Fiscal Federalism and Interstate Risk Sharing: Empirical Evidence from Germany

Thiess Buettner[1],
Centre for European Economic Research (ZEW), and
Martin School of Public Policy and Administration, University of Kentucky

July 2001

Abstract:
Using an approach developed by Asdrubali et al. (1996) the paper estimates the extent of smoothing of state-specific income shocks to West German states from 1970-1997 by federal fiscal institutions. The results show that despite the existence of substantial interregional transfer mechanisms the share of shocks to state income absorbed by fiscal flows is roughly at the same level as in the US.

Keywords: interregional risk sharing, federal taxes, intergovernmental grants, fiscal equalization, federal unemployment insurance

JEL Classification: H77,E63,F42

Address:
ZEW
L 7,1
D-68161 Mannheim
Germany
buettner@zew.de
phone: +49 621 1235 183
fax: +49 621 1235 223

[1] I would like to thank an anonymous referee for helpful comments.

1 Introduction

Recent research has adressed the role of federal taxes, transfers, and grants in providing income insurance to member states of a federation and has discussed whether or not income smoothing by federal fiscal institutions is necessary or desirable among closely integrated states or countries (e.g., Sala-i-Martin and Sachs, 1992, von Hagen, 1992). In particular in the context of the European Monetary Union it has been repeatedly argued that that the lack of vertical and horizontal fiscal flows might create difficulties (e.g., Bayoumi and Eichengreen, 1993) and that monetary union should be complemented by a larger central budget or an interregional transfer system (EC Commission, 1977, see also Goodhart and Smith, 1993). A number of studies, mainly for the U.S. indicate that the federal level contributes to significant smoothing of regional shocks, although the results differ quantitatively (for an overview, see Melitz and Zumer, 2000, and von Hagen, 2000). The present paper adds empirical evidence from Germany, which is an interesting case to compare, as it shows substantial interregional transfers aimed at reducing fiscal disparities between states.

2 Quantifying interregional risk sharing

Based on the approach of Asdrubali et al. (1996) the role of U.S. federal fiscal institutions in smoothing state-specific shocks to income has recently been analysed by Sørensen and Yosha (1999). Following this approach, smoothing of shocks to state income by federal fiscal institutions can be measured in a regression

$$\Delta \log Y_{i,t} - \Delta \log \widetilde{Y}_{i,t} = \alpha_t + \beta \, \Delta \log Y_{i,t} + u_{i,t}, \quad i = 1, ..., s, \quad t = 2, ..., n, \tag{1}$$

involving s states and n observations, where $Y_{i,t}$ denotes state income, and $\widetilde{Y}_{i,t}$ denotes state disposable income, i.e. state income after taxes paid to the federal level and after transfers and grants received from the federal level. β measures the extent to which the differential between state income and state disposable income depends on an innovation in state income. Obviously, if β equals 1, an increase in state income is fully reflected in the differential, and, consequently, income after redistribution is not affected. This is the case of full risk sharing. If β equals 0, the variation in actual income is fully mirrored in disposable income and there is no risk sharing. Therefore, the value of β can be interpreted as showing the extent of smoothing. Applying this equation to pooled cross-sections of U.S. states Sørensen and Yosha (1999) find that on average 14.9 % of shocks to state income are smoothed by federal fiscal institutions where the largest contributions come from federal transfers to individuals and federal grants to states.

A methodological objection against this regression-based approach to measure the extent of income smoothing is the possible existence of measurement error in the state income series, in particular for the smaller states. Howevever, as pointed out by Asdrubali et al. (1996) weighting the observations with the state-specific residual variance will

reduce this problem. In addition, alternative regressions using income shocks defined over longer time intervals will tend to be less affected by measurement error.

By focusing on the smoothing of income shocks to states the analysis neglects other important channels of interstate risk sharing. In particular, the related analysis of Asdrubali et al. (1996) shows that only a fraction of shocks to state product will actually affect state income, since as much as 39.2 % of shocks to state product are already smoothed via interregional income flows in the U.S. This indicates that the extent of income smoothing as such is not revealing of the normative significance of income smoothing provided by federal fiscal institutions. However, a comparative study of the extent of income smoothing in a different federal system provides insights into the role of the design of fiscal federal relationships and allows to address the issue of whether income smoothing is an important feature of federal systems in general or whether the findings for the U.S. system reflect specific institutions.

3 Risk sharing in German fiscal federalism

German federalism might display rather strong interstate income risk sharing via taxes and intergovernmental grants because of its emphasis on revenue sharing and fiscal equalization.[1] Generally, Germany is characterized by a very low degree of taxing autonomy of the states which, however, absorb a large fraction of the consolidated government budget in Germany.[2] Most of the tax resources available to the states result from taxes shared with the central government.[3] The primary allocation among states is determined by origin of revenues (business taxes), residence of tax payers (income taxes) or by population (value added tax (VAT)). However, revenues are redistributed by the fiscal equalization system, which aims at eliminating differences in per capita budgets across states.

Basically, fiscal equalization consists of three elements, the redistribution of VAT revenues, the horizontal transfers, and unconditional federal grants. The redistribution of VAT revenues is quite substantial with a transfer volume in 1990 of about 2.14 % of GDP.[4] In comparison, the volume of direct horizontal equalization transfers amounts only to 0.17 % of GDP in 1990. Among the three components of the fiscal equalization system, the volume of direct federal grants is smallest, with about 0.13 % in 1990. The three elements of fiscal equalization together amount to 2.44 % of GDP in 1990 which

[1] For an overview on the German system of fiscal federalism see Spahn and Foettinger (1997) and Wurzel (1999).

[2] In 1998 approximately 41.3% of total tax revenues finally showed up in the states' budgets. The local juridictions which are subordinated to the states received 12.6 % (Source: Federal Ministry of Finance, 2000).

[3] In 1998 only about 10.8 % of the states' revenues was obtained from state taxes (Source: Federal Ministry of Finance, 2000).

[4] The figure refers to the incoming transfers to the ten West German states in terms of their consolidated GDP. To simplify comparisons GDP is used instead of state income.

is about the same order of magnitude as the figure for federal grants to U.S.states.[5] As compared to the average level of the fiscal equalization flows, their responsiveness to differences in income could, however, be much stronger. In terms of revenue, the implied marginal contribution rates to the fiscal equalization system are between 60 % and 100 % (Huber and Lichtblau, 1998). In other words, if a state receives one additional dollar of tax revenue its net-transfer obligation rises strongly between 60 and almost 100 cents. While the fiscal equalization system primarily provides risk sharing for the state bugdets (von Hagen and Hepp, 2000), it might also provide substantial smoothing of state income shocks, depending on how closely revenues are related to income.

4 Data

The empirical analysis employs annual data for the ten West German States (Länder) in the period from 1970 until 1997. The focus is on the cross-sectional distribution of innovations to state income per capita. The analysis distinguishes the three elements of the fiscal equalization system, i.e. VAT redistribution, horizontal interstate transfers, and federal grants. In addition to the system of fiscal equalization, federal tax receipts are taken into account. Here, the analysis distinguishes two components. Federal tax receipts include explicit federal taxes, mainly the petroleum tax and the Solidarity-levy, a surtax on income taxes introduced after unification. In 1990 federal taxes raised in the ten West German states amount to 3 % of GDP, and this figure rises to more than 4 % in 1997. A second component of federal tax receipts is the federal share in the revenues from income and business taxation, which total 4.7 % of GDP in 1990.

Besides fiscal flows documented in the state and federal budgets, the analysis accounts for social security systems, namely the unemployment insurance and the mandatory pension system. The unemployment insurance is a federal institution with uniform rules determining contributions and benefit levels across states. As compared to the U.S. its budget is rather large, with contributions summing to 1.67 % and benefits to 2.14 % of GDP in 1990. The difference between unemployment contributions and benefits reflects income transfers to long-term unemployed financed by the federal budget.

As it is a federal institution financed by uniform contribution rates among states also the mandatory pension system is included. However, the interpretation in terms of risk sharing bears some problems. There will be an immediate smoothing effect on state income if local contributions to the mandatory pension system vary with the regional level of economic activity whereas pensions stay constant. Yet, this type of risk sharing does not require the existence of a mandatory pension system, as a similar type of risk sharing results from the integration of capital markets (Atkeson and Bayoumi, 1993). Moreover, a reduction in current contributions will cause a reduction of future payments, therefore, the apparent insurance effect is only temporary. Nevertheless, permanent smoothing is provided since pensions are adjusted on the basis of national rather than

[5] Sørensen and Yosha (1999:163) report a figure of 2.6 for 1981-1990.

regional wage growth. The significance of this effect is, however, difficult to assess especially since the German system of labor relations seems to provide this specific type of insurance anyway by equalizing wages across regions (Burda and Mertens, 1995). The pension system shows the largest volume of all flows considered with benefits amounting to 8.16 % of GDP in 1990. As in the case of unemployment insurance the contributions are lower (7.47 % of GDP in 1990) due to subsidies from the federal level.

5 Results

As in Asdrubali et al. (1996) and Sørensen and Yosha (1999), for each of the components a separate regression is carried out, corresponding to equation (1). Formally, if $C_{i,j,t}$ denotes the net contribution of a state to the federation related to the component j, the difference in the growth rates of state income and state disposable income is computed as $\Delta \log Y_{i,t} - \Delta \log (Y_{i,t} - C_{i,j,t})$ and regressed on $\Delta \log Y_{i,t}$ allowing for time-specific effects. Estimation 1 in Table 1 shows the results obtained by taking into account differences in the residual variance of the states (i.e. after controlling for groupwise heteroscedasticity as suggested by Asdrubali et al., 1996). The results suggest that all components of the federal tax and transfer system including social security removed about 14.9 % of the short-run differences in the states' income, which surprisingly close matches the finding of Sørensen and Yosha (1999) for the U.S.

[Table 1 about here.]

Almost half of this effect is due to the system of fiscal equalization. The large variance reduction by the horizontal transfers is indicating that despite their modest overall size the horizontal equalization flows are quite effective in smoothing state income. However, other parts of the equalization system show weaker effects. Besides fiscal equalization, the federal share of income taxes and federal taxes show no significant effects. A stronger effect is found for the mandatory pension system and also the unemployment insurance has significantly smoothed income.[6]

The estimate of the variance reduction is obtained under the assumption that the tax and transfer system reacts to income differences within a period of one year. This constitutes a strong restriction, since fiscal flows may respond with a lag to shocks in income. Table 1 also shows the results for income shocks defined over alternative interval lengths as suggested by Asdrubali et al. (1996).[7] Note that the number of observations declines strongly with the interval length as periods are defined without overlap.

[6]Focusing on the smoothing of gross labor income by the unemployment insurance Kurz (2000) finds an effect of about 7.7 %.

[7]Formally, innovations to state income over a period length of k are defined by

$$\log Y_{i,t} - \log Y_{i,t-k}, \quad t = k+1,\ 2k+1,\ \ldots mk+1, \quad \text{with:} \quad m \leq \frac{n-1}{k}.$$

The joint smoothing effect of the three components of the fiscal equalization system is more or less independent of the choice of the interval length. However, the overall smoothing effect shows an increase if shocks are defined over longer intervals and reaches a figure of 25.3 % for state income shocks defined over a four year interval. This increase is mainly attributable to the unemployment insurance, which might be suprising at first sight, since unemployment benefits are typically paid only for a limited period of unemployment. But, even labor markets with persistently high unemployment rates might show considerable turnover, and, therefore, the number of benefit recipients is not necessarily declining over time. Also note that benefits include income transfers to the long-term unemployed. If, in addition, migration out of depressed regions and into booming regions is selective in the sense that workers with high risk of unemployment remain in the depressed areas, the increase in the smoothing effect of the unemployment insurance over time at least does not seem counterintuitive.

6 Summary

In summary, intergovernmental grants related to the German fiscal equalization system have reduced the cross-sectional variance of annual income in the West German states in the last three decades by about 6.8 %, a figure which is robust against variations in the interval length definining income shocks. Compared to a figure of 4.5 % for federal grants in the U.S. (Sørensen and Yosha, 1999: 162) this indicates that grants do in fact provide more income smoothing in Germany than in the U.S.

Federal tax receipts in Germany, however, do not provide any significant income shock absorption in Germany as they do in the U.S. In addition, there are no direct transfers from the federal level to individuals in the German system which play an important role in U.S. federal income insurance. However, this role is taken by the German unemployment insurance, which shows a stronger smoothing effect than its U.S. counterpart. Thus, including the unemployment insurance and the mandatory pension system the overall variance reduction is at the same level as in the U.S.

The overall smoothing effect is stronger for income shocks defined over a longer time period, but it remains well below the range of 34-42 % obtained in a simulation study of Pisani-Ferry et al. (1993). Generally, the results suggest that smoothing income shocks among states is not particularly strong in German fiscal federalism.

A Data sources and definitions

Income: State income is taken from national account data for the individual states which explicitly account for interstate income flows (net social product). As income is reported at factor prices federal non-personal taxes are added, which includes VAT and federal taxes. Net social product is published by the Arbeitskreis Volkswirtschaftliche Gesamtrechnungen. Population is defined as yearly average population obtained from

the German statistical yearbook, various issues. As no corresponding price series is available at state level, the aggregate GDP deflator is used.

Horizontal equalization: Transfers between states are obtained from the Finance Report (Finanzbericht) published annually by the Federal Ministry of Finance (Bundesministerium der Finanzen).

Value added tax (VAT): The reported VAT revenues of the states before redistribution are not reliable indicators of the states' contributions as states with a large share of trade typically report large VAT revenues. Therefore, the total VAT revenues are allocated among the states according to their income share. Redistribution of VAT revenues among states is taken from the revenue statistics. For the years 1991-1998 the states' unification contributions (Fonds Deutsche Einheit) are included in the federal share. Source: German statistical yearbook, various issues, and own computations.

Federal share of income tax: Federal share of personal and corporate income tax revenues after reallocation (Zerlegung) according to the residence principle. Source: German statistical yearbook, various issues, and own computations.

Federal share of business tax: For the years 1991-1998 the federal share includes unification contributions. Source: German statistical yearbook, various issues, and Institut Finanzen und Steuern: "Entwicklung der Realsteuerhebesätze", 1999.

Federal taxes: Taxes levied by the central government, mainly consisting of specific sales taxes. As in the case of the VAT, the reported revenues are not reliable indicators of the states' contributions. Therefore, with the exception of the Solidarity-levy the revenues from federal taxes are assigned to the states according to their income share. Solidarity-levy revenues are assigned to the states according to their shares in the personal income tax. Source: German statistical yearbook, various issues, and own computations.

Federal transfers: Transfers from the central budget to the states obtained from the Finance Report (see above). Specific grants allocated to Saarland and Bremen for debt reduction starting in 1994 as well as correction payments to Nordrhein-Westfalen and Bremen in 1991 and 1992 are excluded.

Unemployment insurance: Contributions are taken from the Arbeits- und Sozialstatistik, Hauptergebnisse, various issues, published by the Federal Ministry of Labor (Bundesministerium für Arbeit). The total contributions are assigned to the states according to their shares in the payroll tax revenues. Annual payments of the unemployment insurance (Arbeitslosengeld) as well as benefits to long-term unemployed (Arbeitslosenhilfe) are allocated according to the states' unemployment shares, all other expenses of the federal employment service are allocated according to the population shares. The states' level of unemployment is taken from the Amtliche Nachrichten of the Federal Employment Service (Bundesanstalt für Arbeit), various issues.

Mandatory pension system: Annual contributions are taken from the Arbeits- und Sozialstatistik, Hauptergebnisse. Total contributions are assigned to the states according to their share in the payroll tax revenues. The aggregate annual pension payments are allocated using the states' shares of pensioners. Whereas this neglects interregional differences in the previous earnings of the pensioners, it is consistent with the fact that in the German system pensions are adjusted using the national wage growth. The number of pensioners by state is obtained from annual census data (Mikrozensus) published in the Series FS 1, R 1.4.4 of the Federal Statistical Office (Statistisches Bundesamt). Missing values for 1983 and 1984 are calculated by linear interpolation.

B References

Asdrubali, P., Sørensen, B. E., and O. Yosha, 1996, Channels of interstate risk sharing: United States 1963-1990, The Quarterly Journal of Economics 111, 1081-1110.

Atkeson, A. and T. Bayoumi, 1993, Do private capital markets insure regional risk? Evidence from the United States and Europe, Open Economies Review 4, 303-324.

Bayoumi, T. and B. Eichengreen, 1993, Shocking aspects of European monetary integration, in: F. Torres, ed., Adjustment and growth in the European Monetary Union (Cambridge University Press, Cambridge, MA) 193-229.

Burda, M. and A. Mertens, 1995, Locational competition versus cooperation in labour markets: an implicit contract reinterpretation, in: H. Siebert, ed., Locational competition in the world economy (Mohr, Tübingen) 71-107.

EC Commission, 1977, Report of the study group on the role of public finance in European integration, Economic and Financial Series A13, (Commission of the European Communities, Brussels).

Goodhart, C. A. E. and S. Smith, 1993, Stabilization, European Economy 5, 417-455.

Huber, B. and K. Lichtblau, 1998, Konfiskatorischer Finanzausgleich verlangt eine Reform, Wirtschaftsdienst 1998, 142-147.

Kurz, C., 2000, Regional risk sharing and redistribution by the unemployment insurance system: the case of Germany, Working Paper 156 (European-Univ. Viadrina, Frankfurt Oder).

Mélitz, J. and F. Zumer, 2000, Regional redistribution and stabilization by the centre in Canada, France, the United Kingdom and the United States: A reassessment and new tests (CREST-INSEE, Paris).

Pisani-Ferry, J., Italianer, A., and R. Lescure, 1993, Stabilization properties of budgetary systems: a simulation analysis, European Economy 5, 511-538.

Sala-I-Martin, X. and J. Sachs, 1992, Fiscal federalism and optimum currency areas: evidence for Europe from the United States, in: M. B. Canzoneri, ed., Establishing a central bank, (Cambridge University Press, Cambridge, MA) 195-219.

Sørensen, B. E. and O. Yosha, 1999, Federal insurance of U.S. states: an empirical investigation, in: A. Razin and E. Sadka, eds., The economics of globalization: policy perspectives from public economics (Cambridge University Press, Cambridge, MA) 156-170.

Spahn, P. B. and W. Föttinger, 1997, Germany, in: T. Ter-Minassian, ed., Fiscal federalism in theory and practive (IMF, Washington) 226-248.

von Hagen, J, 1992, Fiscal arrangements in a monetary union: evidence from the US, in: D. E. Fair, and C. de Boissieu, eds., Fiscal policy, taxation and the financial system in an increasingly integrated Europe (Kluwer, Dordrecht) 337-359.

von Hagen, J, 2000, Fiscal policy and intranational risk sharing, in: G. D. Hess and E. van Wincoop, eds., Intranational macroeconomics (Cambridge University Press, Cambridge, MA) 272-294.

von Hagen, J. and R. Hepp, 2000, Regional risksharing and redistribution in the German federation, Working Paper B-15 (ZEI, Bonn).

Wurzel, E, 1999, Towards more efficient governments: reforming federal fiscal relations in Germany, Working Paper 209 (OECD, Paris).

Table 1: Income smoothing by federal institutions in Germany

Estimation	1	2	3	4	5
Period:	70-97	73-97	73-97	77-97	77-97
Observations:	270	130	90	60	50
Horiz. fiscal equalization	.033	.029	.027	.022	.025
	(4.79)	(3.60)	(3.52)	(2.27)	(2.81)
VAT revenues	.028	.028	.033	.028	.024
	(5.70)	(7.61)	(5.20)	(6.02)	(4.85)
Federal grants	.006	.009	.005	.008	.016
	(1.98)	(2.06)	(1.22)	(1.81)	(2.88)
Sum: fiscal equalization system	.068	.066	.066	.058	.065
Federal share inc. & bus. tax	-.010	-.015	-.018	-.017	-.017
	(0.90)	(1.48)	(1.76)	(1.86)	(2.10)
Federal taxes	-.001	.000	-.000	-.000	-.001
	(0.79)	(0.17)	(0.39)	(0.04)	(0.94)
Unemployment insurance	.049	.088	.098	.136	.108
	(3.23)	(3.35)	(3.18)	(4.66)	(3.00)
Mandatory pension system	.043	.048	.060	.076	.057
	(2.85)	(2.62)	(3.19)	(3.99)	(3.31)
Sum: all components	.149	.187	.205	.253	.211

Estimates of the share of state income innovations smoothed by the considered federal institution, as determined by β in a regression $\Delta \log Y_{i,t} - \Delta \log \widetilde{Y}_{i,t} = \alpha_t + \beta \Delta \log Y_{i,t} + u_{i,t}$, where $\Delta Y_{i,t}$ denotes changes in state income and $\Delta \widetilde{Y}_{i,t}$ denotes changes in state *disposable* income. The latter takes account of the state's contributions and receipts related to the respective federal institution. Weighted least squares estimates using pooled data for 10 West German states in the period 1970-1997, absolute value of t-statistics in parentheses. The columns display results for alternative interval lengths in the definition of income changes.