basic unemployment benefits in the US does not involve any inter-state risk sharing. It rather allows for **inter-generational risk sharing** with future generations within a given state, which is why our empirical results that treat all benefits and contributions as ‘federal’ may technically overestimate the amount of inter-state risk sharing.

The extended benefit program (grey bar), which extends benefit duration in states facing periods of high unemployment, is the only permanent mechanism designed to provide inter-state risk sharing through a federal fund (EUCA) that provides transfers covering 50% of the cost of extended weeks of benefits. The programme is triggered by different indicators of a state’s unemployment level, which makes it in principle well-suited to deal with significant state-specific shocks. However, it has historically accounted for a modest amount of total UI outlays.

¹⁵ Higher sensitivity of UB spending in the US can be explained by difference in labour market structures, and in particular the higher level of labour market flexibility in the US, which amplifies the reaction of unemployment rates to large movements in the business cycle as compared to most EA countries.

Figure 9. UI expenditure by programme and net federal support (% of US GDP)



Note: Due to data restriction, the variable basic UC includes spending on extended benefits prior to 2000.

Sources: BEA, NIPA tables (prior to 2000), and US Department of Labor (<https://fas.org/sgp/crs/misc/R44527.pdf>).

The federal budget can provide additional funding in two different ways (see 'net federal contribution' in Figure 9, red dotted line).

- Providing loans through the Treasury to finance states' **basic unemployment insurance**.

This occurs when states trust funds run out of funds, typically during spells of prolonged high unemployment, and borrow from the federal level to fund unemployment benefits. It is thus a varying fraction of the light blue bar on Figure 9. This system does not, strictly speaking, involve inter-state risk sharing since loans must be repaid after two years against an interest, which induces some mild procyclicality in UI financing. The system is thus best understood as federal re-insurance instrument that guarantees unemployment benefit payments in hard times.

- Outright transfers to finance **Emergency Benefits** (requires action by Congress).

Emergency Unemployment Compensation (EUC) schemes (dark blue) provide genuine (discretionary) fiscal transfers, but to individuals not states. These transfers finance additional weeks of unemployment benefits to those individuals who have exhausted regular state benefits during periods of US-wide recessions.¹⁶ As can be observed from Figure 9 (dark blue), this programme typically finances the bulk of the increase in benefit spending during crises.

While these are genuine transfers, since they must not be repaid by states, emergency programmes are characterised by their discretionary rather than automatic nature. As such it has historically been activated in the face of US-wide recessions (symmetric shocks), which may explain why the US UI system does not seem to provide significant insurance against asymmetric shocks.

¹⁶ The most recent example of an EUC scheme was from June 2008 until the end of 2013.

5. Concluding remarks and policy implications

The estimation of the macroeconomic insurance role of US federal fiscal stabilisers against asymmetric output fluctuations, and most prominently the role of unemployment insurance, tends to be largely overstated in the current debate on the design of an EA fiscal union.

As such, our results also points to the limitations of policy prescriptions derived by looking at the US fiscal union as a guide for the EA through the single lens of ‘asymmetric shock’ absorption, as prescribed by the OCA theory. The main issue with this narrative is not so much that it overstates the performance of US federal automatic stabilisers in buffering asymmetric output shocks, but that it is fundamentally too narrow an understanding of the stabilising role of US federal fiscal institutions. In order to illustrate this point, the analysis has highlighted three important – but rarely mentioned – features of U.S federal fiscal institutions which should be seriously taken into account in order to better understand the source of the resilience of the US dollar monetary union.

First, the coexistence of different private and public risk-sharing mechanisms, some of which are hardly measurable (e.g. the effect of the FDIC), imply that the low amount of inter-state fiscal risk sharing may well be attributable to the effective action of other insurance mechanisms – public or private – that spread the consequences of shocks in the US, and thereby reduce the need for inter-state fiscal stabilisation.

Second, the discretionary character of US fiscal policy, including US UI, makes it de facto better suited to deal with large US-wide recessions than state-specific shocks. This suggests that the main benefits from an EA fiscal stabiliser could also arise in the face of large common output fluctuations, when the positive externalities of fiscal policy stimuli can be internalised through a centralised fiscal policy instrument.

Third, the design of the US UI system is such that the scope for inter-state risk sharing is essentially restricted to large US-wide crises. Indeed, as far as the basic UI scheme is concerned, the main role of the federal government lies in granting states with permanent access to a line of credit from the US Treasury. Transfers from the federal government require congressional approval and occur only when Congress passes a fiscal stimulus bill in the face of an US-wide economic recession.

Nevertheless, none of the above makes the US fiscal system a less meaningful guide for the design of a euro-area fiscal capacity. On the contrary. The US UI shows that *ex ante* re-insurance of decentralised basic UI schemes can be achieved such that it limits the degree of inter-state solidarity to a large extent, while allowing for outright transfers in the face of large shocks. The US system thus provides some interesting insights into how to provide insurance against the risk that EA member states end up being forced to cut back social benefits when they are faced with difficulties in accessing financial markets. The latter point would be the single-most important value added of an EA stabiliser from a macroeconomic and social point of view. This would also support the internalisation of demand externalities, hence generating positive effects across the entire EA.

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Annex A. The decomposition methodology

Risk-sharing mechanisms in monetary unions

The effectiveness of smoothing mechanisms among the euro area member states and US is estimated using the approach of Asdrubali et al. (1996) and Sorensen and Yosha (1998), who provide an integrated framework to quantify the relative amount of inter-regional risk sharing.

The framework, which is equally applicable to regions, states or countries, distinguishes between three different channels for smoothing consumption and income among regions or countries. For simplicity let us describe the framework assuming a cross-country scenario.¹⁷ First, individuals and firms can insure themselves against income shocks via the cross-ownership of assets by using the international capital market. This channel is captured by international factor income, which is the difference between GDP and GNI and corresponds closely to the primary investment income recorded in the balance of payment.

Secondly, government transfers (fiscal risk sharing) can also smooth income if net transfers to regions or countries are larger when hit by a negative shock. Although such transfers may be influenced by other motives than risk sharing, a system of federal tax, transfers and grants in federations is typically designed to help absorb the negative effects of asymmetric shocks. In most cases, automatic transfers and/or benefits (e.g. unemployment insurance) are activated under certain conditions.

Finally, inter-temporal risk sharing through savings or borrowing in domestic or international credit markets also contribute to inter-regional consumption smoothing. Saving and borrowing allow the smoothing of consumption over time through the business cycle, as governments, households and firms can save or dis-save.¹⁸ The fraction of shocks left unsmoothed is the remainder, which is captured by the correlation between GDP and final consumption.

In order to measure the effect of these channels, GDP (in the case of EA countries) or GSP (in the case of US states) is thus disaggregated into the following national (state) accounts aggregates:

- $GDP - GNI = \textit{international capital and labour income transfers (factor income flows)}$
- $NI - NNDI = \textit{net international taxes and transfers}$
- $NNDI - (CONS) = \textit{total savings}$
- $GNI - NI = \textit{capital depreciation}$

Where i is an index of countries while GDP is decomposed in: Gross National Income (GNI), National Income (NI), Net National Disposable Income (NNDI) and total consumption (CONS) that is equal to the sum of private (C) and government (G) consumption. All variables are measured in real and per capita

¹⁷ The methodology used for US states is similar to the exception that capital depreciation is included in international factor income. Other differences between the US state and EA data is discussed in the next section.

¹⁸ Intertemporal consumption smoothing can embed an international component, but this is not necessarily the case in reality. Decomposing domestic and international smoothing, Alcidi et al. (2016) show that the bulk of consumption smoothing is achieved domestically, via adjustments in domestic investment rather than externally, via cross-border flows of assets (as reflected in financial accounts).

terms. The difference between GDP and GNI, NI and NNDI, NNDI and Consumption represent the three risk-sharing channels outlined above.

Net factor income comprises income from productive assets, such as FDI, equity and debt securities, loans but also labour income. The second channel, the fiscal insurance channel, reflects taxes and transfers, accounting for the difference between income and disposable income. Net savings comprise households, government and corporate savings. A fourth channel, capital depreciation, also contributes to the smoothing of shocks to GDP.¹⁹

We implement a cross-sectional variance decomposition of shocks to GDP to measure the relative smoothing capacity of the various channels of absorption. We start from the following national account identity, valid for each year and each country (or region) under analysis:

$$GDP_i = \frac{GDP_i}{GNI_i} \frac{GNI_i}{NI_i} \frac{NI_i}{NNDI_i} \frac{NNDI_i}{CONS_i} * CONS_i \quad (1)$$

The interpretation of this equation is that the effect of a shock hitting an economy, affecting its GDP, can be smoothed in the economy if some counter-cyclical movement in other economic aggregates prevents corresponding swings in total consumption. In particular, full stabilisation is achieved if a shock to GDP growth does not lead to any variation in the consumption growth rate. This implies that one of the four ratios must move positively with GDP. For instance, the ratio $\frac{GDP_i}{GNI_i}$ will be positively correlated with GDP if there is some degree of income smoothing via international factor income, and $\frac{GNI_i}{NI_i}$ will be positively associated with GDP movements if depreciation of capital provides further income smoothing. In the case that transfers from the federal level, or some EU institution provide income smoothing, $\frac{NI_i}{NNDI_i}$ should move positively with GDP. Similarly, $\frac{NNDI_i}{C_i+G_i}$ should be positively related to GDP if saving and borrowing provide additional consumption smoothing. Any remaining positive co-movements between total consumption and GDP indicate that some part of output shocks is not smoothed.

To derive the equations to be estimated, we start from equation (1), take logs and difference and multiply both sides by $\Delta \log GDP$ (minus its mean for each time period) to obtain:

$$\begin{aligned} var(\Delta \log GDP) = & cov(\Delta \log GDP, \Delta \log GDP - \Delta \log GNP) + \\ & cov(\Delta \log GDP, \Delta \log GNP - \Delta \log NI) + \\ & cov(\Delta \log GDP, \Delta \log NI - \Delta \log DNI) + \\ & cov(\Delta \log GDP, \Delta \log DNI - \Delta \log CONS) + \\ & cov(\Delta \log GDP, \Delta \log CONS) \end{aligned}$$

Dividing by $var(\Delta \log GDP)$ we obtain the following system of independent equations with time fixed effects:

¹⁹ In principle, capital depreciation could be an effective channel of smoothing: during booms, capital tends to depreciate faster because of more intense utilisation while the opposite occurs during recessions. However, capital depreciation is measured following fixed accounting rules, usually leading to a pro-cyclical behaviour for this channel.

$$\text{International factor: } \Delta \log GDP_{i,t} - \Delta \log GNI_{i,t} = \alpha_t^{if} + \beta^f \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

$$\text{Capital depreciation: } \Delta \log GNI_{i,t} - \Delta \log NI_{i,t} = \alpha_t^d + \beta^d \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

$$\text{International transfers: } \Delta \log NI_{i,t} - \Delta \log NNDI_{i,t} = \alpha_t^t + \beta^t \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

$$\text{Total net savings: } \Delta \log NNDI_{i,t} - \Delta \log CONS_{i,t} = \alpha_t^s + \beta^s \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

$$\text{Total consumption: } \Delta \log TOT\ CON_{i,t} = \alpha_t^c + \beta^c \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

where $\beta^f + \beta^d + \beta^t + \beta^s + \beta^u = 1$ and the β coefficients are the OLS estimates of the slope in the cross-sectional regressions. We present panel correct standard errors, and in order to account for possible autocorrelation in the residuals, we assume that the error follows an AR(1) process. We do not impose any constraint on the β s: a positive coefficient measures the smoothing effect of a given channel, a negative coefficient indicates that the channel has a di-smoothing effects. For instance, if international fiscal transfers increase during an economic upturn, this flow of resources will increase the disposable income, amplifying the initial shocks on GDP.

The regression's coefficients are to be interpreted in the following way: β_s capture the percentage of shocks absorbed by the various smoothing channels; α_t denotes the time-fixed effects, controlling for year-specific effects on growth rate. With the introduction of time fixed effects, we control for shocks on aggregate GDP, while the β coefficients are weighted averages of the yearly cross-sectional regressions. This is because we only want to include country specific shocks, removing the aggregate component, which is by definition not insurable among the countries in the sample.

One crucial feature of the present empirical analysis is that our two samples feature respectively EA11 countries and the 50 U.S states, and thus somehow implicitly envisions the sample as a 'closed world'. While this might sound trivial, this means that the introduction of time fixed effects removes the aggregate component from the growth rates of the countries present in the sample, not based on the world output fluctuations. Thus, the implication of the time fixed effects is that GDP shocks at the country (state) level are defined as deviations from the (unweighted) sample average output growth rate.²⁰ Countries (states) can experience (relative) positive and negative shocks no matter whether all countries are, say, in a recession or boom at the same time.

Consumption smoothing through fiscal policy in the EMU

In order to quantify the amount of consumption smoothing through the different fiscal policy instruments that make up the government saving in EA11 member states, we consider the following equation:

$$\frac{DNI_i}{TOT\ CONS_i}$$

²⁰ The lack of weights partly constitutes a caveat of the model, which is not mentioned in the literature, surprisingly. Thus, we have performed a similar analysis departing from the time fixed effects method by removing the weighted average output growth rates by from the individual country's growth rate to better capture the true 'common' part of the shock. Results hold up to this change.

that can be re-written as:

$$\frac{DNI_i}{DNI_i - Net\ Savings} = \frac{DNI_i}{(DNI_i \pm f)} \frac{(DNI_i \pm f)}{TOT\ CONS_i}$$

where f stands for the fiscal policy instrument. This framework, allows us to distinguish between the smoothing role of private saving and the role of various components of fiscal policy that, which by construction sum up to the public sector net saving. Thus, overall, we provide a complete picture of the role of government consumption smoothing via the use of the national budget. Namely we estimate the smoothing properties of government consumption, transfers, subsidies on the expenditure side; and social contributions, direct and indirect taxes on the revenue side.

We estimate the following equations:

$$\text{Fiscal policy element (x): } \Delta \log DNI_{i,t} - \Delta \log(DNI \pm x)_{i,t} = \alpha_t^{if} + \beta^{if} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

$$\text{Total Public Saving: } \Delta \log DNI_{i,t} - \Delta \log(DNI - pub\ sav)_{i,t} = \alpha_t^{pus} + \beta^{pus} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$$

Where f is positive for any type of government expenditure, and negative for revenue components. The coefficient estimates measure the fraction of shocks to GDP absorbed by the various domestic fiscal policy instruments. We thus measure the fraction of the cross-sectional variability in GDP that is absorbed by different types of fiscal components. Note that portion of shocks smoothed via the components of the general government saving are simply an additional decomposition of the portion of shocks smoothed via total net saving. The remainder is the amount smoothed privately.

Income insurance via the federal tax and transfer system

Measuring the extent to which the different components of the federal system of taxes and transfers provide insurance is straightforward from the framework presented above. Following the methodology and the variable constructed in Asdrubali et al. (1996) the analysis uses per capita net fiscal transfers from the government to a state i , which is defined as the difference between per capita disposable income (after net transfers). Similarly to the method presented in section 2.1, we take the logarithms of the first differenced variables, and multiply both sides of the equation by $D.\log(GSP)$, minus its mean for every year, and compute the expected value, which yields the following variance decomposition of GSP:

In particular we estimate the following equation:

$$\text{Risk - sharing federal budget via } f : \Delta \log SI_{i,t} - \Delta \log (SI + f) = \alpha_t^f + \beta^f \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

$$\text{Risk - sharing Federal tax and transfers: } \Delta \log SI_{i,t} - \Delta \log DSI_{i,t} = \alpha_t^t + \beta^t \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

The idea is that there the federal budget provides fiscal risk sharing if:

$$(\text{State income}/\text{State income} + f)$$

moves positively with State income, when $f = (+)$ Transfer and $f = (-)$ Tax. Thus, if state income increases, the rise in $SI +$ federal transfer should be smaller.

One crucial feature of the estimation concerns the introduction of time fixed effects, which capture the common aggregate year specific effects on output growth. Time fixed capture the aggregate effects on US-wide GDP. As such the shocks are measured relative to the average growth rate among US states.²¹

²¹ Asdrubali et al. (1996) show that the coefficient from such regressions with time fixed effects boils down to a weighted average of the coefficients that would be estimated from year-by-year cross-sectional regressions.

Annex B. Government budgets decomposition and shock smoothing

Table B1. Composition of national government savings in the EA11, periphery and core (% of GDP)

	1995-2013			2008-2013		
	EA11	PERIPHERY	CORE	EA11	PERIPHERY	CORE
<i>Revenues</i>	40.5%	36.2%	44.0%	40.6%	36.7%	43.8%
Social contributions (+)	13.4%	10.8%	15.6%	13.6%	11.4%	15.4%
Other revenues(+)	2.1%	1.9%	2.2%	2.2%	2.0%	2.4%
Indirect tax (+)	12.8%	12.7%	13.0%	12.6%	12.3%	12.9%
Direct tax (+)	12.2%	10.9%	13.3%	12.1%	11.0%	13.1%
<i>Expenditure</i>	42.2%	39.1%	44.8%	44.5%	43.1%	45.7%
Transfers (-)	17.1%	15.4%	18.6%	18.6%	18.3%	18.9%
Subsidies (-)	1.3%	0.9%	1.7%	1.4%	0.9%	1.7%
Other sp (-)	3.7%	4.2%	3.2%	3.1%	3.9%	2.4%
Government Cons (-)	20.1%	18.5%	21.4%	21.4%	20.0%	22.6%

Source: OECD, detailed national accounts.

Table B2. Decomposition of transfers to individuals in the EA11, periphery and core (% of GDP)

	1995-2013			2008-2013		
	EA11	PERIPHERY	CORE	EA11	PERIPHERY	CORE
Old age	8.5%	8.4%	8.5%	9.5%	9.7%	9.3%
Survivors	1.6%	1.5%	1.6%	1.6%	1.9%	1.4%
Incapacity related	2.6%	1.9%	3.2%	2.6%	2.0%	3.0%
Family	2.0%	1.4%	2.5%	2.2%	1.8%	2.5%
Active labour market	0.8%	0.6%	0.9%	0.7%	0.6%	0.9%
Unemployment	1.6%	1.3%	1.8%	1.8%	1.9%	1.7%
Housing	0.3%	0.2%	0.4%	0.3%	0.2%	0.4%
Other social policy areas	0.4%	0.2%	0.5%	0.5%	0.3%	0.6%
Health	6.1%	5.6%	6.5%	6.8%	6.4%	7.2%
Total	23.7%	21.1%	25.9%	26.0%	24.7%	27.1%
Total - health (<u>Transfers</u>)	17.6%	15.5%	19.4%	19.2%	18.3%	19.9%

Source: OECD, Social Expenditure Database.

Table B3. Average federal disbursements/receipts (% of US GDP)

	1980-1995	1996-2007	2008-2013
<u>Total Revenue</u>	17.2%	17.5%	15.5%
Personal income tax	7.9%	8.2%	7.1%
Corporate income tax	1.6%	1.8%	1.6%
Social security contributions	6.1%	6.2%	5.7%
Unemployment contributions	0.3%	0.2%	0.3%
Other tax (excise)	1.2%	1.1%	0.9%
<u>Total Expenditure</u>	11.5%	11.9%	15.0%
Aid to state (grants)	2.6%	3.1%	3.7%
Unemployment benefits	0.4%	0.3%	0.6%
Other direct transfers (Old age, health...)	8.4%	8.5%	10.6%

Source: Bureau of Economic Analysis (BEA), US Department of Commerce.

Table B4. Government shock smoothing in the EA11

1995-2013	Time FE
Total smoothing	19.8
Expenditure	
Unemployment benefits	4.6***
Transfers (other than UB)	11***
Subsidies	1.3***
Government consumption	13***
Other expenditure	-1
Revenue	
Indirect tax	-5
Direct tax	-1
Social contribution	-2.3
Other revenues	4***

Notes: Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term. Standard errors are corrected for panel heteroscedasticity.

Table B5. Federal fiscal risk sharing in the US

1980 2013	Time FE
Total smoothing	11***
Expenditure	
Unemployment benefits	1***
Transfers (other than UI)	5.3***
Federal grants	1.8***
Revenue	
Direct federal tax	3***
UI contributions	-0.2***
Corporate tax	-0.2***
Social security contributions	-0.5***
Other indirect taxes	-0.1***

Notes: Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term. Standard errors are corrected for panel heteroscedasticity.

Table B6. Overview of unemployment insurance in the US, by programme

	Basic unemployment benefits	Extended Benefits (EB) program (permanent)	Emergency benefit (Discretionary temporary federal programs)
Economic circumstances	All times	Asymmetric unemployment shock to a state. Does not pre-requisite a nation-wide recession	Nation-wide recession (common shock). e.g. Emergency Unemployment Compensation (June 2008 through December 2013)
Duration	Generally up to 26 weeks	Additional 13-20 weeks after exhaustion of regular benefits. Total number of weeks depends on state's unemployment rate Note: The 2009 Recovery Act authorised temporary full federal funding through 2013	EUC provided 34 weeks of emergency federal benefits in all states, and up to 53 weeks in states with unemployment rate > 8.5% Also contribute to inter-temporal stabilisation
Trigger	Anyone losing his/her job for no fault of their own and eligible.	Based on the level of insured unemployment rate Triggered when the average insured unemployment rate (IUR) for the previous 13 weeks is at least 5% and is 120% of the rates for the previous 2 years. Certain provisions allow states to choose to extend benefits	Federal discretionary action
Funding	i) State's trust funds ii) A credit line is available from Federal Unemployment Account (FUA) If state UI account is insolvent.	50/50 (state/federal - FUA) i) State's trust funds ii) If insolvent: a Credit line is available through Federal Unemployment Account (FUA) - Fully covered by the federal government in 2008-2013	Emergency benefits are based on Congressional discretion and are paid primarily from General Revenues
Type of insurance	<u>Self-insurance</u> : states have an account at the Treasury, from which they draw upon or contribute depending on the cycle Corrective mechanism: automatically adjust contributions if funds not reimbursed within 2 years (FUTA increases).	<u>Self-insurance and risk sharing</u> : This mechanism includes some proper risk sharing (50% of the extra cost). Funded by the fund created out of the federal tax	Inter-state and inter-generational <u>risk sharing</u> through the federal budget



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