Fiscal Federalism in Germany: Stabilization and Redistribution Before and After Unification

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We provide estimates of the risk-sharing and redistributive properties of the German federal fiscal system based on data from 1970 to 2006, with special attention to the effects of German unification. Tax revenue sharing between the states and the federal government and the fiscal equalization mechanism (*Länderfinanzausgleich*) together reduce differences in per-capita state incomes by almost 40 percent. The federal fiscal system offsets 47 percent of an asymmetric shock to state per-capita incomes. This effect has significantly decreased after the inclusion of the East German states in 1995. Furthermore, we find that the German fiscal system provides almost perfect insurance for state government budgets against asymmetric revenue shocks; also, its redistributive effect with regard to the tax resources available to state governments is very strong.

The payment of intergovernmental grants within a federation is a core issue of federalism. Traditional fiscal federalism (Oates 1972) regards them as an instrument to address the inefficiencies arising from interjurisdictional fiscal spillovers and to reduce inequalities in the supply of public goods across regions with different tax capacities and levels of income. The political economy of federal fiscal constitutions, in contrast, suspects that intergovernmental transfers serve self-interested, budget-maximizing politicians as a way to suppress fiscal competition (Brennan and Buchanan 1980, Chapter 9).[1] Accordingly, their direction and size reflect the political bargaining power of individual state governments rather than efficiency considerations. Thus, Brennan and Buchanan predict that small states and relatively poor states in terms of tax capacity benefit most from such arrangements.[2] Rodden (2003, 2006) argues that intergovernmental transfers weaken fiscal discipline at the state level and promote excessive borrowing which ultimately forces the federation to bail out individual states.[3] This view of fiscal equalization as a barrier against fiscal competition and a disincentive for fiscal discipline has played an important role in recent debates over fiscal federalism in

Germany, where the large degree of reallocation of tax revenues among state governments strongly reduces the incentives for governments to attract potential tax payers and foster economic growth through good economic policies.[4]

More recent literature has pointed out that, in a world with imperfect capital markets, fiscal arrangements for risk-sharing and redistribution of income across the states of a federation can play an important role for income and consumption smoothing (Boadway 2004; Bucovetsky 1998; Lockwood 1999). One branch of this literature considers the role of intergovernmental transfers for income or consumption risk-sharing among the residents of a federation, the parts of which are exposed to region-specific shocks.[5] The other branch of the literature starts with Mundell's (1961) and Kenen's (1969) analysis of optimum currency areas and argues that, in a world of sticky wages and prices, intergovernmental transfers can stabilize regional aggregate demand and employment in the presence of regionally asymmetric cyclical shocks.[6] This view has played an important role in the design of the EMU.[7]

The empirical work in this area has focused on the extent to which fiscal flows between different regions or between the regions and the central government offset regional differences in economic fluctuations at relatively short frequencies. Most of this work has analyzed the US fiscal system. Sachs and Sala-i-Martin (1992) estimate that the tax and transfer flows between the US federal government and the states offset between 33 and 40 percent of a region-specific shock and, thus, provide considerable stabilization. Von Hagen (1992) points out the importance of distinguishing between the (short-term) stabilization and the (long-term) redistribution function of federal fiscal systems, which Sachs and Sala-i-Martin neglect.[8] Later studies in this area distinguish explicitly between the short-term stabilization and the long-term redistribution functions of federal fiscal systems and commonly suggest that the contribution of the US fiscal system to stabilizing regional incomes ranges between 10 and 30 percent. At the same time, the redistributive effects are large.[9] Empirical studies for other countries, including Canada, France, and Italy, report similar results.[10] Mélitz and Zumer (2002) provide a careful discussion of the methodological differences between the various studies and develop a unified approach for the analysis of the redistributive and the stabilizing functions of a federal fiscal system.

In this article, we study the properties of the German federal fiscal system in this regard. Germany is a particularly interesting case in this context, because, like Canada and unlike the United States, it has an explicit, constitutional, and formula-based mechanism for fiscal equalization, which reallocates tax revenues vertically, between the states and the federal government, and horizontally, among the states.[11] Yet, empirical evidence on the German federal fiscal system with regard to both income and tax revenue smoothing remains somewhat scant. This is most

likely due to the intricacies of the rules of the system, data problems, and the structural breaks connected with German unification in the early 1990s.

While the principle of fiscal equalization is grounded in the German constitution, the particular mechanism used for this purpose and its frequent changes over time have been regulated by federal legislation negotiated between federal and state governments. They are, therefore, the outcome of intergovernmental negotiations, in which the representatives of the regional and federal governments fight over the distribution of tax revenues (Renzsch 1989, 1991; Rothweiler 1972; Selmer 1994).[12] Several recent empirical studies analyze the distributional properties of the system in terms of per-capita or relative tax revenues and show that the benefits depend strongly on the extent to which states are over or underrepresented in the Upper House of Germany's Parliament (*Bundesrat*).[13]

Recent empirical studies of the stabilizing properties of the German fiscal system follow the methodological approach of Asdrubali, Sorensen, and Yosha (1996), which defines stabilization in terms of the pass-through of unconditional variations of the growth rate of output to the growth rate of consumption at the state level. Full stabilization thus implies that output shocks do not affect consumption. Büttner (2002) finds that, during the period from 1970 to 1997, the West German fiscal system smoothed around 15 percent of shocks to state income. Fiscal equalization contributed about 7 percent to this. Kurz's (2000) empirical investigation finds a very similar result for the German unemployment insurance system.[14] Kellermann (2001) is the only study we are aware of that distinguishes explicitly between data before and after German unification, although her post-unification data covers only six years. She finds that fiscal transfers smooth over 40 percent of shocks to state income. Unlike our article, she does not consider the individual contributions of the vertical and horizontal reallocation mechanisms in the German fiscal system. More recently, Jüßen (2006) investigates risk-sharing and redistribution in post-unification Germany based on a regionally much more disaggregated data set of 271 labor market regions. He finds that the German fiscal system provides no insurance against asymmetric income shocks. Jüßen's data, however, cannot identify the specific effects of Germany's fiscal equalization system.[15]

Our article makes a variety of contributions to these different strands of literature. First, we analyze both the stabilizing and the redistributive properties of all stages of the German fiscal equalization system for a sample encompassing pre- and post-unification Germany.[16] This allows us in particular to study the effects of the 1995 reform that brought the East German states into the system. Second, we use the methodology proposed by Mélitz and Zumer (2002), which, similar to Sachs and Sala-i-Martin (1992) and the subsequent literature, defines stabilization in terms of variations of state-level aggregates around federal aggregates. Full

stabilization thus implies perfect correlation between state and federal aggregates, which seems to us closer in spirit to the idea of equalization. Third, our methodology and data allow us to estimate the individual contributions of the different vertical and horizontal transfer mechanisms embedded in Germany's fiscal equalization system. Fourth, we extend this analysis to state tax revenues. In contrast to the related political economy literature, we analyze the effects of fiscal equalization based on relative state tax revenues rather than absolute or relative gains from equalization. This gives a more direct representation of the redistributive properties of the system.

Finally, to the best of our knowledge, the political economy approach to fiscal federalism has so far only considered distributional aspects of fiscal equalization and neglected its risk-sharing properties. Assume that state government representatives are risk averse. In this case, they care not only about the size but also about the stability of their budgets over time. They may regard fiscal equalization not only as an instrument for redistribution but also for insuring state government revenues against idiosyncratic shocks. Bargaining over the design of a system of fiscal federalism then involves the possibility of a welfare trade-off between redistribution and insurance: A state government may agree to more redistribution in favor of other states in return for more stabilization of its own revenues. Under these circumstances, showing that, in a reform of fiscal equalization, some states gained in terms of relative income is not sufficient to prove that these states had superior bargaining power. In addition, one would have to show that the same states did not end up with less tax revenue stabilization. Our methodological approach allows us to do just that.

The rest of this article is organized as follows. In the following section, we briefly explain the design of the federal fiscal system in Germany and formulate our empirical hypotheses. Then, we present our empirical methodology and our main empirical results. A detailed description of the data may be found in the Supplementary Material.

The Federal Fiscal System in Germany

Germany is a federation of sixteen states, of which ten together with West-Berlin formed the Federal Republic of Germany from 1949 to 1990. Five East German states became additional members in 1990, and the (now united) city of Berlin also became a state at that time.[17]

The country's federal fiscal system attempts to reconcile two conflicting constitutional principles (Renzsch 1991). On the one hand, the state governments are autonomous and independent of each other and of the federal government in their budgetary policies; and they are individually responsible for carrying out their tasks effectively.[18] On the other hand, the German constitution requires the states

to assure "uniform living standards throughout the territory of the federation."[19, 20] With regard to the tax revenues, it mandates the federation to assure that all state governments have the financial means to supply their citizens with public goods and services of similar quantity and quality.[21] The tension between these two principles arises from the large differences in economic strength and, hence, tax capacity of individual states. These differences call for transfers among states to achieve a greater degree of equality. In addition, the federal government can pay transfers to individual states in order to improve their fiscal conditions.

Our article focuses on the effects of the German *Länderfinanzausgleich (LFA)*, its formula-based fiscal equalization mechanism. It regulates tax revenue allocation among states after the revenues from taxes shared by the federal government and the states have been divided up, a step that already involves considerable redistribution of revenues among the states. The LFA itself is a three-stage process. At the first stage, the states' share of total national value-added tax (VAT) revenues is reallocated among the states. Seventy-five percent of the total VAT revenues attributed to the states are distributed among the states on an equal per-capita basis. The remaining 25 percent of the total VAT revenues are transferred to states with initial per-capita tax revenues from all state taxes of less than 92 percent of the federal average.[22]

At the second stage of LFA, tax capacities and resource needs are calculated for all states. Tax capacity is determined by the sum of state tax revenues[23] and 50 percent (64 percent after 2005) of the local taxes collected in a state's territory. Resource needs are calculated as the average per-capita state tax revenues in Germany multiplied by the population of the respective state.[24] The difference between tax capacity and resource needs determines whether a state pays or receives (additional) direct horizontal transfers under LFA. Financially weak states receive payments lifting them to at least 92 percent of federal average per-capita tax revenues.

At the third stage of LFA, the federal government pays supplementary grants to the states to further reduce the differences in per-capita tax revenues.[25] In 2000, eleven of the sixteen states received supplementary grants suggesting that the latter respond more to political bargains between states and the federal government than to purely distributional concerns, which, in principle, could be addressed at the earlier stages of the system (Selmer 1994). The discretionary nature of these new vertical grants has reduced the transparency that previously characterized German fiscal equalization (Guihéry 2001).

To summarize, the federal fiscal system in Germany involves the following steps: (1) Splitting of tax revenues from shared taxes between the federal and state governments; (2) LFA, which has three stages: (2A) horizontal reallocation of VAT revenues, (2B) horizontal equalization payments, and (2C) vertical supplementary grants from the federal to state governments.[26]

Empirical Hypotheses

We consider two aspects of Germany's fiscal federalism, the traditional view of equalization as an instrument for income redistribution and regional income insurance, and the political economy view that regards equalization as an instrument for state government representatives to obtain larger and more stable budgets. Regarding the traditional view, our empirical hypotheses are straightforward: Equalization should reduce income differences among states and reduce income fluctuations around a common mean income.

Regarding the political economy view, recent empirical studies for Germany (Lenk 2004; Pitlik 2004; Pitlik and Schmid 2000; Pitlik, Schmid, and Strotmann 2001; Pitlik, Schneider, and Strotmann 2006) have shown that the gains and losses states obtain due to the federal fiscal system can be explained by arguments drawn from political economy as suggested by Brennan and Buchanan. The first argument is that states coming into the system with relatively weak tax revenues should benefit the most, because, in the negotiations over the rules of equalization, they have the least to lose and, therefore, do not have to make large concessions to other states. In line with this, these studies find that the gains states obtain through the system are strongly negatively correlated with their pre-equalization tax revenues. One should note, however, that the same correlation pattern would also obtain if the federal fiscal system objectively aimed at reducing inequalities in the states' disposable tax revenues per capita.

The second argument starts from the observation that states are not equally represented in the *Bundesrat*, which must agree to all changes in the rules of the system. Specifically, large states have a much smaller number of seats per citizen in the *Bundesrat* than small states and the small states can outvote the larger ones.[27] In legislative decisions concerning fiscal federalism in the *Bundesrat,* small states are attractive candidates for winning coalitions, because they bring relatively many votes. Furthermore, smaller states tend to be fiscally weak compared to larger ones in Germany. As explained by Pitlik (2004), one should, therefore, expect small states to favor stronger redistribution of tax revenues and, due to their strong relative bargaining power, one should also expect these states to gain more from the federal fiscal system than large states. This hypothesis is confirmed in terms of absolute transfer amounts by Pitlik (2004), Pitlik, Schmid, and Strotmann (2001) and Pitlik, Schneider, and Strotmann (2006).

In this article, we carry this reasoning further in three respects. First, German unification has increased the number of small and financially relatively weak states. By doing so, it has increased the bargaining power of the small and relatively weak West German states in the *Bundesrat*. In view of this, our hypothesis is that these states are among the winners of the reform of the federal fiscal system that occurred in 1995.

Second, while the studies mentioned above only consider the redistributive effects of the entire system, our analysis allows us to look at the effects of the various stages of the system. This is interesting, because the nature of the political negotiations changes from the perspective of the states. Splitting the revenues from joint taxes with the federal government (Stage 1 of the process) is a non-zero-sum game, where the states as a group can benefit at the cost of the federal government. States may be willing to accept more redistribution among themselves for the benefit of obtaining a larger share of the revenues from these taxes jointly. In contrast, the horizontal revenue sharing at stages 2A and 2B is a zero-sum game for the states where redistribution may be more difficult to agree on. Finally, if, as argued by the literature, federal supplementary grants mainly respond to political bargains between individual states and the federal government, we expect equity concerns regarding the distribution of revenues to states to play a minor role at best at stage 2C. This suggests that redistribution is strongest at the stage of revenue splitting, followed by stages 2A and 2B and weakest at stage 2C.

Third, as explained above, state governments may perceive a welfare trade-off between redistribution and insurance of tax revenues in the negotiations over the rules of fiscal federalism. This implies that, in order to show that small and fiscally weak states can exploit their bargaining power, it is not enough to show that they obtain larger net transfers in the federal system, because this could also be the outcome of a trade of more redistribution for more insurance for the fiscally stronger states. Therefore, we hypothesize that the fiscally strong states did not get more tax revenue insurance in return for agreeing to more redistribution in favor of the smaller states.

Empirical Results

We use annual data for state income, taxes, and transfers for West Germany from 1970 to 1994, and for all German states from 1995 to 2006. A detailed description of the data and some descriptive statistics may be found in the Supplementary Material.

In our empirical analysis, we apply a model developed by Mélitz and Zumer (2002), which encompasses the earlier approaches presented in the literature and facilitates comparison across different studies. One advantage of applying their approach to Germany is that it allows us to analyze redistribution and risk-sharing within a unified framework.[28] Let X_{it} be the ratio of per-capita state income (tax revenue) in state i at time t and the national average per-capita income (tax revenue) at time t. Furthermore, let Y_{it} be the ratio of per-capita *state disposable income (tax revenue)* in state i at time t and the national average disposable income (tax revenue) per capita. For our purposes, X_{it} refers to the state income (tax revenue) ratio before and Y_{it} to the state income (tax revenue) ratio after the

application of the different stages of the federal fiscal system. Let variables without time indices, X_i and Y_i, denote the sample period averages. Mélitz and Zumer start from the following equation:

$$Y_{i,t} = \alpha_d + \beta_d X_i + \beta_s(X_{it} - X_i) + e_{it};$$

$$i = 1,...,M; \ t = 1,...,T$$

(1)

In Equation (1), e_{it} is a stochastic disturbance. The coefficient β_d describes the effect of a change in the relative long-run average state income (tax revenue) on the relative long-run average state disposable income (tax revenue). A coefficient of $\beta_d = 1$ implies no redistribution at all, while $\beta_d = 0$ implies ''full redistribution'' as a change in relative state income (tax revenue) does not affect relative state disposable income (tax revenue). Thus, $(1 - \beta_d)$ gives the degree of redistribution achieved by the stage of fiscal equalization under consideration. Furthermore, the coefficient β_s relates deviations of relative state income (tax revenue) at time t from the relative long-run average state income (tax revenue) to deviations of relative state disposable income (tax revenue) from its relative long-run average and describes the stabilization aspect of the federal fiscal system. Again, $(1 - \beta_s)$ indicates the degree of stabilization provided by the fiscal system. Mélitz and Zumer decompose Equation (1) into two parts to illustrate this point:

$$Y_i = \alpha_d + \beta_d X_i + v_i,$$ (2)

$$Y_{it} - Y_i = \beta_s(X_{it} - X_i) + u_{it}$$ (3)

where v_i and u_{it} are random disturbance terms. Equations (2) and (3) define the two regressions we use below to determine the degrees of redistribution and stabilization achieved by fiscal equalization in Germany. Note that Equation (2) uses the cross section only. This might be a problem, if the state economies had grown with very different trend growth rates during the sample period. This, however, was not the case. We estimate Equation (2) by OLS and Equation (3) using a panel estimator with robust standard errors to correct for heteroskedasticity and serial correlation of the errors. To check for robustness, we also estimated Equation (3) with time fixed effects that would pick up any relevant effects at the aggregate level such as the country-wide business cycle or political events such as federal elections. Since the time fixed effects did not change the results, we do not report these estimates below.

Results for State Income[29]

Table 1 presents the results of estimating Equation (2), where $1 - \beta_d$ corresponds to the degree of redistribution. The table reports the standard errors of the estimates

Table 1 Redistribution of state income in Germany, 1970–2006

Dependent variable	West Germany 1970–1994		Germany 1995–2006	
State disposable income after . . .	$1-\beta_d$	Adj. R^2	$1-\beta_d$	Adj. R^2
. . . Transfer of federal tax share	0.314 (0.036)***	0.98	0.25 (0.107)***	0.92
+VAT redistr. among states	0.356 (0.037)***	0.98	0.344 (0.110)***	0.89
+State-to-state transfers	0.366 (0.040)***	0.97	0.36 (0.110)***	0.89
+Federal grants	0.369 (0.041)***	0.97	0.386 (0.108)***	0.88

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients represent the *cumulative* redistribution effect of the fiscal system at the respective stage; the standard errors in parentheses pertain to β_d. Constants are not reported; 1970–1994: ten observations; 1995–2006: sixteen observations. The regression equation is Equation (2) in the text.

together with an indication of statistical significance. Note that the latter refers to the Null of $\beta_d = 0$ or $(1-\beta_d) = 1$.

For the time period from 1970 to 1994, we find that the degree of redistribution provided by Germany's federal fiscal system ranges from 31.4 to 36.9 percent, depending on which elements of the system are included. Most redistribution occurs at the stage of sharing joint taxes with the federal government. It reduces differences in per-capita state disposable income by 31.4 percent. This is less than von Hagen's (1992) result for the US of 47 percent, but in the same range as Mélitz and Zumer's (2002) and Bayoumi and Masson's (1995) results for Canada. The redistributive effect of the horizontal VAT reallocation and state-to-state transfers together is only 5.2 percent, coming mainly from the reallocation of VAT revenue. The contribution to redistribution of vertical transfers from the federal government to states is negligibly small.

After the inclusion of the East German states in LFA in 1995, the degree of redistribution at the stage of tax sharing with the federal government falls to 25 percent, while the contribution of VAT reallocation increases to 9.4 percent. Overall, transfers among the states have become much more important as an instrument for income redistribution after 1995. Vertical federal grants now contribute about 2.6 percent of redistribution.

In table 2, we repeat the regressions for the later period, but we now ask to what extent the federal fiscal system leads to redistribution of income among the West

Table 2 Redistribution of state income in Germany, 1995–2006

Dependent variable	West Germany 1995–2006		East Germany 1995–2006	
State disposable income after . . .	$1-\beta_d$	Adj. R^2	$1-\beta_d$	Adj. R^2
. . . transfer of federal tax share	0.511 (0.047)***	0.91	0.139 (0.016)***	0.99
+VAT redistr. among states	0.606 (0.053)***	0.80	0.283 (0.016)***	0.99
+State-to-state transfers	0.618 (0.053)***	0.81	0.232 (0.015)***	0.99
+Federal grants	0.63 (0.055)***	0.77	0.252 (0.015)***	0.99

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients represent the *cumulative* redistribution effect of the fiscal system at the respective stage; the standard errors in parentheses pertain to β_d. Constants are not reported; 1995–2006: ten observations (West), six observations (East). The regression equation is equation (2) in the text.

and the East German states separately. We do this by using East and West German averages, respectively, as reference levels for state income instead of the national average. The table shows two interesting features. First, both the transfer of the federal tax share and the reallocation of VAT revenues have become significantly more redistributive among the West German states compared to the earlier time period. Overall, the federal fiscal system now eliminates 63 percent of the differences in per-capita incomes among West German states compared to 37 percent before 1995. Thus, the relatively poor West German states have benefitted greatly from the inclusion of the East German states into the system. Second, the degree of redistribution is much lower among the East German states. Overall, it is less than half the degree of redistribution among West German states and about two-thirds of the degree of redistribution achieved at the national level. State-to-state transfers even increase income inequality slightly among East German states, and federal grants do not contribute much to redistribution at all. Thus, after 1995, the federal fiscal system is more effective in closing the income gap between East and West German states than the gap among East German states.[30]

Next, we turn to estimating Equation (3). Our results are presented in tables 3 and 4. We pool our data for the German, West German, and East German samples, and we also distinguish stabilization effects by state size.[31] Let us first focus on our pooled samples in table 3. In the period from 1970 to 1994, the cumulative degree of stabilization is 46.7 percent. While the reallocation of VAT revenue contributes 3.3 percent of stabilization, horizontal transfer payments between states contribute

Table 3 Stabilization of state income in Germany, 1970–2006, with interactive dummies for state size.

State disposable income after…	Dependent variable	…Transfer of federal tax share		+VAT reallocation among states		+State-to-state transfers		+Federal grants	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Germany 1970–1994	$(X_{it} - X_i)$	0.348	−0.098	0.381	−0.110	0.450	−0.074	0.467	−0.067
		(0.196)***	(0.041)***	(0.211)**	(0.047)***	(0.227)**	(0.048)***	(0.236)**	(0.049)***
	$(X_{it} - X_i)*small_i$		0.362		0.514		0.486		0.460
			(0.210)		(0.307)		(0.305)		(0.310)
	$(X_{it} - X_i)*city_i$		0.836		0.895		0.968		0.994
			(0.107)***		(0.101)***		(0.104)***		(0.130)***
	Adj. R^2	0.59	0.81	0.52	0.76	0.43	0.74	0.38	0.67
Germany 1995–2006	$(X_{it} - X_i)$	0.081	0.070	0.159	0.102	0.180	0.174	0.194	0.167
		(0.081)***	(0.098)***	(0.120)***	(0.121)***	(0.127)***	(0.138)***	(0.126)***	(0.136)***
	$(X_{it} - X_i)*small_i$		−0.012		0.032		−0.031		0.140
			(0.117)		(0.152)		(0.164)		(0.189)
	$(X_{it} - X_i)*city_i$		0.023		0.079		0.023		−0.017
			(0.160)		(0.225)		(0.243)		(0.232)
	Adj. R^2	0.89	0.89	0.83	0.83	0.81	0.81	0.74	0.74

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients (in rows 1 and 5) represent the *cumulative* insurance effect of the fiscal system at the respective stage; the clustered standard errors in parentheses pertain to the respective β_s while the reported stabilization effect on variable $(X_{it} - X_i)$ corresponds to $(1 - \beta_{s,large})$ and it corresponds to $(-\beta_{s,city})$ and $(-\beta_{s,small})$ in the other two cases, respectively. 1970–1994: 250 observations, 1995–2006: 192 observations. Columns 1, 3, 5, and 7 report the results from estimating Equation (3) in the text. Columns 2, 4, 6, and 8 report results from estimating a modified version of Equation (3) where we interact the RHS variable $(X_{it} - X_i)$ with a dummy variable for state size. The omitted category is *large state*. For example, the coefficient for $(X_{it} - X_i)*small_i$ tells us by how much the insurance effect on a small state deviates from the insurance effect on a large state (the omitted category). Hence, the overall insurance effect on a small state is the sum of the coefficients on $(X_{it} - X_i)$ and $(X_{it} - X_i)*small_i$.

Table 4 Stabilization of state income in Germany, 1995–2006, with interactive dummies for state size

State disposable income after . . .	Dependent variable	. . . Transfer of federal tax share		+VAT reallocation among states		+State-to-state transfers		+Federal grants	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Germany 1995–2006	$(X_{it} - X_i)$	0.16 (0.087)***	0.04 (0.089)***	0.28 (0.134)***	0.06 (0.106)***	0.31 (0.137)***	0.12 (0.121)***	0.31 (0.146)***	0.12 (0.130)***
	$(X_{it} - X_i)^*small_i$		−0.01 (0.112)		0.04 (0.151)		−0.02 (0.158)		0.2 (0.212)
	$(X_{it} - X_i)^*city_i$		0.27 (0.093)**		0.45 (0.124)***		0.42 (0.134)**		0.25 (0.280)
	Adj. R^2	0.85	0.88	0.76	0.83	0.73	0.80	0.59	0.59
East Germany 1995–2006	$(X_{it} - X_i)$	0.03 (0.016)***	0.05 (0.064)***	0.1 (0.014)***	0.12 (0.060)***	0.13 (0.014)***	0.15 (0.058)***	0.14 (0.014)***	0.16 (0.057)***
	$(X_{it} - X_i)^*Berlin$		−0.04 (0.064)		−0.03 (0.060)		−0.03 (0.058)		−0.03 (0.057)
	Adj. R^2	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients (in rows 1 and 5) represent the *cumulative* insurance effect of the fiscal system at the respective stage; the clustered standard errors in parentheses pertain to the respective β_s while the reported stabilization effect on variable $(X_{it} - X_i)$ corresponds to $(1 - \beta_{s,large})$ and it corresponds to $(-\beta_{s,small})$ and $(-\beta_{s,city})$ or $(\beta_{s,Berlin})$ in the other cases, respectively. 1995–2006: 120 observations (West), 72 observations (East). Columns 1, 3, 5, and 7 report the results from estimating Equation (3) in the text. Columns 2, 4, 6, and 8 report results from estimating a modified version of Equation (3) where we interact the RHS variable $(X_{it} - X_i)$ with a dummy variable for state size. For example, the coefficient for $(X_{it} - X_i)^*small_i$ tells us by how much the insurance effect on a small state deviates from the insurance effect on a large state (the omitted category). Hence, the overall insurance effect on a small state is the sum of the coefficients on $(X_{it} - X_i)$ and $(X_{it} - X_i)^*small_i$. The omitted category is *large state*.

the largest part with 6.9 percent. Federal grants to states play the smallest role with 1.7 percent.

For the period from 1995 to 2006, the stabilization properties of the federal fiscal system decrease considerably to 19.4 percent. The decline is due entirely to the smaller effect of tax revenue sharing between the states and the federal government. In contrast, the contribution of horizontal transfers and the effect of supplementary federal grants remain about the same.

In the even-numbered columns of table 3, we present the regression results of a modified version of Equation (3), where we interact our explanatory variable with state size dummies for small and city states.[32] We ask to what extent the stabilization properties are different for states of different size. Conventional macro economics would argue that stabilization is more important for city and small states, since their economies tend to be more specialized and, hence, more exposed to sector-specific shocks than the economies of large states. The table reports the stabilization effect for large states' incomes and the *additional* stabilization effects for small ("small") and city states ("city"). The negative coefficients indicate that, before 1995, the federal fiscal system had a small but statistically significant destabilizing effect on state incomes of large states. This was mainly due to the transfer of the federal government's share of tax revenues (–9.8 percent). In contrast, LFA had a small stabilizing effect, so that the overall effect was reduced to around negative 6.7 percent. The results for city states differ strongly: state incomes are almost completely stabilized by the fiscal system. The coefficients for small states point in the same direction. However, the differences to the large states' coefficients are not statistically significant.

After 1995, tax sharing with the federal government has a small stabilizing effect on state income for large states. Together with the later stages of equalization, the entire system now has a statistically significant albeit small stabilizing effect of around 17 percent for the large states. Note that the definition of an asymmetric shock here is relative to the average income for all of Germany rather than for West Germany alone. There is no significant stabilization advantage for city states any more. In table 4, we perform similar exercises using the West and East Germany sub-samples separately for the period since 1995. The results for the pooled data for West Germany show that the stabilizing effect of the fiscal system (31.1 percent) is lower than in the pre-unification period. The largest contribution comes from tax revenue sharing between the federal government and West German states (16.2 percent), followed by VAT reallocation, which has a stabilizing effect of about 11.4 percent. Distinguishing the effects according to state size reveals that city states are much better protected against asymmetric shocks than large and small states.

For East Germany, we distinguish between so-called area states (Brandenburg, Mecklenburg-Vorpommern, Saxony-Anhalt, Saxony, and Thuringia) and the city state of Berlin. As table 4 shows, the stabilizing effect of the fiscal system for Berlin

is indistinguishable from that for the other states. Overall, about 15 percent of asymmetric shocks are smoothed. Tax sharing with the federal government has a small, stabilizing effect on state income (around 5 percent). LFA delivers the larger contribution with about 10 percent.

In sum, our results suggest that the federal fiscal system provides much less insurance against asymmetric shocks to state disposable incomes since 1995 compared to the earlier period.

Results for State Tax Revenues

In this section, we consider the properties of Germany's federal fiscal system in a different dimension. Rather than asking to what extent it leads to redistribution and insurance of per-capita disposable incomes, we ask to what extent it serves to redistribute and insure per-capita state government (tax) revenues. While the previous sections have focused on the importance of the system for consumers living in the different states of Germany, we now focus on the role it plays for governments. The methodology remains the same with the exception that ''income'' now refers to state government tax revenues. Recall that our concept of tax revenues is more comprehensive than the revenues considered for the purposes of fiscal equalization in Germany. Thus, in the regressions below, we are not just reproducing the formulas applied at the various stages of the system. Instead, we estimate its effects on total state government tax revenues.

Tables 5 and 6 show the results for redistribution of state tax revenues. Before 1995, almost 60 percent of all revenue differences were eliminated at the stage of

Table 5 Redistribution of state tax revenue in Germany, 1970–2006

Dependent variable	West Germany 1970–1994		Germany 1995–2006	
State tax revenue after ...	$1-\beta_d$	Adj. R^2	$1-\beta_d$	Adj. R^2
... Transfer of federal tax share	0.589 (0.023)***	0.95	0.407 (0.083)***	0.87
+VAT redistr. among states	0.74 (0.016)***	0.93	0.729 (0.042)***	0.80
+State-to-state transfers	0.775 (0.023)***	0.90	0.774 (0.039)***	0.73
+Federal grants	0.716 (0.026)***	0.89	0.783 (0.069)***	0.56

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients represent the *cumulative* redistribution effect of the fiscal system at the respective stage; the standard robust standard errors in parentheses pertain to β_d. Constants are not reported; 1970–1994: ten observations; 1995–2006: sixteen observations. The regression equation is Equation (2) in the text.

Table 6 Redistribution of state tax revenue in Germany, 1995–2006

Dependent variable	West Germany 1995–2006		East Germany 1995–2006	
State tax revenue after...	$1-\beta_d$	Adj. R^2	$1-\beta_d$	Adj. R^2
... Transfer of federal tax share	0.541 (0.021)***	0.94	0.094 (0.026)***	0.98
+VAT redistr. among states	0.786 (0.011)***	0.79	0.759 (0.013)***	0.94
+State-to-state transfers	0.807 (0.012)***	0.75	0.604 (0.021)***	0.94
+Federal grants	0.892 (0.014)***	0.60	0.678 (0.016)***	0.95

Notes: *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. The coefficients represent the *cumulative* redistribution effect of the fiscal system at the respective stage; the standard robust standard errors in parentheses pertain to β_d. Constants are not reported; 1995–2006: ten observations (West), six observations (East). The regression equation is Equation (2) in the text.

sharing tax revenues with the federal government. VAT reallocation adds another 15 percent; state-to-state transfers 3.5 percent. Federal grants, however, increased revenue inequality among the states by about 7 percent. Overall, the redistribution effect exceeds 70 percent.

From 1995 onwards, tax sharing and LFA are almost equally effective. Tax sharing eliminates 40.7 percent of income differences, while VAT reallocation adds 32.2 percent and state-to-state transfers add 4.5 percent. Federal grants contribute virtually nothing to the redistribution of tax revenues. Overall, the system has become slightly more redistributive than before. Our results indicate that fiscal equalization plays a much more significant role for redistributing tax revenues among governments than for redistributing income among citizens.

In table 6, we look at the redistributive properties of the federal fiscal system among West and East German states separately after 1995. We find that the overall redistributive effects of the fiscal system are quite large in both subsamples (West: 89.2 percent; East: 67.8 percent), but smaller for East Germany. Tax sharing with the federal government has very different effects on both subgroups; but tax sharing and VAT reallocation taken together eliminate more than 75 percent of the differences in state tax revenues. However, state-to-state transfers have opposite effects on state tax revenues in West and East Germany. They add about 2 percent to the redistribution effect in the West, but increase inequality in tax revenues in the East by about 15 percent. Overall, the degree of redistribution among West German states has increased by about 18 percent compared to the pre-unification period. This is due entirely to the effect of federal grants at the last stage of LFA.

As in the case of state disposable incomes, this indicates that the relatively poor state governments in West Germany have benefitted significantly from the 1995 reform of the federal fiscal system.

Among the East German states, tax sharing with the federal government has only a small redistributive effect. VAT transfers eliminate 65 percent of differences in per-capita state tax revenues, but horizontal transfers increase revenue inequality. Federal grants compensate part of that latter effect. Overall, fiscal equalization eliminates about 68 percent of the differences in per-capita tax revenues among East German state governments. This is less than the corresponding effect among West German states.

Tables 7 and 8 show our results for insurance against asymmetric shocks to state tax revenues.

In the pooled data (odd-numbered columns in table 7), before 1995, tax sharing with the federal government absorbs 63 percent of all asymmetric shocks to state tax revenues among the West German states. The subsequent stages of fiscal equalization add more insurance, and the system including federal grants provides perfect insurance against such shocks. Distinguishing by state size (even-numbered columns in table 7) reveals that tax sharing absorbs about 28 percent of asymmetric shocks in large and small states, but almost 70 percent in city states. At the later stages of fiscal equalization, the overall effect for small and city states increases to almost perfect insurance.

After 1995, the federal fiscal system has become somewhat less effective in insuring state tax revenues, although the difference is not statistically significant. The entire system still absorbs a remarkable 87 percent of asymmetric shocks to state tax revenues. Tax sharing with the federal government provides about 40 percent of the insurance, and VAT reallocation provides an additional 44 percent. Horizontal state-to-state transfers contribute about 10 percent. Federal grants now weaken the insurance effect by about 7 percent. When we control for state size, our results suggest that, except for the last stage, city states receive more insurance than large and small states.

Finally, we again split our sample into East and West German states and investigate the stabilization properties of the fiscal system for these subsamples separately (table 8).

For West Germany, the overall fiscal system absorbs about 89 percent of asymmetric shocks to tax revenues, with the largest contribution coming from VAT reallocation with about 45 percent. Federal grants are again slightly destabilizing. When we distinguish by state size (columns 2–4 in the table), it turns out that tax sharing is stabilizing for all states with about 20 percent. Including VAT reallocation, stabilization increases to about 43 percent for small and large states, and to about 87 percent for city states. After state-to-state transfers, city states' tax revenues remain significantly better insured than those of large and small states

Table 7 Stabilization of state tax revenue in Germany, 1970–2006

State tax revenue after...	Dependent variable	...Transfer of federal tax share		+VAT reallocation among states		+State-to-state transfers		+Federal grants	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Germany 1970–1994	$(X_{it} - X_i)$	0.63 (0.064)***	0.28 (0.145)***	0.79 (0.031)***	0.6 (0.183)*	0.96 (0.010)***	0.75 (0.099)**	1.03 (0.04)	0.84 (0.267)
	$(X_{it} - X_i)*small_i$		0.12 (0.160)		0.35 (0.183)*		0.19 (0.099)*		0.21 (0.269)
	$(X_{it} - X_i)*city_i$		0.4 (0.151)**		0.18 (0.185)		0.22 (0.099)*		0.19 (0.270)
	Adj. R^2	0.52	0.57	0.32	0.34	0.02	0.05	0.01	0.02
Germany 1995–2006	$(X_{it} - X_i)$	0.4 (0.056)***	0.23 (0.217)***	0.84 (0.065)**	0.53 (0.050)***	0.94 (0.021)**	0.8 (0.053)***	0.87 (0.041)***	0.85 (0.116)
	$(X_{it} - X_i)*small_i$		−0.02 (0.250)		0.33 (0.157)*		0.09 (0.111)		−0.05 (0.157)
	$(X_{it} - X_i)*city_i$		0.21 (0.219)		0.34 (0.075)***		0.17 (0.053)***		0.03 (0.123)
	Adj. R^2	0.52	0.53	0.12	0.15	0.03	0.05	0.11	0.11

Notes: *significant at 10%; **significant at 5%; ***significant at 1%. The coefficients (in rows 1 and 5) represent the *cumulative* insurance effect of the fiscal system at the respective stage; the clustered standard errors in parentheses pertain to the respective β_s, while the reported stabilization effect on variable $(X_{it} - X_i)$ corresponds to $(1 - \beta_{s,\text{large}})$ and to $(-\beta_{s,\text{city}})$ and $(-\beta_{s,\text{small}})$ in the other two cases, respectively. 1970–1994: 250 observations, 1995–2006: 192 observations. Columns 1, 3, 5, and 7 report the results from estimating Equation (3) in the text. Columns 2, 4, 6, and 8 report results from estimating a modified version of Equation (3) where we interact the RHS variable $(X_{it} - X_i)$ with a dummy variable for state size. The omitted category is *large state.* For example, the coefficient for $(X_{it} - X_i)*small_i$ tells us by how much the insurance effect on a small state deviates from the insurance effect on a large state (the omitted category). Hence, the overall insurance effect on a small state is the sum of the coefficients on $(X_{it} - X_i)$ and $(X_{it} - X_i)*small_i$.

Table 8 Stabilization of state tax revenue in Germany, 1995–2006, with interactive dummies for state size

State tax revenue after...	Dependent variable	...Transfer of federal tax share		+VAT reallocation among states		+State-to-state transfers		+Federal grants	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Germany 1995–2006	$(X_{it} - X_i)$	0.38	0.2	0.83	0.43	0.94	0.7	0.89	0.81
		(0.068)***	(0.225)***	(0.075)*	(0.044)***	(0.031)*	(0.083)***	(0.020)***	(0.146)
	$(X_{it} - X_i)*small_i$		−0.14		0.36		0.13		−0.02
			(0.255)		(0.232)		(0.176)		(0.198)
	$(X_{it} - X_i)*city_i$		0.23		0.44		0.27		0.1
			(0.228)		(0.070)***		(0.083)**		(0.146)
	Adj. R^2	0.60	0.61	0.14	0.19	0.05	0.11	0.12	0.13
East Germany 1995–2006	$(X_{it} - X_i)$	0.69	0.79	0.92	0.93	0.95	0.94	0.69	0.83
		(0.089)**	(0.140)	(0.022)**	(0.047)	(0.010)***	(0.024)*	(0.111)**	(0.156)
	$(X_{it} - X_i)*Berlin$		−0.17		−0.02		0.01		−0.24
			(0.140)		(0.047)		(0.024)		(0.156)
	Adj. R^2	0.12	0.12	0.09	0.07	0.04	0.02	0.25	0.28

Notes: *Significant at 10%; **significant at 5%; ***significant at 1%. The coefficients (in rows 1 and 5) represent the *cumulative* insurance effect of the fiscal system at the respective stage; the clustered standard errors in parentheses pertain to the respective β_s, while the reported stabilization effect on variable $(X_{it} - X_i)$ corresponds to $(1 - \beta_{s,large})$ and it corresponds to $(-\beta_{s,small})$ and $(-\beta_{s,city})$ or $(\beta_{s,Berlin})$ in the other cases, respectively. 1995–2006: 120 observations (West), seventy-two observations (East). Columns 1, 3, 5, and 7 report results from estimating Equation (3) in the text. Columns 2, 4, 6, and 8 report results from estimating a modified version of Equation (3) where we interact the RHS variable $(X_{it} - X_i)$ with a dummy variable for state size. The omitted category is *large state*. For example, the coefficient for $(X_{it} - X_i)*small_i$ tells us by how much the insurance effect on a small state deviates from the insurance effect on a large state (the omitted category). Hence, the overall insurance effect on a small state is the sum of the coefficients on $(X_{it} - X_i)$ and $(X_{it} - X_i)*small_i$.

(large and small: 70.1 percent; city: 96.9 percent). The magnitude and differences (due to state size) of the insurance effect remain similar over time. After 1995, large and small states receive less insurance against asymmetric revenue shocks than city states in West Germany.

For East Germany, the results are less conclusive. In the pooled data, tax sharing with the federal government together with the first two stages of LFA provides almost perfect insurance against asymmetric tax revenue shocks. However, federal grants at the last stage of LFA have a destabilizing effect and reduce the insurance effect to 69.2 percent. The distinction between area states and the city state of Berlin suggests that the fiscal system may provide less insurance for Berlin than for the other five East German states, but the effects are not statistically significant. Also, federal grants seem to have a much more destabilizing effect on Berlin than on the other states. But again, the effect is not statistically significant.

Conclusions

Our analysis explores the redistributive and stabilizing properties of the federal fiscal system in Germany, using data from 1970 to 2006. The system features a formula-based mechanism reallocating tax revenues between the states and the federal government and among the states. It is an outflow of the constitutional mandate to secure equal living conditions for all citizens in the country. Our article contributes to the literature by analyzing both the stabilization and redistributive properties of all stages of the German fiscal equalization mechanism of pre- and post-unification Germany. Furthermore, we investigate the insurance effect of this mechanism on state tax revenue, an aspect neglected in the literature so far.

We find that the federal fiscal system achieves a significant degree of redistribution of income and of stabilization of asymmetric shocks to state incomes in Germany. Most of this is achieved by sharing of tax revenues between the states and the federal government, while the smallest contribution comes from supplementary grants to states by the federal government. However, the system is much more effective in eliminating differences in state tax revenues and in shielding state budgets from the impact of asymmetric revenue shocks. This suggests that the politicians who negotiated fiscal equalization since the beginning of the Federal Republic cared more about its implications for state governments than for private households in their regions. Furthermore, we find that the redistributive effect of the federal fiscal system has slightly increased since the inclusion of the East German states, and that it equalizes incomes and tax revenues among West German states much more strongly than before. In this sense, the relatively poor West German states are among the winners of the reforms of fiscal

equalization that came into effect in 1995. Obviously, German unification has not only led to large fiscal transfers from the Western to the Eastern part of the country. It has also increased transfers among the West German states. There is also a slight decline in the degree of insurance against asymmetric shocks to state tax revenues provided to large West German states, while the degree of insurance provided to small and city states has remained the same. A suggestive interpretation is that, in the negotiations between the federal and state governments of that reform, the political representatives of the relatively poor West German states managed to forge a successful coalition with the representatives of the East German states. This is consistent with the observation that all relatively poor West German states fall into the categories of small and city states (see table A5 in the Supplementary Material) and that the bargaining power of these states in the *Bundesrat* is larger than that of the large West German states (Pitlik, Schmid, and Strotmann 2001).[33]

Recent research on the stabilizing functions of fiscal equalization was stimulated by the creation of a monetary union in Europe. A common argument in the debate over EMU has been that the monetary union needs a mechanism for paying transfers between member states in different stages of the business cycle. Our empirical results suggest that the stabilization of state disposable incomes provided by the horizontal transfers among the states of Germany is rather limited. Most of the stabilization achieved by fiscal equalization in Germany comes from transferring tax revenues from the states to the federal government. Since Europe does not have a government of a size comparable to today's national governments, that is hardly an option for EMU. Germany's example suggests that horizontal fiscal equalization alone is not a promising alternative, and may not be a politically viable option in any case. Since, in the case of the EU, fiscal equalization would necessarily be negotiated among the governments of the member states, the German example also warns that the outcomes of such negotiations may serve the interests of the policymakers involved more than the goal of macroeconomic stabilization originally intended.

Supplementary Material

Supplementary material is available at *Publius* online.

Notes

1 In contrast, Boadway and Mörk (2004), among others, argue that intergovernmental grants can help mitigate the adverse effects of excessive competition among local governments that would lead to a "race to the bottom" in the provision of public goods.

2 Pitlik (2004) provides a formal exposition of this argument based on the Baron and Ferejohn (1989) model of legislative bargaining.

3 Rodden (2003, 2006) shows that German state governments that systematically received transfers have a higher tendency to borrow and a lower tendency to undertake fiscal adjustments to adverse economic shocks. Von Hagen et al. (2000) provide supporting evidence for Germany and other OECD countries.

4 See Homburg 1994; Peffekoven 1994, 2001; Huber and Lichtblau 2000; Lenk 2004; Baretti, Huber, and Lichtblau 2002.

5 See Atkeson and Bayoumi 1993; Wildasin 1996; Persson and Tabellini 1996a, 1996b; Bucovetsky 1998; Lockwood 1999; Boadway 2004.

6 See European Commission 1977a, 1977b; Sachs and Sala-i-Martin 1992; von Hagen 1992; Goodhart and Smith 1993; Bayoumi and Masson 1995; Athanasoulis and van Wincoop 2001.

7 The main point of this argument is nicely summarized by the former president of the European Commission, Jacques Delors (1989, 89), in the blueprint for the EMU: "... in all federations, the different combinations of federal budgetary mechanisms have powerful 'shock-absorber' effects dampening the amplitude either of economic difficulties or of surges in prosperity of individual states. This is both the product of, and the source of the sense of national solidarity which all relevant economic and monetary unions share."

8 In this article, we use the terms *stabilization*, *risk-sharing* and *insurance* interchangeably.

9 See Goodhart and Smith 1993; Bayoumi and Masson 1995; Asdrubali et al. 1996; Sorensen and Yosha 1997; Mélitz and Zumer 2002; van Wincoop 1995; von Hagen 2000; Becker and Hoffman 2006; and Kletzer and von Hagen 2001 for a detailed review of this literature.

10 With regard to Canada, however, Smart (2004) points out that, due to lags in the calculation of the equalization grants, fiscal equalization may actually be destabilizing.

11 Federal health insurance, unemployment insurance, and pension systems, though targeting individuals rather than regions, also lead to significant interregional income flows. Including these elements in the analysis, however, is beyond the scope of this article and, for data reasons, impossible with our methodology.

12 Thus, Selmer (1994, 343) writes: "The reform of fiscal equalization presents itself as an attempt, questionable in many respects, to embed the compromise regarding the contributions of the federal and the state governments to the transfers flowing into East Germany, which had been negotiated at a closed meeting in Bonn, November 11–13, 1993, into the formal framework for redistribution given by the existing fiscal constitution of Article 106–107 of the German constitution." (our translation). See, e.g., Persson and Tabellini (1996a, 1996b) for a formal analysis of the difference between intergovernmental grants negotiated at the constitutional stage and grants negotiated in legislative bargains.

13 Lenk (2004), Lenk and Birke (2000), Pitlik (2004), Pitlik and Schmid (2000), Pitlik Schmid, and Strotmann (2001), Pitlik, Schneider, and Strotmann (2006).

14 Her study covers the time period 1975 to 1997, but—like Büttner (2002)—she does not distinguish between the pre- and post-unification period and the data set only includes West German states.

15 Pisani-Ferry, Italianer, and Lescure (1993) study the combined effects of social insurance and tax reallocation on state (disposable) income with a macroeconomic simulation model. They find that the German fiscal system stabilizes between 34 and 42 percent of asymmetric shocks affecting individual states.

16 Büttner (2002) also considers all stages of the fiscal equalization mechanism, but focuses only on stabilization and does not consider the post-unification period. Kellerman (2001), on the other hand, also uses both pre- and post-unification data, but only looks at the German fiscal system as a whole.

17 For a list of states, see table A5 in the Supplementary Material. West-Berlin had a special status in pre-unification Germany and was not part of the fiscal equalization mechanism during that time period.

18 Grundgesetz (German Constitution) Articles 29, 30, and 109:1.

19 Grundgesetz, Articles 72:2, Para 3, and 106:3, Para 2.

20 There is a discussion in Germany on how this article in the constitution should be interpreted given demographic and migration developments (see, for example, Barlösius 2006).

21 Grundgesetz, Article 107, see also Jung (2008).

22 The tax revenues considered at this stage include all pure state taxes as well as a state's share of personal and corporate income tax.

23 This sum now includes the VAT revenue assigned to a state in the first stage.

24 At this stage, the special financial needs of the city states Hamburg and Bremen (and later Berlin and the sparsely-populated states Brandenburg, Mecklenburg-Vorpommern, and Sachsen-Anhalt) are recognized by attributing them with larger than actual populations.

25 These ''Bundesergänzungszuweisungen'' are general purpose grants which are computed on the basis of special financial needs and the per-capita VAT revenue of the financially weak states. Before 1995, the total volume of these grants was capped at 2 percent of total VAT revenues. The 1995 reform lifted this cap and greatly increased the role of these payments in order to provide the East German states with sufficient fiscal resources (Dickertmann and Gelbhaar 1996; Pitlik and Schmid 2000; Selmer 1994). Furthermore, it introduced a number of new supplementary grants targeting smaller West German states, all East German states, as well as the West German states Bremen and Saarland, which were facing difficulties with the transition from the old equalization system. Bremen and Saarland have also received bailouts for their excessive debts in the early 1990s.

26 More detailed information on the federal fiscal system in Germany may be found in the Supplementary Material.

27 See table A5 in the Supplementary Appendix.

28 As pointed out above, the alternative methodological approach is the one proposed by Asdrubali, Sorensen, and Yosha (1996) (ASY). They decompose the variance of state output and ask, how much of an output shock feeds through to various definitions of

state income and, ultimately, consumption. Full risk-sharing would imply no correlation between the growth of state output and the growth of state consumption. In their original paper, Mélitz and Zumer (MZ) use both state output and state income as regressors, but present arguments for either choice. We decided to use state income over state output with the argument that part of the shocks to state output are already eliminated by private factor markets, e.g., state residents commuting accross state borders, cross-border investments, etc. (this argument is similar to the distinction between GDP and GNI). For a more detailed discussion on differences and similarities of the ASY and MZ approach, see Melitz and Zumer (2002).

29 As a robustness check, we ran the same regressions using state output instead of state income and our results change little with respect to both redistribution and stabilization effects.

30 To check the robustness of our results with respect to the fiscal system's reform of 2005, we also split the post-1994 sample into subsamples 1995–2004 and 2005–2006 for both the state disposable income and the state tax revenue redistribution regressions. In both cases, the results do not change significantly and coefficients from the two subsamples differ little.

31 For the categorization of states by state size, see table A5 in the Supplementary Material.

32 Hence, large states are the omitted category.

33 Table A5 in the Supplementary Material illustrates this point by reporting the number of seats the individual states have in the *Bundesrat*. Of the total of sixty-three seats, twenty-three are for East German states, eighteen for the West German states that are typically net receivers in LFA (Bremen, Lower Saxony, Rhineland-Palatinate, Saarland, and Schleswig-Holstein), and the remaining twenty-six belong to the West German states that are typically net contributors (Baden-Württemberg, Bavaria, Hamburg, Hesse, and North-Rhine Westfalia.)

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