US Interstate Risk Sharing:
A Post-Crisis Examination

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Abstract:

This paper examines the modalities of risk sharing in the US, and their evolution between the pre-financial crisis period and the post-crisis one. Reassessing the mechanisms at play in the American economy, we document a lower share of adjustment coming from capital markets, in comparison to previous estimates. The measures taken during the crisis have not impacted the absolute degree of risk sharing, although the relative size of its components has changed, with a stronger role for the federal government.

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1. Introduction

The Great Recession has been accompanied by relatively important fiscal measures, undertaken by both the American federal government and the states. The latter were exposed differently to the crisis, depending on their specialization and dependence on the mortgage and financial industry (Hamilton and Owyang, 2012). The economic impact of the decisions taken during this period by the government and the states has been important, helping the economy to navigate through the crisis, but they may also have reshaped the components of the American fiscal federalism. Public finance being an element of risk sharing (i.e., the insurance mechanisms which allow one region to protect itself from a shock by holding assets in another region or receiving funds from the upper-tier government), it would be surprising if the crisis has not impacted the channels of risk sharing in the US. If anything, the relative roles of the states and of the federal government for consumption smoothing may in particular have changed. In this paper, we assess how much the American economy intra-national degree of risk sharing has changed since the pre-crisis period.

The literature on risk sharing can be traced back to, at least, Brennan and Solnik (1989), who proposed a measure of the welfare losses from imperfect risk sharing. Asdrubali et al. (1996) empirically analyze the degree of risk sharing in the US between 1964 and 1990. This study has sparked an interest in the importance of risk sharing for the sustainability of monetary unions. While Atkeson and Bayoumi (1993) show the US to benefit from a larger degree of capital mobility, compared to Europe, they also show the importance of federal transfers to insure against idiosyncratic shocks. The sheer size of the federal degree of insurance – and thus the relative importance of capital markets and governmental interventions - has been hotly debated by, e.g., Sala-i-Martin and Sachs (1992), von Hagen (1992), Italianer et al. (1993), Mélitz and Zumer (1999), Sorensen et al. (2001), Kalemli-Ozcan et al. (2003) and Asdrubali and Kim (2004, 2008). The general lessons from the debate emphasize the importance of capital flows inside the US, compared both to the European case and to the degree of consumption smoothing offered by international markets. On both counts, however, Balli et al. (2012) and Duwicquet and Mazier (2010) show that the situation may have improved, due to an increase in the integration of capital markets, which is even truer in the European case, since the launch of the euro.[1]

In this paper, we turn back to the American case and bring two contributions to the literature. First, we highlight that the literature has relied on approximations based on national accounts aggregates in testing the mechanisms that have been signaled as important. We thus provide new measures of intra-national risk sharing for the US, based on households' incomes, which are closer to the initial theoretical framework, and deliver strikingly different results. By using data on households' incomes (and not on regional products), we notably show that previous analyses have overestimated the insurance gains issued from capital markets, and minored the role of the federal government in the provision of income insurance.

Second, we provide several estimates. The first ones bear on the same period (1964 – 1990) as

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[1] Although first focused on the American and European cases, the literature has now turned to other regions. For example, Balli et al. (2013) consider the case of MENA countries and show a degree of smoothing larger than among OECD countries.

Asdrubali et al. (1996), as their study is a benchmark in the literature. We then provide separate estimates for the period that runs to the crisis, and for the crisis one. This allows measuring the extent to which the risk sharing mechanisms in the US have been modified by the policy measures that have been implemented to deal with the crisis. Hepp and von Hagen (2012), studying the German case, show that reforms in the fiscal equalization system have led to important changes in the degrees of risk sharing delivered by the Länder and the German federal government. Although the Great Recession is not comparable with the shock of reunification Germany has known, this example reveals that channels of risk sharing evolve over time. As our results establish, this is also the case for the American economy, albeit on a smaller scale. In particular, we show that the federal government influence on income insurance has been larger in the crisis period than before.

2. Defining Risk sharing: the GDP-based View

The presence of risk sharing entails that state consumption is not fully proportionally related to state output. The prevalence of this can be assessed through an estimate of equation (1):

$$\Delta \log C_{i,t} = \beta \Delta \log Y_{i,t} + v_t + u_{i,t} \tag{1}$$

where $C_{i,t}$ denotes the consumption in state i in period t, $Y_{i,t}$ is output (GDP), v_t is a time effect, and $u_{i,t}$ is the residual, while $(1-\beta)$ measures the (absence of) correlation between consumption and production. In other words, if $\beta=1$, there is no risk sharing while, if $\beta=0$, risk sharing is perfect and consumption smoothing complete.

If the risk is perfectly shared among the states, consumption growth rates will be fully correlated, which implies that the growth rates of each state and of the federal aggregate will be equal ($\Delta C_{i,t} = \Delta C_{US,t}$).[2] Asdrubali et al. (1996) simultaneously estimate three mechanisms (capital markets, nets fiscal transfers and inter-state credit), which were generally considered separately. They rely on the following identity:

$$Y_{i,t} - C_{i,t} = \left(Y_{i,t} - I_{i,t}\right) + \left(I_{i,t} - ID_{i,t}\right) + \left(ID_{i,t} - C_{i,t}\right) \tag{2}$$

where $Y_{i,t}$ is the state GDP (which includes compensation of employees, gross operating surplus and taxes on production and imports less subsidies), $I_{i,t}$ is the state household income (which includes compensation of employees, proprietor's income and financial revenues – interests receipts, dividends and rents), $Id_{i,t}$ denotes the household net disposable income (i.e., after personal current tax and contributions for government social insurance paid and transfers receipts). The difference between output and consumption can thus be decomposed in three components, each of them corresponding to one of the mechanisms Asdrubali et al. (1996) estimate and which we describe in turn.

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[2] However, if consumers have a taste for international diversification, the equality will be imperfect (see, e.g., Tesar, 1993, Del Negro, 2002, Asdrubali and Kim, 2008).

First, interstate capital revenues are approximated by the difference between GDP, $Y_{i,t}$, and regional income, $I_{i,t}$. Relying on the definitions provided by the BEA and simplifying, the national accounts difference between GDP and regional income can be written as:[3]

$Y_i - I_i$ = Taxes on production and imports less subsidies + Gross Operating Surplus – Proprietor's income[4] – Dividends, interest and rents (unknown origin)

$$(3)$$

Omitting the first and third items, the difference becomes:

$Y_i - I_i$ = Taxes on production and imports less subsidies + Corporate Gross Operating surplus – Dividends, interest and rents (unknown origin)

$$(4)$$

It should be noted that this difference has been interpreted as interstate capital revenues, which may not be completely accurate, depending on the behavior of firms. As the difference can notably be associated with investment (or fixed capital consumption) or savings by firms, and that the data does not permit to distinguish the economic (nor geographic) destination of the gross operating surplus, interpreting this expression is a relatively tricky issue and the interpretation retained by the literature is not necessarily the only correct one.

Second, net fiscal transfers are directly available from the BEA and this is the data used by Asdrubali et al. (1996) and the literature based on their study. They are estimated as the difference between the regional income, I, and households' disposable income, Id, which itself is defined as the personal revenue minus income taxes. As federal transfers to households are not included in the regional income measure, net fiscal transfers can be written as:

$I_i - Id_i$ = Personal current transfers receipts – Employee and self-employed contributions for government social insurance – Personal current taxes

$$(5)$$

Third, interregional credit is obtained by calculating the difference between disposable income and consumption. At the macro level, the residual is equal to households' savings. However, as for capital income, the identity itself does not allow to conclude about the intra- or extra-state origin of the credit.

To conclude, it has to be kept in mind that measuring interstate credit by the degree of

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[3] The simplification notably comes from neglecting international labor revenues (a tiny amount including, for example, wages of UN employees).
[4] Proprietor's income is a part of gross operating surplus. In 2010, this part represents about 20% of the total.

correlation between disposable income and consumption is an approximation, based on a relatively passive view of firms' behavior and on the assimilation of differences of national accounts aggregates with inter-state capital mobility.

3. Estimating Risk Sharing: the Income-based View

To assees the degree of stabilization provided by capital revenues and net fiscal transfers, we first repeat the established method. However, to take full account of the limits raised in the preceding section, we further provide new estimates, based on households' incomes.

Following Asdrubali et al. (1996), the degree of stabilization provided by variation in capital revenues can be estimated through the following equation:

$$\Delta log Y_{i,t} - \Delta log I_{i,t} = \beta_k \Delta log Y_{i,t} + v_t + u_{i,t} \qquad (6)$$

where β_k measures the fraction of the shock to GDP that is smoothed through capital market, v_t is a time effect and $u_{i,t}$ is the residual.

The next equation gives the degree of stabilization (i.e. the variation of income) coming through net fiscal transfers:

$$\Delta log I_{i,t} - \Delta log Id_{i,t} = \beta_f \Delta log Y_{i,t} + v_t + u_{i,t} \qquad (7)$$

where β_f measures the share of the shock to GDP being absorbed by transfers from the federal government, v_t is a time effect and $u_{i,t}$ is the residual.

Here, we present a revised method, for two main reasons. First, estimating the impact of revenues aimed at smoothing households' consumption by relying on GDP measures is by definition a loose proxy, if only because the behavior of firms is, at best, considered as passive. Hence, the method used by Asdrubali et al. (1996) – and the literature that has followed – probably overestimates the degree of stabilization. However, since Brennan and Solnik (1989) 's contribution, households lie at the heart of the consumption smoothing question, and it seems more consistent to estimate income smoothing from their perspective.

Second, given that inter-state measures are not available for capital revenues, measuring them through the difference between GDP and disposable income is at best an extrapolation. However, when looking at the households' data, one can distinguish wages from net fiscal transfers and capital revenues. It thus becomes possible to measure income smoothing by considering the sources of incomes for households, with the wage as the reference value (and no longer the GDP). If, in a given state, the variation in capital revenues is counter-cyclical with regard to wages, then it can be said that part of the shock on wages is smoothed through capital markets. This mechanism is measured through the following equation:

$$\Delta log W_{i,t} - \Delta log(W_{i,t} + K_{i,t}) = \beta_{kr}\Delta log W_{i,t} + v_t + u_{i,t} \tag{8}$$

where $W_{i,t}$ is wage and salary disbursements, $K_{i,t}$ is dividends, interest and rents and β_{kr} is the degree of insurance provided through capital markets.

From this, the next equation allows to measure the degree of smoothing coming through the federal budget:

$$\Delta log W_{i,t} - \Delta log(W_{i,t} + F_{i,t}) = \beta_{kf}\Delta log W_{i,t} + v_t + u_{i,t} \tag{9}$$

where $F_{i,t}$ are personal current transfers minus employee and self-employed contributions for government social insurance and personal current taxes ; β_{kf} measures the degree of insurance coming through the federal budget.

Panel fixed effects estimates are run on data for the 50 American states (plus the District of Columbia) on the period going from 1964 to 2011. For comparability, we use exactlythe same method as Asdrubali et al. (1996) and also provide estimates based on the same time-span (1964-1990). Table 1 provides the results for the two methods.

Table 1

		ASY Method			
Skock on GDP smoothed by		1964-2011	1964-1990	1990-2011	2007-2011
Capital Markets	βk	47.6	43.2	56.7	52.9
	t student	(40.3)	(28.3)	(31.1)	(13.4)
	R-squared	0.56	0.45	0.69	0.77
	DW	2.09	2.1	2.07	1.95
Federal budget	βf	10.6	11.3	9.3	6.7
	t student	(22.9)	(19.8)	(11.7)	(3.4)
	R-squared	0.8	0.74	0.85	0.9
	DW	2.2	2.4	1.97	2.38
Total		58.2	54.5	66	59.6
		Revised Method			
Skock on Wage smoothed by		1964-2011	1964-1990	1990-2011	2007-2011
Capital Markets	βkr	11.7	11.7	11.9	11.5
	t student	(18.8)	(17.8)	(9.0)	(4.5)
	R-squared	0.75	0.74	0.73	0.86
	DW	1.87	1,75	2.04	2.4
Federal budget	βfr	31.6	26.9	46.1	50.0
	t student	(32.3)	(23.0)	(26.6)	(12.1)
	R-squared	0.83	0.77	0.88	0.9
	DW	2.19	2.32	2.07	2.65
Total		43.3	38.6	58	61.5

Three types of results are worth commenting. First, as shown in the first column of Table 1, the estimates based on the households' incomes measure (lower part of Table 1) reveal a lower degree of total income insurance than those based on the whole GDP. More precisely, on the 1964 to 2011 period, the degree of stabilization of a 1 dollar-shock is equal to 43.3 cents, compared to 58.2 when one uses the method generally used in the literature., This is true even when one considers the period initially considered by Asdrubali et al. (1996): our method delivers a stabilization measure of 38.6 cents to the dollar, while their method entails a stabilization of 54.5 cents. This confirms that the data generally used in the literature on risk sharing overestimates the degree of income insurance.

Second, our measure reveals strikingly different weights for the two channels of risk sharing. With the revised method, one gets an estimate of the coefficient attached to the degree of risk sharing coming from capital markets equal to 11.7, while the one related to net fiscal transfers is equal to 31.6. In other words, capital markets account for 27% (11.7 / 43.3) of income smoothing and the federal government for 73%. The measure relying on GDP delivers almost opposite shares, as capital markets account for almost 82% of the stabilization. This shows the interest of a different method for quantifying the real strength of risk sharing mechanisms.

Third, and final, the two sets of estimates deliver apparently equivalent results for the crisis period (2007 – 2011), as the coefficients for stabilization are equal to 59.6 and 61.5 for, respectively, the GDP-based and the households' income-based measure. But the relative size of the net fiscal transfers channel is now even larger than in the whole period, reaching 81% with the households' income measure, compared to around 11% with the GDP-based measure. These results reveal that the federal government has been more active during the crisis period, offering to American households a better protection against the income shock that has characterized the Great Recession.

4. Conclusion

In this paper, we build on the literature on risk sharing and offer new estimates of the degree of risk sharing in the US. We first discuss the data and methodology used in the existing literature and show that using data from households' income delivers coefficients of the capital market channel that are inferior. In other words, the existing literature probably overestimates the degree of income smoothing offered by capital markets.

We then compare the channels of interregional risk sharing before and after the Great Recession and exhibit that the American government has offered a larger degree of income insurance than before. Net fiscal transfers have thus damped the shock on wages during the crisis.

A natural extension of this work would be to use the same type of data to assess to which extent the existing estimates for the European Monetary Union would be challenged too. Finally, this work also raises the question of why the literature has up to now ignored data on incomes and favored estimates based on GDP. But such an investigation goes beyond the scope of this paper.

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