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Fiscal risk-sharing in response to shocks: New lessons for the euro area from the US

Abstract

Discussions on European integration have been influenced for a long time by the experience of the US, whose unemployment insurance (UI) system is often portrayed as an effective tool to respond to idiosyncratic shocks and one that missing in the euro area (EA). This paper investigates the extent to which this is the case in reality. It first offers empirical evidence that EA member states manage to provide a higher degree of insurance against asymmetric shocks (about 20%) than that provided by the US federal budget, which insures through inter-state fiscal risk-sharing (11%). It also shows that the larger budgets of EA member states do not explain this trend alone. Second, the paper finds that the US UI system is mostly relevant a as stabilisation mechanism in the face of US-wide shocks, rather than idiosyncratic shocks. We explain this by highlighting the institutional features of the US UI system as well as the existence of market mechanisms for inter-state risk-sharing. We draw two main lessons for the EA. First, the same system is unlikely to produce the same effects, given the structural features of the EA economies and the lack of effective market mechanisms. Second, a key role of the US federal UI system is to extend the duration and generosity of unemployment benefits in order support states, this tends to be associated with nation-wide recessions and it is the result of a discretionary Congress decisions rather than automatic mechanisms.

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1 Introduction

Discussions on European integration have been influenced for a long time by the experience of the United States. The debate on fiscal union is no exception. In recent times, the ability of the US to recover more quickly from the financial crisis has often been attributed to the larger degree of inter-state insurance[2] compared to the Economic and Monetary Union (EMU). In particular, the lack of fiscal capacity within EMU is often cited to explain the divergence between the US and the euro area in the aftermath of the global financial crisis.

Most arguments for such a capacity revolve around the need to dampen the effects of 'asymmetric shocks'. Put simply, the rationale for a common fiscal stabilisation function is primarily grounded on the fact that the loss of monetary policy sovereignty constrains member states' capacity to adjust to idiosyncratic shocks and shifts most of the burden onto domestic fiscal policy, which often has limited room of action (Enderlein et al., 2012). A federal budget or a common fiscal capacity can help insure against macroeconomic shocks hitting individual states, by making fiscal risk-sharing possible, as well as insure against common shocks that affect all member states simultaneously (common stabilisation).[3]

The fact that the US federal budget is often taken as a benchmark for its ability to make fiscal transfers to states facing a downturn stems from the prediction that risk-pooling at the central level enhances the degree of insurance against macroeconomic shocks. The sovereign debt crisis pushed distressed member states to cut fiscal policy at precisely the time when stabilisation was needed the most (De Grauwe, 2013). A fiscal stabiliser at the EMU level should ideally preserve member states' capacity to use automatic stabilisers to smooth macroeconomic shocks, at least partially, by relieving the burden on public finances when domestic monetary policy is no longer an available instrument.

It is against this backdrop that the federally operated unemployment insurance (UI) system in the US has attracted significant attention from researchers (see Dullien, 2007) and EU policy makers (e.g. the Four and Five Presidents' Reports – Van Rompuy, 2012, and Juncker, 2015). It carries some theoretically powerful features: it is a highly cyclical spending source by nature, it has stabilising features and not least, it embeds a social protection element that many regard as important for improving the perception of Europe by its citizens.

The US UI system is generally portrayed as an effective and timely tool for inter-state risk-sharing in the face of state-specific macroeconomic shocks. The underlying idea is that it allows unemployment benefits to freely operate in case of a downturn, hence directly dampening the effect of the shocks, whereas benefit payments towards states in the upturn are reduced. For these reasons, a European unemployment benefit scheme is at the current economic and political juncture considered as one of the most promising proposals for a common fiscal capacity (Dullien, 2013, Andor 2016 and Beblavý and Lenaerts, 2017), even though consensus is still lacking.

Against this background, the purpose of this paper is twofold. Since the US budget is used by some observers as a model for how a euro-area budget may enhance the economy's resilience to idiosyncratic

[2] As will be explained in more detail in this paper, this includes both the role of markets, via private cross-state flows of income, and fiscal transfers.

[3] Most federal budgets also have additional functions, like interregional redistribution. Here we focus on stabilisation.

shocks, we first quantify the risk-sharing properties of the US budget, and focus on the features of the UI system. As explained below, when looking at the US, we do not consider the role of states' fiscal policy, which is found negligible, and focus only on the Federal level. By contrast, in the EA, given that the EU budget does not have stabilisation functions, we only look at the member states' domestic fiscal policy. Hence, we are comparing the degree of insurance provided by the US budget with the capacity of euro-area member states to address asymmetric shocks. In order to quantify the extent of insurance against asymmetric shocks, we update the original study of Asdrubali et al. (1996) and Sorensen and Yosha (1998) on the channels of fiscal risk-sharing in the US, and extend and update the work of Arreaza et al. (1998) on the smoothing effect of government budgets in EU countries.[4]

We find that EA member states manage to provide a higher degree of insurance against asymmetric shocks (about 20%) than provided by the US federal budget insurance through inter-state fiscal risk-sharing (11%). We show that 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.

This brings us to the second objective of this paper, namely to ask whether the US budget, and in particular the UI system, rather than cushioning against asymmetric shocks, provides insurance against common macroeconomic shocks (stabilisation). Along these lines, we try to disentangle the importance of insurance against asymmetric output shocks relative to symmetric shocks, finding that the unemployment insurance performs three times better when the common output fluctuations in US are included in the calculations,

To better understand this result, we look at the dispersion of output growth and changes in unemployment rates. The results highlight the higher dispersion of output growth rates in the US, but they also indicate a significantly lower dispersion in changes in unemployment relative to the EA11. We interpret this as potential evidence that market-based mechanisms spread the effect of state-specific output shocks over other states through different estimations. It is beyond the scope of this paper, however, to establish the causal linkages that could provide more careful support for this claim.

Finally, we offer a description of the US unemployment insurance system in order to highlight how the institutional set-up provides very limited scope for true inter-state risk-sharing. The crucial role of the federally organised basic UI system lies in the credit line made available to states, which must be repaid with interest. We conclude that the basic UI is a combination of inter-generational risk-sharing supplemented by a federal credit line acting as reinsurance. Finally, and perhaps most crucially, transfers from the federal government only occur through emergency benefit programmes financing the extension of the duration and generosity of the basic UI. These programmes are discretionary rather than automatic as they require Congressional approval. 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 provides a review of the literature on how government budgets provide insurance against idiosyncratic shocks. Section 3 introduces the empirical strategy and provides a comparative analysis of the capacity of US and EA11 to buffer asymmetric shocks through government budgets. Section 4 extends the results from section 3, including the insurance against

[4] In this analysis, the role of US states' fiscal policy in absorbing shocks is intentionally neglected. Indeed, the literature suggests that budget constraints at state level and institutional design make such a role a minor one.

common shocks. Sections 5 offers two perspectives on the key factors that can explain the performance of UI in the US, and section 6 concludes and draws implication for the euro area.

2 Fiscal policy and risk-sharing in the US and in the euro area: Concepts and literature

It is conceptually important to distinguish between i) the insurance role of a common budget to stabilise the output fluctuations at the level of the entire federation (through borrowing at federal level to respond to common shocks), ii) the inter-state risk-sharing insurance function that characterises a federal system of fiscal transfers and taxes in case of idiosyncratic shocks and iii) inter-temporal risk-sharing through state's government budget, i.e. standard budgetary policy at the level of the state. The main difference between the euro area and the US is that in the euro area, which has no common budget, only the latter form of insurance is available, i.e. inter-temporal risk-sharing.

Similarly, it is crucial to distinguish between fiscal-policy responses against asymmetric and symmetric shocks. Table 1 summarises the nature of the fiscal tools available to euro-area member states and in the US in order to deal with asymmetric and symmetric output shocks.

Table 1. Typology of output shocks and government fiscal policy's responses

Type of shock	**Asymmetric shock** Defined as deviation in growth rate with respect to the rest of the monetary union (idiosyncratic shock)	**Symmetric shock** Defined as the deviation in growth rate in a MU with respect to historical MU growth rate (e.g. EA/US-wide recession)
Type of insurance	**US*** - Inter-state risk-sharing through federal budget's automatic stabilisers - Inter-temporal risk-sharing through state or local government deficit **EA** - Inter-temporal risk-sharing through state or local government deficit	**US** - US federal budget – discretionary stimulus packages enacted by Congress **EA** - Cross country fiscal policy coordination (e.g. European Recovery Plan, 2009)=> Inter-temporal risk-sharing

* As explained in detail in section 5, the basic (state level) unemployment insurance system in the US is technically inter-temporal risk-sharing.

Source: Authors' elaboration.

Asymmetric shocks in a monetary union can be absorbed through states' fiscal budgets (inter-temporal risk-sharing) or by the federal budget (inter-state risk-sharing). In the US, even though total states' government spending nearly equals in size the federal government's budget, asymmetric shocks are essentially addressed by the federal budget. The marginal counter-cyclical role of states' budgets in the

US is explained by the existence of strong fiscal rules and a clear no-bail-out policy by the federal level, as well as by the fact that personal direct transfers are distributed by the federal level.

The conduct of fiscal policy in the euro area conceptually stands in stark contrast to the US. First, a common euro-area budget does not exist and fiscal policy is carried out at the national level regardless of the nature of the shock. Therefore inter-state fiscal risk-sharing is virtually non-existent, as the EU budget is not designed to provide such stabilisation. Nevertheless, some argue that the European Stability Mechanism (ESM) is a mechanism to smooth the impact of asymmetric shocks.[5]

Second, symmetric shocks can occur and affect all member states of a monetary union, and in this case the nature of stabilisation differs in the euro area from the US. In the euro area, inter-generational risk-sharing solely involves individual member states, through their sovereign debt. In contrast, in the US, federal borrowing leads to a form of inter-generational risk-sharing that also involves mutualisation of risks among states.[6]

Overall, from this conceptual framework, it appears that the US federal budget theoretically allows for two complementary ways of mutualising risks: it allows for inter-state insurance and it can be deployed to address US-wide shocks, which is absent from the euro area.[7]

2.1 Fiscal policy in monetary unions: Empirical literature

Since the 1990s, a number of studies have attempted to quantify the amount of fiscal risk-sharing occurring through the US federal transfer system. It is noteworthy that the range of estimates is relatively large due to the different methodologies used to capture different types of insurance and redistribution effects. Results range from 33% of shock absorbed through the federal budget in Sachs and Sala-i-Martin (1991), who do not distinguish between the redistribution and risk-sharing effects of federal fiscal transfers, and the work based on more refined methodologies as in Hepp and Von Hagen (2013) and Poghosian et al. (2015), who estimate fiscal risk-sharing at 10-11% of output shocks.

Asdrubali et al. (1996) expanded the analysis of risk-sharing in the US to other channels than the federal budget. In line with previous studies that focused on capturing the inter-state risk-sharing effect, they find that in the US, over the period 1963 to 1990, 13% of shocks are absorbed through the federal system of transfers. In addition, they find that about 40% of the shock is smoothed by the international factor income, namely through cross-state market transfers and another 20% through (net) personal savings.

The federal budget, which is about 20% of US GDP, makes up for the bulk of the cyclically sensitive spending in the US. But states also bear an important weight in the overall country's fiscal spending

[5] The ESM could be thought of as an instrument for risk-sharing to the extent that it provides emergency support to countries in case of extreme shocks, associated with a sovereign crisis, through a common pool of resources. Unlike traditional federal budgets, the support does not take the form of a fiscal transfer but of a loan, which has to be repaid with interest. In this sense it is different from federal risk-sharing. However, the support is provided at times when no other lender would be available and the credit risk of the borrower is very high; hence there is an element of risk-sharing. Likewise, liquidity injections into the banking sector by the European Central Bank can also be seen as a tool aimed at absorbing the impact of shocks.

[6] Note that since the federal level becomes liable, debt repayment is guaranteed by common future taxes, which technically makes such borrowing both cross-state and intertemporal.

[7] In the standard Optimum Currency Area theory, symmetric shocks are meant to be addressed by the common monetary policy. This approach neglects situations in which monetary policy is constrained and/or financial markets are dysfunctional, and hence a common fiscal policy would become relevant.

(more than 15% of US total GDP). A few studies (e.g. Yosha and Sorensen 1998 and Sorensen, Wu and Yosha 2001 Folette and Lutz 2013) have investigated the cyclical properties of the fiscal policies adopted by US state and local government. Depending on the specifications, their findings suggest that states' capacity to smooth asymmetric shocks is mildly pro-cyclical, neutral or weakly countercyclical. This reflects the fact that automatic stabilisers operate (almost entirely) at the federal level, and that states' budgets are strictly constrained by balanced budget rules and a credible no bail-out commitment.

In the 1990s, the European monetary unification project sparked a new wave of research focusing on EU countries based on the empirical framework initially developed by Asdrubali et al. (1996) for the US states. Sorensen and Yosha (1998) find that risk-sharing is non-existent in the euro area, which is not surprising given the size of the EU budget and the fact that it was not designed for stabilisation purposes. International factor income was found to have almost no smoothing properties in the euro area, which would reflect a stronger 'home bias' in investment decisions within the euro area, despite the Single Market. As a result, the only operating channel to smooth consumption against output shocks is through savings or borrowing, and particularly through national governments' deficits, which smooth about 20% of output shocks (Arreaza et al., 1999). More recent studies, among others Afonso and Furceri (2009) and Kalemli-Ozcan et al. 2014, using the same methodology, broadly confirm these features, even for the years following the introduction of the euro.

Using a different methodology to disentangle the role of fiscal policy, Dolls et al. (2012) find that the income stabilisation capacity of EMU member states through fiscal policy is larger than that of the US.

3 Quantifying the capacity of fiscal policy to absorb shocks: EMU vs US

This section empirically gauges the contribution of fiscal policy instruments in the US and EA government budgets to provide insurance against asymmetric macroeconomic shocks. This is done by using the approach proposed by Asdrubali et al. (1996) and Arreaza et al. (1998). As described in further detail in Annex A, this consists of a variance decomposition of shock to GDP in order to measure the share of smoothing achieved by fiscal policy instruments.

The empirical analysis is based on the four equations displayed below and 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). This implies that what we refer to as the fiscal policy capacity to smoothen the impact of output shocks 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.

Given that the methodology is based on national accounting, the state-level smoothing is measured through the states' contribution to the 'net savings' of the whole economy, whereas the role of the federal budget is measured by the difference between state income and domestic income.

Euro-area/US states' budgets[8]

[8] Note that fiscal policy items, either from states or federal budgets, respectively take on a positive sign for expenditure, and a negative sign for revenue.

1) **Government budget**: $\Delta \log\ DNI_{i,t} - \Delta \log(DNI - Gov\ Saving)_{i,t} = a_t^{pu\ s} + \beta^{pub\ s} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$
2) **State fiscal policy item** (**x**): $\Delta \log\ DNI_{i,t} - \Delta \log(DNI \pm x)_{i,t} = a_t^{if} + \beta^{if} \Delta \log GDP_{i,t} + \varepsilon_{i,t}$

Net federal transfers to states

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

3.1 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.[9]

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, and adding personal and employer social contributions, and subtracting social security and transfers. Non-personal state taxes, as well as 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, as well as 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 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

[9] We follow the methodology of Asdrubali et al (1996). The Annex to their paper provides a detailed description of the data sources.

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[10] euro-area countries over 1995-2014. Data come 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 above-mentioned aggregates do not have a deflator.

3.2 The role of governments' budgets over time[11]

Using the data described above, we estimated the share of a variance shock to the GDP absorbed by domestic fiscal policy in the euro area and compared it with the role of the federal budget in the US. From Figure 1, it emerges that in the EA, member states' domestic fiscal policy smooth nearly twice as much of an asymmetric shock (19.8%) than the federal budget in the US (11%), over the full sample period. These results are in line with earlier estimates on the EU and US (e.g. Arreaza et al., 1998 and Asdrubali et al. 1996, respectively).[12] In order to account for the great recession, we split the sample in three sub-periods, isolating 2008 and 2009, which have been special both in terms of shocks – Lehmann collapse – and policy reaction. Results for different time periods show 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 2008-2009, while it remains stable at 10% in the US. On the one hand, the high number in the EA must be taken with a grain of salt given the small size of the sample in the period 2008-2009. 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 very promptly. As shown in Alcidi et al. (2017), such a role of fiscal policy was particularly important as, during the same period, households' savings increased, driven by precautionary behaviour, and tended to amplify the effect of the GDP shock.

This trend reversed dramatically in 2010-2013, 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. On the one hand, this result is intuitively consistent with the narrative stating that budget

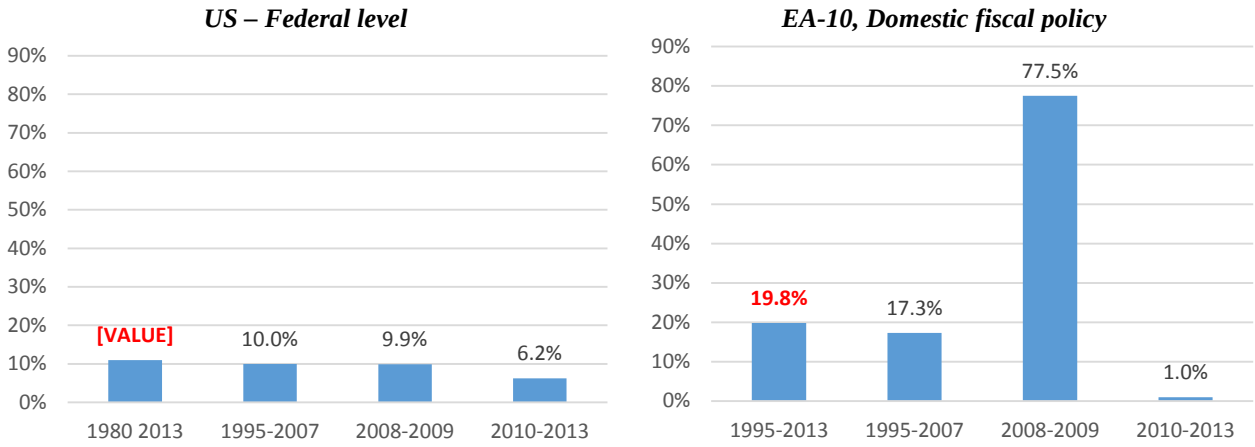
[10] We leave out the Baltic States, Slovakia and Slovenia since data are missing for most of the period, as well as Luxembourg, Cyprus and Malta, given their size and the atypical financial sector.

[11] It is worthwhile to stress 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, and calls for caution in the comparative interpretation of the results, and in particular of the benefits from fiscal risk-sharing in the US. See Alcidi and Thirion (2016b).

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

consolation measures in EA member states facing a deep recession have lowered the scope for fiscal policy-smoothing (Kalemli-Ozcan et al., 2014). On the other hand, findings for the US appear to be at odds with the received wisdom that the US federal budget serves as better instrument for smoothing asymmetric shocks than EA countries' national fiscal policies.

Figure 1. Fiscal risk-sharing over time, EA vs US

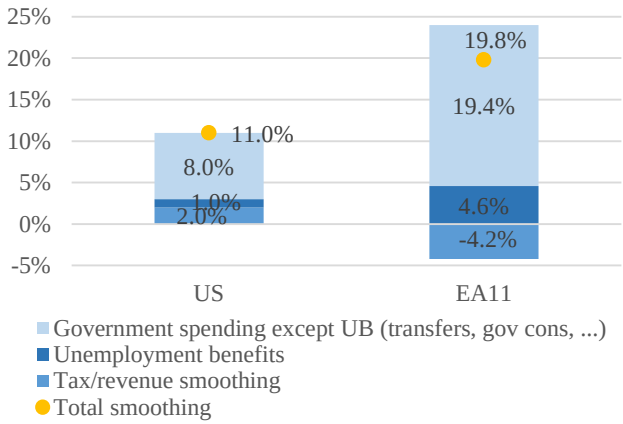


Note: The bars represent the percentages of states' output shocks absorbed through the government budget; federal in the US and domestic in the EA. Equations are estimated using OLS with time fixed effects, correcting for AR(1) process in the error term. Standard errors are corrected for panel heteroscedasticity.
Source: Authors' calculation based on data from Ameco and BEA (see section 3.1 for more details).

3.3 The role of unemployment benefits

In this section, we further decompose the channels through which the impact of shocks can be absorbed and look into the role of the main government budgets' components. Based on the same approach as above, we quantify the response to shocks through tax/revenues, unemployment benefits and other government expenditure (i.e. other personal transfers, subsidies and government consumption).[13] As shown in Figure 2, it turns out that government budgets smooth asymmetric shocks through the expenditure side of the budget rather than through progressive taxation.

Figure 2. Government budget breakdown: Revenue, unemployment benefits, and other spending (1995-2013)



[13] A more detailed breakdown is reported in Annex B, Tables B4 and B5.

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 3.1 for more details).

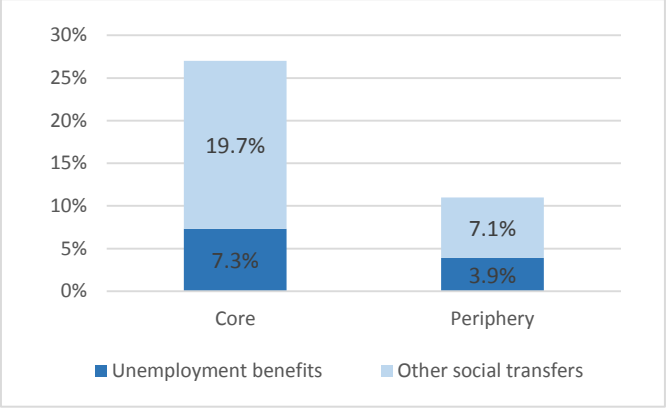
While surprising, this fact is well-documented in Deroose et al. (2009) who argue that the bulk of automatic stabilisation does not stem from progressive tax codes and unemployment benefits but rather "work through the inertia of discretionary expenditure with respect to cyclical swings in output: their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

Thus, contrary to the commonplace view, unemployment benefits seem to play a negligible role in the US, cushioning barely 1% of the effect of an output shock. In the EA11, this is relatively much larger as unemployment benefits provide 5% of insurance, but it is still quite small in absolute terms.

Box 1. Unemployment insurance: Periphery vs. core, rich vs. poor states

Core vs periphery

The sovereign crisis stressed the different capacity of euro-area member states to deal with adverse economic shocks. In a recent study Kalemli-Ozcan et al. (2014) show that the overall smoothing of asymmetric shocks tends to be smaller in the periphery. They provide evidence that it became even negative over the course of the sovereign debt crisis as some of these countries were cut off from financial markets and forced to adjust their external position. 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). We find evidence of such a discrepancy (see Table B5 in Annex B): direct transfers have a stabilising effect that is more than twice as large in the core (27%) than in the periphery (11%). In particular, 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



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.
Source: Authors' calculation based on data from Ameco, SOCEXP (OECD). See data description in section 3.1 for more details.

Rich/poor US states and net recipients/contributors from federal transfers

In contrast with the large gap between periphery and core, the amount of smoothing (not reported) appears highly homogenous across rich/poor and net recipient/contributor of federal funds. 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 of federal money and net contributors. One interpretation is that most transfers are indeed not designed to achieve risk-sharing or stabilise output fluctuations, but are rather generally guided by the structural features of the transfer system (state income level, demographics, presence of US military bases, US federal institutions). As far as the UI system is

concerned, this may also suggest that it does not disproportionally benefit the poorer states in terms of stabilisation capacity.

3.4 Relative efficiency of government insurance: US vs EA11

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% (based on AMECO 2017 data) than they are in the US, about 10% in the US[14] (based on BEA 2017 data).

In order to substantiate that argument, we evaluate the relative efficiency of fiscal policy in providing insurance in the US, the EU core and the EU periphery. The measure of efficiency is simply defined as the ratio of the fraction of shock to output that is smoothed (as reported above) relative to the total amount of government expenditures (% of GDP). Table 2 displays the ratios for the overall government budget, direct transfers to individuals and unemployment benefits (one portion consists of direct transfers) in the US, as well in the core and periphery EA member states.

Table 2. Relative efficiency of the government budget and selected items

	EA core	**EA periphery**	**US states**
Overall government budget	0.75	0.5	0.78
Transfers to individuals	1.2	0.6	1.1
Unemployment benefits	4.1	3.0	2.5

Source: Authors' own calculations based on previous regression estimates.

The results reveal that the relative efficiency of risk-sharing through the US federal budget is virtually equal to that of the budget of core governments, but surpasses that of the peripheral EA member state governments.[15] Similar conclusions hold for the insurance role of fiscal transfers (which includes UI benefits). Unsurprisingly, transfers to individuals are always more efficient relative to the rest of the government budget. The results further suggest that unemployment benefits are dramatically more efficient than other budget items in providing consumption insurance. The fraction of asymmetric shocks to state output absorbed through unemployment benefits, relative to the total amount of unemployment benefit spending, is between three and six times larger than the fraction absorbed by the overall budget. These findings have important implications since they point to the fact that an appropriately designed unemployment insurance scheme can achieve a considerable degree of smoothing with relatively limited resources (see Annex A for detailed government budget data).

[14] See Tables B1 through B3 in Annex B for stylised facts on the different elements of the US and EA11 budgets.
[15] One must emphasise that despite the better 'efficiency' of EA11 spending in smoothing shocks, the results still suggest that part of the explanation for the limited fiscal stabilisation of asymmetric shocks in the US is due to the fact that automatic macroeconomic stabilisers still form a limited part of the US federal budget. Direct personal transfers accounted for less than 10% of GDP in the US compared to more than 20% in EA11 in 1995-2013.

4 Fiscal insurance from the US federal budget: Beyond asymmetric shocks

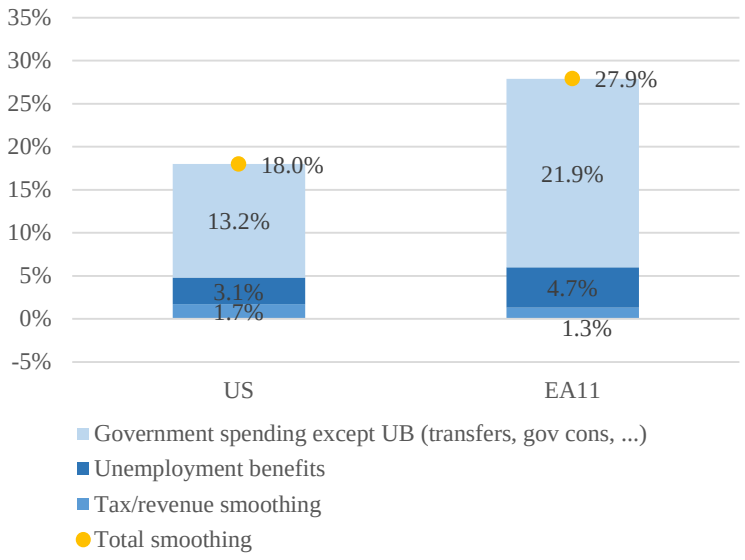
Section 3 assessed empirically the importance of fiscal policy in buffering asymmetric shocks and provided empirical evidence supporting the view that individual fiscal policies by EA11 member states cushion a larger portion of asymmetric shocks than the US federal budget. Against this background, the rest of this section investigates further the features of the US federal budget, and in particular its unemployment insurance system and its functioning in relation to the nature of shocks.

Thus far we have measured the extent to which government budgets offset a state's consumption and income from idiosyncratic output fluctuations relative to average output growth (namely inter-state risk-sharing in case of asymmetric shocks to member states). However, in federations, fiscal insurance at the central level can also take another form, namely intertemporal stabilisation buffering the effect of a decline in output across all states.

In order to account for this considerations we adapt the econometric specification used in the previous sections in the vein of Poghosyan et al. (2015). To identify the common stabilisation effect in addition to the risk-sharing features of the US federal budget, we estimate similar equations as those presented previously without controlling for the effect of shocks affecting all states simultaneously. As in Poghosyan et al. (2015), we interpret these new regression coefficients as the amount of insurance to protect against asymmetric *and* symmetric shocks together. 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.

Similarly to Poghosyan et al. (2015), we find that net fiscal transfers have a larger insurance impact in terms of the stabilisation of common shocks than on inter-state risk-sharing. Here we go one step forward and quantify the effect of the different government tools such as the unemployment insurance.

Figure 3. 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 BEA (see section 3.1 for more details).

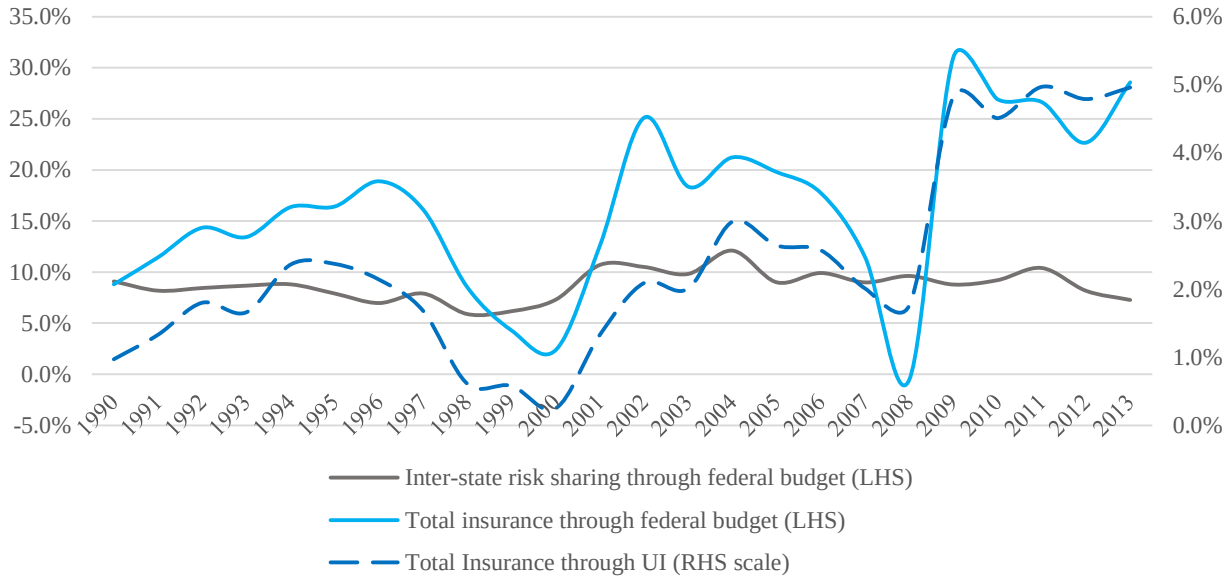
Comparing Figure 3 with Figure 2 (previous section) reveals that income insurance raises from 11-18% in the US and from 20-28% in the EA when time fixed effects no longer control for the portion of shocks affecting all states simultaneously.

When considering the total insurance effect of unemployment benefits from the US UI system, we find an increase from 1 to 3% over the period 1980-2013. This suggests 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 effect of the respective government budgets in stabilising common fluctuations must vary significantly over time. Figure 4 reports the coefficient estimates for the total amount of smoothing through the unemployment insurance and the federal budget (except UI) over time, using a 5-year rolling window approach. We also report the evolution of federal risk-sharing over time in order to highlight its steadiness.

Figure 4 provides support further for the hypothesis that inter-state risk-sharing (grey line) tends to remain remarkably constant over time, including during crises. At the same time, the continuous blue line, which represents the amount of shock absorption without controlling for common shocks, fluctuates markedly, broadly tracking (inversely) the US business cycle. Quite remarkably, the line measuring the total insurance provided through unemployment insurance features a remarkably similar dynamic to the one of the total US budget.

Figure 4. 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 3.1 for more details).

The evidence seems to point to an important stabilising role of the federal budget essentially against nation-wide output fluctuations rather than for idiosyncratic output shocks at the state level.

4.1 Shock differences across states and risk-sharing

Beyond the relatively small size of automatic stabilisers in the US federal budget, two distinctive features of the US economy could also explain the weak performance of the US UI scheme in providing insurance against asymmetric shocks:

1. A high degree of private inter-state risk-sharing cushions the effect of an idiosyncratic output shock, reducing the need for fiscal transfers.
2. Asymmetric shocks are rare and relatively small across countries – i.e. there is limited scope and need for inter-state risk-sharing (both private and public) because business cycles are synchronised.

The first explanation is in line with the findings of Asdrubali et al. (1996) and more recently Furceri and Zdzienicka (2013), among others, that private risk-sharing in the US is large and absorbs around 40% of asymmetric shocks.

Here we want to look into the second explanation. Figures 5 displays, for the US and the EA, the standard deviation in real GDP growth rates. It shows that in US states, dispersion in growth rates is larger than in EA11, with the only exception of the sovereign debt crisis (2011-2012) and 2003. Interestingly, during the years 2008-2011, this declined, whereas it sharply increased in the EA. High dispersion of growth patterns in the US does not necessarily mean low synchronisation of cycles across states and that US states are more prone to asymmetric output shocks. As illustrated in Alcidi et al. (2017b), correlation in GSP growth rates in the US is high, close to 90%, and slightly higher than in the EA. The data also show that state-specific shocks in the US are on average less persistent than in the EA.

Figure 5. Real GDP growth standard deviation

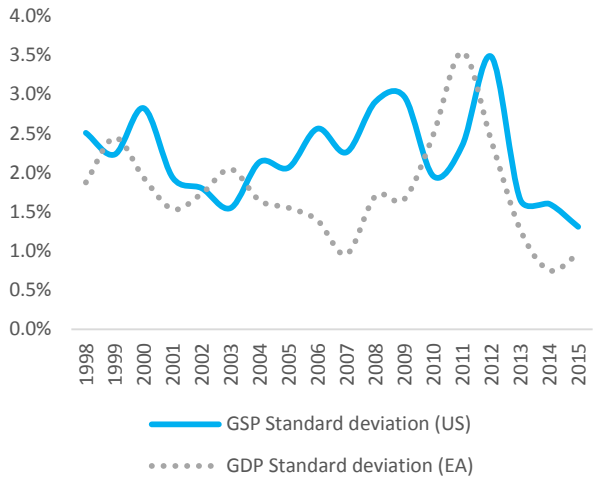
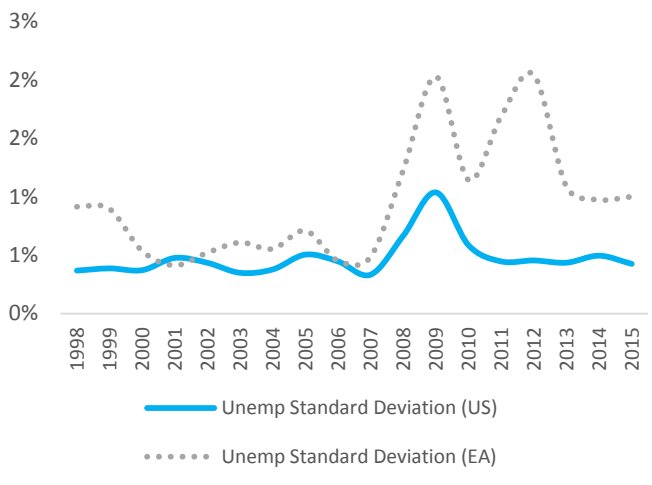


Figure 6. Unemployment rate change standard deviation



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

In Figure 6, we compare the standard deviation of unemployment rates in the US and the EA. (We opted for the changes in unemployment rates in order to eliminate possible country bias due to difference in the

level of structural unemployment.) We find dispersion to be consistently lower in the US than in the EA. In addition, with the exception of 2008-2009, the standard deviation of changes in US states' unemployment rates has remained remarkably stable over time. This finding contrasts with the large increase in the dispersion of unemployment rate changes among EA11 countries during the crisis. The combination of high output growth dispersion and low dispersion of unemployment rate changes in the US is puzzling at first sight. Indeed, the lower degree of employment protection in the US labour markets, compared to Europe, should lead to higher cyclical unemployment movements (Bertola, 2009), and hence high dispersion also in changes in unemployment.

However, as mentioned above, inter-state risk-sharing through capital and credit markets can help buffer income and consumption from idiosyncratic disturbances, which are much larger in the US than in the EA.[16] In addition, and as shown in Werning and Farhi (2012), federal fiscal institutions, including the Federal Deposit Insurance Company (FDIC), may also reinforce the market's willingness to share risk, hence contributing to stability.

A second important point is that risk absorption mechanisms are more effective (or effective *tout court*) in the face of transitory shock. If shocks are very persistent, as is suggested in Alcidi et al. (2017b) to be the case in the EA more than in the US, output shocks will materialise in consumption, unemployment and the real economy. This would explain higher dispersion in unemployment growth rates in the EA. Last but not least, 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.

5 Unemployment Insurance in the US: A semi-automatic stabiliser with limited capacity for risk pooling?

This section documents the functioning of the UI system in the US, describing its financing and its different programme. The purpose of this is to highlight that the debate about a European unemployment benefit system, as tool for increasing risk-sharing across EA member states, has misleadingly looked at the US UI and its capacity to deal with asymmetric shocks.

We argue that the design of the UI makes it *de facto* a tool best geared towards insuring symmetric shocks and has an important discretionary component. Technically, the cross-state fiscal cross-state insurance only occurs indirectly through a federal credit line offered to states in order to finance unemployment benefits during hard times. Finally, in line with the argument made in previous sections, we show that UI spending are very modest (about 5-7 times lower than in the EA in % GDP, see Annex B2-3 for more details) unless a US-wide recession triggers discretionary extension of the UI programme.

5.1 General features

Following the Great Depression, the Social Security Act (1935) established the unemployment insurance scheme as a hybrid state-federal scheme. The current US UI covers workers who lose their jobs for no

[16] The idea that US risk-sharing institutions buffer employment from output shocks in the US tends to be supported by the finding that state unemployment is weakly reactive to state's output growth (-.15) whereas national output and unemployment changes are highly and negatively correlated (-0.4).

fault of their own for a duration of up to 26 weeks (with few exceptions) and at rather modest average replacement rate of 44% (US Department of Labor, 2017).

Unlike the fully centralized UI system introduced in Canada during the same period, the US system was deliberately designed to limit the degree of risk pooling. Thus, the programme is administered at the federal level by the US Department of Labor, which sets broad guidelines and minimum common standards that state's programmes must follow while a number of provisions left the ultimate design and implementation of the scheme to the states. The important leeway left to the state in the implementation and design results in important differences in the, pre-requisites, duration, and generosity of benefits among states[17].

The foremost implication of the hybrid institutional nature of the system is that, contrary to common wisdom, the system does not technically permit inter-state risk-sharing in its basic (and rather minimalistic) permanent form. Nevertheless, this very feature makes it a particularly interesting case study for the EA since it provides an example of a system that maintains a strong decentralization component.

There are three different types of UI programs in the U.S:

- The basic unemployment insurance (up to 26 weeks), which is paid for by state taxes.
- The extended benefit scheme (up to an additional 13-19 weeks), funded 50% by the federal tax and 50% by state. It is only implemented in case of severe recession and high unemployment in a state[18]. The federally funded portion is the true inter-state risk-sharing element of the system.
- Emergency unemployment compensation, which is only implemented upon Congress decision, and during US-wide economic recessions (i.e. symmetric shocks).

5.2 Funding

Figure 7 describes the (complex) funding structure of the system in order to highlight the nature of the system under different cases. 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 managed by the 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)[19]. Thus the effective rate is 0.6%.

The federal tax finances the administration cost of the UI programme at the federal and state levels and covers 50% of the cost of extended weeks of benefits under the Extended Benefit program (EB). It also serves to finance the *federal unemployment account (FUA)* which provides credit lines to states whose trust funds run low on fund – thus providing some re-insurance of state trust funds. There is a double layer of insurance since in case the *federal unemployment account (FUA)* is exhausted, it can in turn borrow from the U.S Treasury to make loans to the state's trust funds.

[17] Note that workers 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.

[18] The EB program was exceptionally funded by the federal government as part of the 2009 American Recovery Act.

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

Contrarily to the federal tax, the state tax (State Unemployment Tax Act, SUTA) is state specific, reflecting the flexibility of the system to accommodate local preferences. It is also firm specific since the tax level is determined by an experience rating system based on the employer's history of laying off workers. Hence certain businesses contribute more to the funding of the scheme. The state tax finances the state's UI accounts within the federal unemployment trust fund. As long as trust funds are solvent, state's basic unemployment benefits are paid out of the state's trust funds. However, as it runs out of fund, states can either raise the money themselves or borrow from the credit line available from the Federal Unemployment Account (FUA). These loans must be repaid with an interest by the states' governments within two years of borrowing. If not repaid voluntarily by states, the federal government automatically raises payroll taxes (through FUTA credit reduction) on employers until the loan is repaid. States carry the burden of the interest rate payment to the FUA

Figure 7. Funding channels of permanent unemployment insurance programmes

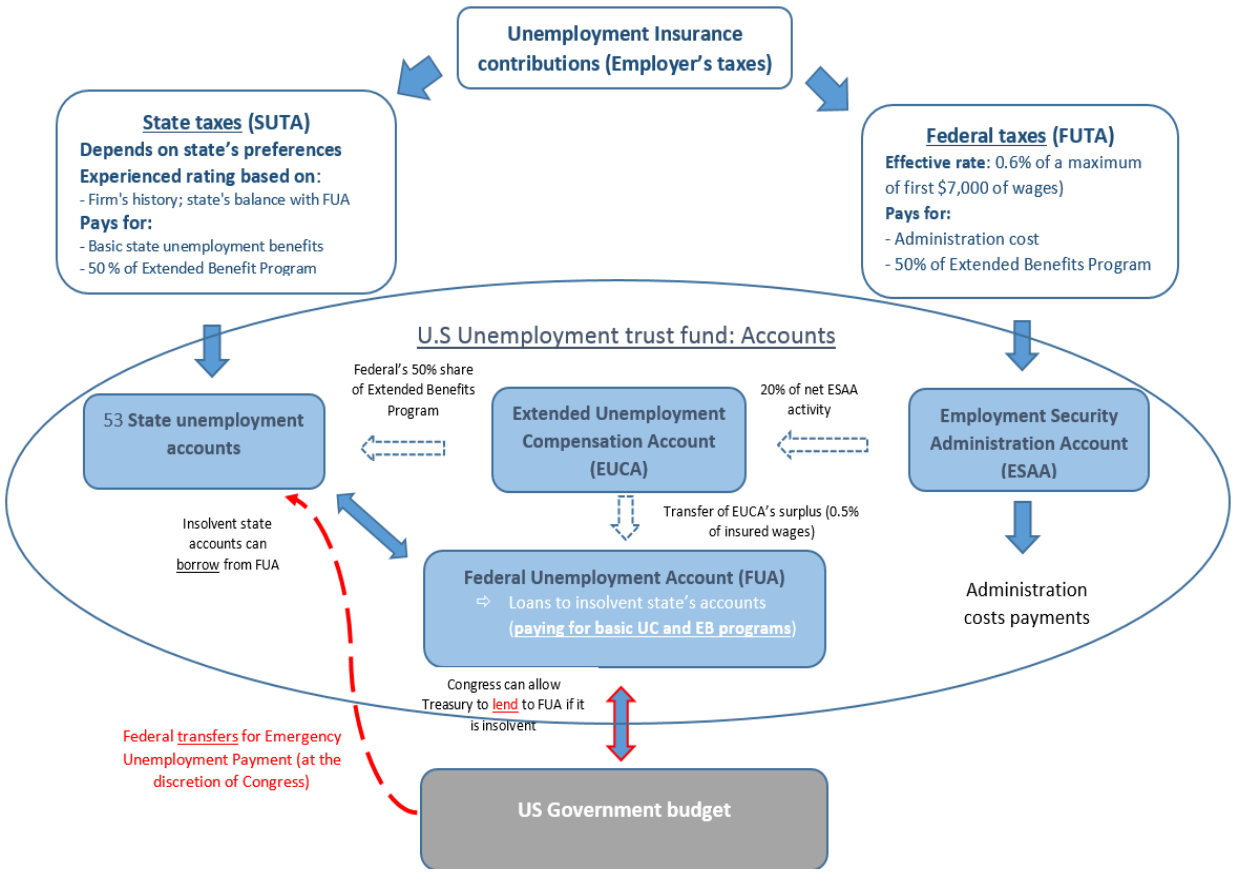
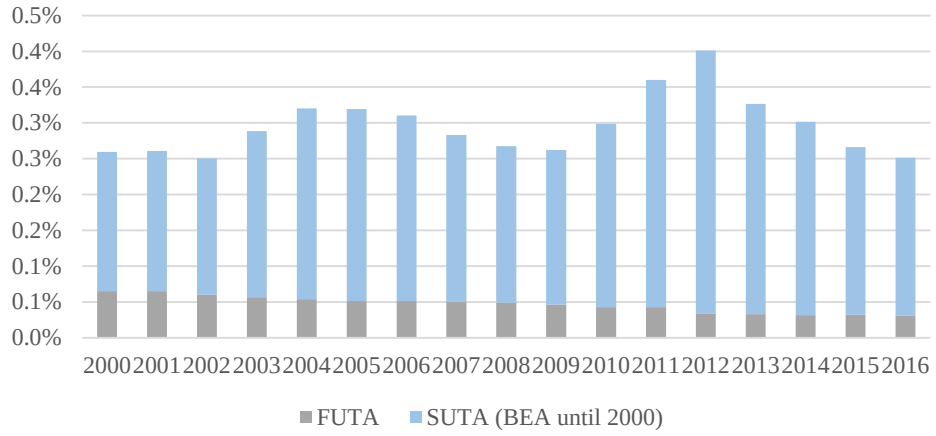


Figure 10 (below) indicates that the bulk of the system is financed through the state tax (SUTA), whereas the FUTA tax only brings in a very limited amount of funding. The lower incidence of the federal tax over time reflects the fact the taxable base is restricted to 7,000 $, which explains why it shrinks as % of GDP. The state tax tends to fluctuate along the business cycle, the figure below suggests some pro-cyclicality in the collection of state taxes, which increase in years following the dotcom crisis, and the outbreak of the financial crisis. This hints toward the pro-cyclical bias of loans repayment after state's

funds borrowed from the federal level in order to finance spending on basic unemployment insurance during periods of crises.

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).

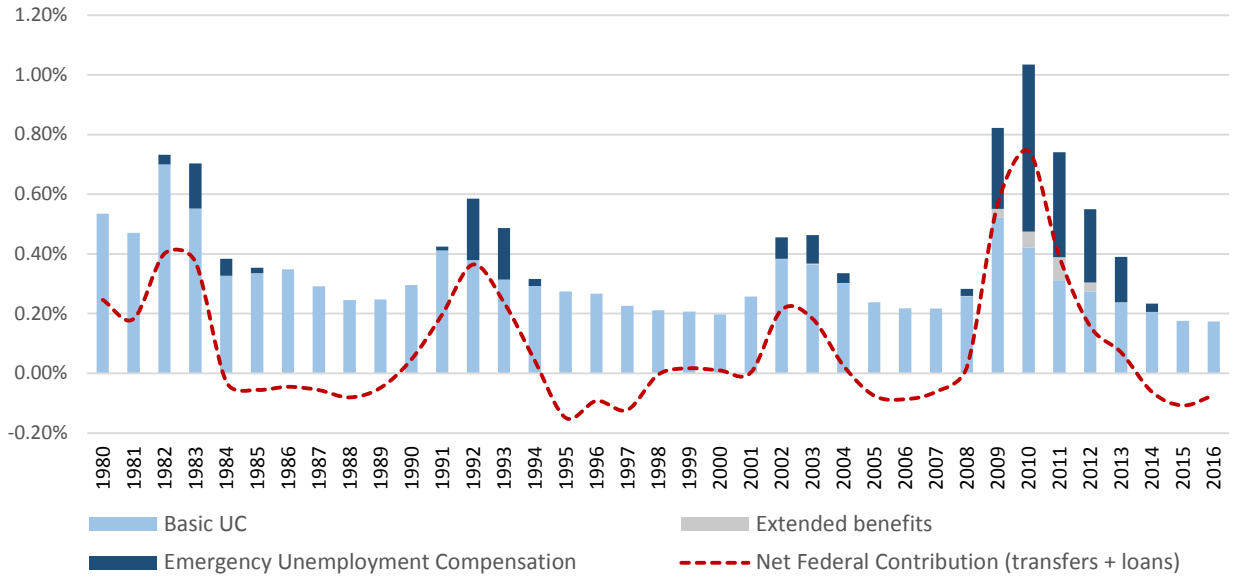
In times of large shocks, in addition to the contribution to extended benefits (where applicable), the federal budget can provide *additional* funding (to the FUTA) in two ways:

- Providing loans to finance states' basic unemployment insurance through FUA
- Outright transfers to finance Emergency Unemployment Benefits (requires action by Congress).

5.3 Unemployment insurance spending by program

Figure 9 illustrates the amount of benefit spending by program over time. The net federal contribution corresponds to the difference between state and federal tax contributions and total UI spending, namely the sum of the federal loans made to refinance insolvent state's trust funds and federal transfer programs in times of recession. For a summary table of the key features of the different programmes, see Annex B6.

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.

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

On average, spending account for slightly above 0.2% of US GDP during 'non crisis' times. However, the cost rises to 0.5- 1% of GDP in the wake of nation-wide recessions. As a matter 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[20]. 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 virtually account for the total amount of expenditure when no significant symmetric shock affect the U.S economy. This spending type does not involve any inter-state risk-sharing. It rather allows for inter-generational state risk-sharing[21]. As long as states' unemployment accounts are positive, benefits are financed out of previous state's contributions. Since economic crises can rapidly exhaust the reserves, the Treasury provided loans to 40 states from 2010 through 2015 (Whittaker, 2016). If the Treasury needs to issue new debt in order to lend funds to the FUA, this will increase the federal debt. Conversely, when a state pays back the state loan from the FUA, the FUA would then use those funds to repay its debt to the Treasury and the federal debt would decrease.

The extended benefit program (EB) is the only one to provide direct inter-state risk-sharing. A federal fund (EUCA) provides transfers covering 50% of the cost of extended weeks of benefits. The programme is triggered by different indicators of state's unemployment level, which makes it in principle well-suited to deal with significant state-specific shocks. However, the programme has historically accounted for a modest amount of total UI outlays.

Last but not least, Congress has historically enacted emergency unemployment benefit payments in crisis period, directly through the so-called Emergency Unemployment Compensation (EUC) schemes. These discretionary programs typically provide additional weeks of unemployment benefits available to workers who have exhausted regular state unemployment insurance benefits during period of high unemployment in the US[22]. Over the last decades, this program has financed the bulk of the increase in benefit spending. In particular, the federal government's contribution reached unprecedented levels in 2008-2013, as it extended benefit duration and generosity, and exceptionally provided full funding for the extended benefit program.

Box 2. Moral hazard vs stabilisation in the US unemployment insurance

Any income insurance mechanism is inherently confronted with a trade-off between reigning in moral hazard and not compromising the counter-cyclical feature of the scheme. It is even more challenging in the particular case of a multi-tier polity, where the federal government has to address the risk of individual and institutional moral hazard at the same time (Vanderbroucke et al., 2016).

Three features of the US system to contain moral hazard stand as compared to the EMU decentralised system:

- At the employee's level, an experience rating system allows to put a penalty, in the form of higher state tax, on firm's which have a track record in laying off their workers.

[20] Higher sensitivity of UB spending in the U.S 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.

[21] This, to some extent, implies that our empirical results over estimate the amount of inter-state risk-sharing.

[22] The most recent example of an EUC scheme was from June 2008 until the end of 2013. EUC payments are directly made out of federal government's resources.

- Each state can borrow from the federal level, but has to repay with an interest rate.
- Transfers only take place in case of large shocks (implicitly assumed to not be induced by hazardous behaviour)

The hybrid nature of the system means that under normal economic conditions, UI is fully funded by states, albeit the federal level can provide loans. This feature of the US system is relevant to the EMU as it greatly reduces moral hazard and increases stabilization by allowing states to borrow at all times. Indeed, the fact that distressed member states had to cut off automatic stabilizers was they were priced out of the credit markets is the single most important reason why a fiscal capacity would be justified in the EMU.

In order to stem moral hazard, most states set up systems that automatically raise employers' contribution in order to help repay federal loans. If the states fail to raise funds by itself, the federal level's tax credit can be removed, increasing the federal tax to up to 6% in order to recollect its dues. However, while this should ensure that no state is net-benefiter or contributor, this system is not necessarily well-suited for stabilization purposes.

Firstly, Stone and Chen (2013) stress that there is no mechanism or rule to force states to create buffers in their trust fund balance during good times. This leads certain states governments to reduce UI taxes during good times. Reflecting this tendency, a number of state's UI trust funds were ill-prepared to face a large increase in unemployment, and borrowed from the federal governments in order to pay UI benefits.

This leads to a second issue, which is however not necessarily related to the first one: state and federal unemployment taxes tend to increase the average cost per employee for UI program[23] following a recession (see graph showing pro-cyclical funding above). Hence undermining the counter-cyclicality of the system. As pointed out by Dolls et al. (2012) claw-back and experience rating mechanisms tend to reduce the stabilizing effects of the system. Leachman (2016) stress that most of the nine states that have reduced the generosity of their systems since the Great Recession have seriously underfunded their UI systems prior to the recession. As a result, these states have cut the duration of UI benefits.

6 Concluding remarks

The conventional rationale for a common fiscal budget in monetary unions is primarily grounded on the idea that pooling fiscal risk enhances insurance against macroeconomic shocks hitting individual states (inter-state risk-sharing in response to asymmetric shocks).

Against this background, this paper first assesses the claim that the federal US budget, and the fiscal risk-sharing it allows for, puts the US at an advantage compared to the EA in protecting the economy against asymmetric shocks. Such comparison is made difficult by the different institutional settings on both side of the Atlantic. In the EA a common budget for fiscal risk-sharing does not exist and the response comes for individual member states. In the US, the response to shocks at the state level is negligible and, at the federal level, it is difficulty to isolate the effect of the US federal budget expenditure from the stabilising role played by a fully-fledged US banking union backed by the Treasury.

With these caveats in mind, the comparison of fiscal insurance of EA countries provided at the level of member state with the amount of fiscal risk-sharing provided through the US federal budget reveals that the US does not seem to perform better than the EA. Our empirical analysis suggests that the US budget provides limited insurance against idiosyncratic shocks, cushioning on average 11% of shocks in 1980-2013, and unemployment benefits only barely insure a meagre 1% of such shocks.

[23] State and federal taxes per employee rose from about $350 in 2007 to nearly $550 in 2012.

In the EA, national governments can only rely on self-insurance through savings and borrowing, and we find that they cushion as much as 20% of country-specific output disturbances, with unemployment benefits smoothing about 5% alone. While part of this gap is explained by the lower size of the US expenditure compared to the EA, we show that 'spending efficiency' is higher in Europe than in the US. These findings are puzzling if we consider that the idea of looking at the US fiscal union as a guide for designing an EA fiscal capacity rests on the idea of enhancing insurance against asymmetric shocks.

This leads us to ask a different question, namely: Is the US unemployment insurance best understood as a common insurance mechanism deployed in the face of symmetric shocks rather than an inter-state risk-sharing mechanism against idiosyncratic shocks? We subject this hypothesis to careful scrutiny in three simple ways.

First, we show empirically that US federal transfers, and most notably the UI system, essentially carry out the stabilisation purpose providing insurance against common output fluctuations. This finding militates against the view that the US UI system is primarily a tool to share cyclical risks at state level, but it is corroborated by the factual evidence that fiscal insurance is the highest in the face of US-wide recessions, e.g. 2001 and 2008-2009. In the EA, the amount of smoothing remains similar when including the common shock.

Secondly, we explore the possibility that this latter finding is attributable to the action of other mechanisms smoothing the impact of asymmetric shocks. Looking at the dispersion of output growth and unemployment changes over time, we find that despite larger output growth dispersion in the US, the dispersion in the changes in US states' unemployment rates is significantly lower than in the EA11. One explanation for this pattern is that a number of market mechanisms, such as labour and capital mobility, allow the effect of state-specific shocks to be spread over other states or countries (i.e. through inter-state risk-sharing). This is in line with previous findings in the literature.

Thirdly, we make the point that the design of the UI system largely contains the scope for inter-state risk-sharing. One of the reasons is the minimalistic character of the US UI system which is on average more than five times cheaper than in the average EA member state. As far as the basic UI scheme is concerned, the main role of the federal government technically lies in granting states with permanent access to a line of credit from the US Treasury. Hence the nature of flows between the federal and state levels is fundamentally different from a fiscal transfer. True transfers from the federal government require Congressional approval and occur only when Congress passes a fiscal stimulus bill most often in the face of an US-wide economic recession. This simple institutional feature of US fiscal policy provides perhaps the single-most straightforward explanation for the small amount of stabilisation of asymmetric shocks achieved through fiscal policy in the US.

Overall the US system provides interesting insights into the future design of a more stable EMU. The finding that US UI produces limited absorption of asymmetric shocks does not necessarily make the US system a less meaningful guide for a euro-area fiscal capacity. First, if cyclical unemployment-rate movements are more asymmetric in Europe, the rationale for a euro-area fiscal capacity along the lines of the US UI could be large. Indeed, a similar system would likely result in a significantly higher amount of country-specific shock absorption. Second, it raises questions as to whether a euro-area fiscal capacity should deal with common shocks. Nevertheless, the value added of such capacity would crucially depend on its power to reduce the risk of member states being forced to cut stabilisers, which is a key purpose of the federal component of the US UI.

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Annex A. The decomposition methodology

Risk-sharing and insurance mechanisms in monetary unions

The effectiveness of smoothing mechanisms among the euro area member states and U.S 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[24]. First, Individuals and firms can insure themselves against income shocks via the cross-ownership of asset 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 motivated by other motives than risk-sharing, a system of federal tax, transfers and grants in federations is typically designed to help absorb 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[25]. 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 U.S states) is thus disaggregated into the following national (state) accounts aggregates:

- GDP-GNI =***international capital and labour income transfers (factor income flows)***
- NI-NNDI = ***net international taxes and transfers***
- NNDI-(CONS) = ***total savings***
- GNI-NI = ***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 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[26].

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

[25] Intertemporal consumption smoothing can embed an international components, 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).

[26] 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

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:

$$GDP_i = \frac{GDP_i}{GNI_i}\frac{GNI_i}{Ni_i}\frac{Ni_i}{NNDI}\frac{NNDI_i}{CONS_i} * CONS_i \qquad (1)$$

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 stabilization is achieved is a shock to GDP 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:

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

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

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

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

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

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

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

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 βs: 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; a_t denotes the time-fixed effects, controlling for year-specific effects

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depreciation is measured following fixed accounting rules, usually leading to a pro-cyclical behaviour for this channel.

on growth rate. With the introduction of time fixed effects, we control for shocks on aggregate GDP, while the β coefficients are weighted average 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 thus defined as deviations from the (unweighted) sample average output growth rate[27]. Countries (states) can experience positive and negative shocks no matter whether all countries are, say, in a recession or boom at the same time. At the same time, bear out that the risk can still be shared

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:

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

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 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 follow equations:

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

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

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.

Consumption and income smoothing through regional and federal fiscal policy in the U.S

Income insurance via the federal tax and transfer system

[27] The lack of weights constitutes to some extent a caveat of the model, which is surprisingly not mentioned in the literature. Thus, we have performed 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.

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:

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

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

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

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

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 U.S states[28].

Consumption smoothing via state public budgets

$$Gov\ Cons \quad \Delta \log\ DSI_{i,t} - \Delta \log(DSI + gov\ cons)_{i,t}\ = \ a_t^{if} + \beta^{if} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

$$State\ Tr. \quad \Delta \log\ DSI_{i,t} - \Delta \log(DSI + state\ tr)_{i,t}\ = \ a_t^{if} + \beta^{if} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

$$Dir\ Tax \quad \Delta \log\ DSI_{i,t} - \Delta \log(DSI - dir\ tax)_{i,t}\ = \ a_t^{if} + \beta^{if} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

$$Ind\ Tax \quad \Delta \log\ DSI_{i,t} - \Delta \log(DSI - ind\ tax)_{i,t}\ = \ a_t^{if} + \beta^{if} \Delta \log GSP_{i,t} + \varepsilon_{i,t}$$

[28] 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 form 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
Revenues	***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%
Expenditure	***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 (Transfers)	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
Total Revenue	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%
Total Expenditure	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***

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***

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)**	**Discretionary temporary federal programs** [29]
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 job for no fault of his own and eligible across the nation	**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 from Federal Unemployment Account (FUA) If state UI account is insolvent - **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	Self-insurance: 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).	Self-insurance and risk-sharing: 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 risk-sharing through the federal budget

[29] Note that during some downturns, a number of states have decided to use their own funds to provide additional weeks of benefits to jobless workers.