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

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January 2009

Preliminary and Incomplete. Please Do Not Cite.

Abstract

We provide empirical estimates of the risk-sharing and redistributive properties of fiscal equalization among the states of the German federation. Fiscal equalization serves the dual role of insuring regional income against asymmetric revenue shocks (i.e., short-run income differences), and decreasing long-run differences by redistributing tax revenues among states. In our empirical study, we evaluate the performance of the German fiscal system between 1970 and 2006. We find that tax revenue sharing and the fiscal equalization mechanism (*Länderfinanzausgleich*) together lead to a redistribution of 36.9 percent of state income, with a contribution of 5.5 percent by the *Länderfinanzausgleich*, for the period 1970 to 1994. After the full integration of East German states into the mechanism in 1995, redistributive effects drop to about 35 percent. The contribution of the *Länderfinanzausgleich* increases significantly – to 14 percent – for this period. With respect to the insurance effect of the German fiscal system, our results indicate that this effect has dramatically increased after the inclusion of the East German states (from 41.6 percent for 1970 to 1994 to 73.6 percent for 1995 to 2006), however, with the contribution of the *Länderfinanzausgleich* decreasing from 11.8 percent to 2.5 percent.

- *Keywords*: Regional Risk-sharing, Fiscal Federalism, Monetary Union
- *JEL Codes*: H77, E63, F42

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1 Introduction

In a world with imperfect capital markets, fiscal arrangements for risk sharing and redistribution of income across different regions of a country or across the states forming a federation can play an important role for consumption smoothing. Such arrangements have received considerable interest in recent years in the contexts of designing the fiscal framework of the European Monetary Union and the design of new federal systems in developing countries. One branch of this literature considers the role of such arrangements for consumption risk-sharing among consumers living in different regions of a country or federation who are exposed to region-specific shocks (Atkeson and Bayoumi, 1993; Wildasin, 1995; Persson and Tabellini, 1996a, 1996b; Bucovetsky 1998; Lockwood, 1999, Boadway, 2004). The empirical work following this approach has focused on comparing the amount of consumption-risk sharing provided by the fiscal system to that of factor markets and financial markets. The other branch of the literature starts with Mundell's (1961) analysis of optimum currency areas and argues that, in a world of sticky wages and prices, fiscal arrangements among regions or states sharing the same currency can stabilize regional aggregate demand and employment by redistributing income between regions affected by asymmetric cyclical shocks (European Commission, 1977a, 1977b; Sachs and Sala-i-Martin, 1992; von Hagen, 1992; Wyplosz, Goodhart and Smith, ; Bayoumi and Masson, ; Athanasoulis and van Wincoop, 1998). This is nicely summarized by the former president of the European Commission, Jacques Delors (see Delors, 1989 p.89), in the blueprint for the European Economic and Monetary Union:

> "... 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."

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 developments. Most of this literature has analyzed the US fiscal system. Sachs and Sala-i-Martin (1992) estimate that the latter offsets between 33 and 40 percent of a region-specific shock and, thus, provides considerable stabilization. Subsequent studies, starting with von Hagen (1992); point out that it is important to distinguish between the (short-term) stabilization and (long-term) redistribution properties of federal fiscal systems. Their empirical results commonly suggest that the contribution of the US fiscal system to stabilizing regional income is smaller than what Sachs and Sala-i-Martin estimated, ranging between 10 and 30 percent, and that the redistributive effects are large.[3] Empirical studies for other countries, including Canada, France, Italy, report similar results.

This paper provides new evidence on the stabilization and redistributive properties of the federal fiscal system in Germany. Germany is a particularly interesting case in this context, because, like Canada and in contrast to the United States, it has an explicit, constitutional, and formula-based mechanism for revenue sharing among the states of the federation and the central government, *Länderfinanzausgleich (LFA)*. Yet, empirical evidence on the German federal fiscal system remains scant due to the intricacies of the rules of equalization, data problems and the structural breaks connected with German unification in the early 1990s.

This paper focuses specifically on the properties of fiscal equalization. This is in contrast to earlier studies that have looked at the aggregate redistribution and stailization effects of the entire fiscal system, i.e., including federal social insurance programs and taxes. The paper makes three contributions to the literature. First, it provides an analysis of the stabilization and redistributive

[3] See Goodhart and Smith, 1993; Bayoumi and Masson, 1995; Mélitz and Zumer, 1998, 2002, van Wincoop) von Hagen () for a detailed review of this literature.

properties of all three stages of LFA. In contrast, Mélitz and Zumer (2002) only consider the overall impact of the system. Second, our analysis covers the pre-unification period, during which only the 11 West German states participated in the system, and the post-unification period, which extended LFA to the five East German states. It thus provides evidence for the effects of unification on the German fiscal system. In contrast, Mélitz and Zumer (2002) and Büttner (2002) only consider the pre-unification period, while Kellermann (2001) uses data from the first seven years following unification, but with a different methodology, and Juessen (2006) looks only at the post-unification period. Third, while the extant literature has focused on the stabilization and redistributive properties of federal fiscal systems with regard to regional or state income, we also analyze the characteristics of the German system with regard to state fiscal revenues.

Our main results can be summarized as follows. First, German fiscal equalization provides very little redistribution of income between states and stabilizes only a very small fraction of real income shocks across states. Second, German fiscal equalization serves primarily as a tool to insure state governments against shocks to their tax revenues. It also serves to redistribute tax revenues among the states. The redistributive function, however, is reduced by federal government interventions in the form of special grants. Third, German unification has dramatically changed the functioning of the system in both dimensions. This may reflect the unwillingness of the Western states to share the fiscal consequences of unification with the federal government.

The rest of this paper proceeds as follows. In section 2, we briefly review the relevant literature. German fiscal system. Section 3 provides a detailed description of the fiscal equalization mechanism in Germany. In section 4, we present the empirical methodology and our main empirical results. Section 4 concludes.

2 Literature on the German fiscal system

While the fiscal system in the United States has been studied extensively, there are only a few studies that consider interregional risk-sharing and redistribution for Germany. The first such study was conducted by Pisani-Ferry et al (1993). They calibrate a two-sector simulation model for the United States, Germany, and France. For Germany, they find that the fiscal system stabilizes between 34 and 42 percent of asymmetric shocks affecting individual state. Buettner (1999, 2002) focuses on the stabilization properties of the German fiscal system for the West German states from 1970 to 1997. In addition to fiscal transfers mandated by the fiscal equalization system, his study considers income smoothing through federal taxes and contributions to and transfers from the mandatory pension system and the federal unemployment insurance. Using the methodology suggested by Asdrubali et al (1996), Buettner (2002) finds that the German fiscal system smoothes only around 15 percent of a shock to state income. The *Länderfinanzausgleich* contributes roughly 6.8 percent of this income smoothing.[4] Kellermann (2001) looks at German data from the same time period. However, she distinguishes between pre- and post-unification data. The sample from 1970 to 1990 ("*pre*-unification") includes only the 10 states of the former West Germany; the sample from 1992 to 1997 ("*post*-unification") includes all 16 states of the unified Germany. Based on the same methodology as Buettner (1999, 2002) as well as on the methodology proposed by Bayoumi and Masson (1995) for the pre-unification data, she finds that public transfers smooth over 40 percent of

[4]Of the remainder, about 5 percent of income smoothing comes from the federal unemployment insurance, and around 4.3 percent from the federal mandatory pension system. In a paper that focuses on the risk sharing properties of Germany's federal unemployment insurance with respect to regional labor income, Kurz's (2000) empirical investigation leads to a very similar result. In her study, about 8 percent of a shock to regional labor income is smoothed by the federal unemployment insurance. Additionally, she finds that unemployment insurance has only a small effect on long-term redistribution of regional labor incomes.

shocks to state income. In addition, private capital markets smooth out about 30 percent of state GDP volatility. In the post-unification data, the role of private capital markets in income smoothing is drastically reduced (to 7 and 1 percent, respectively). The results for the income smoothing effect of public transfers depend heavily on the estimation method used: They are 38 and 16 percent, respectively. In a more recent study, Juessen (2006) investigates both risk sharing and redistribution in post-reunification Germany. His data set is very disaggregated and comprised of 271 labor market regions. To study risk-sharing, the author uses a modified version of the methodology proposed by Asdrubali et al (1996). Looking at data for the years 1995 to 2002, the study has two main empirical findings. First, estimation of risk-sharing properties by using ordinary least squares (OLS) as well as a non-parametric density estimation suggest that private capital markets provide almost full insurance against region-specific income shocks, with the German fiscal system providing no additional insurance. The study's OLS results even seem to suggest that the fiscal system has a destabilizing effect on regional incomes. Second, estimating the redistributive properties of the German fiscal system using a distribution dynamics approach, the fiscal system turns out to be very effective in decreasing long-term differences in regional incomes leading to convergence of regional incomes towards the national average. Juessen's data, however, cannot identify the effects of fiscal equalization.

3 The Fiscal Equalization Mechanism in Germany

Deriving from principles laid out in the German constitution, the main goal of fiscal equalization in Germany is to *"create and secure uniform living standards throughout Germany"*.[5] The main element of the German fiscal system for this purpose and the focus of our study is the *Länderfinanzausgleich*, an arrangement for redistributing tax revenues among the federal, state, and local governments of Germany. The original constitution of West Germany in 1949 assigned all taxes of unambiguous local incidence to the states, among them personal and corporate income taxes and business taxes, and all other taxes to the federal government. Apart from some minor taxes, this left the federal government with sales tax revenues, which were later replaced by a value-added tax (VAT). In order to secure the federal government with a sufficient revenue base, it initially received a third of personal and corporate income tax revenue (with its share eventually climbing to 35 percent by 1969). Thus, the revenues from personal income tax, corporate income tax, and value-added tax (VAT) are shared among the federal government and the states. These taxes are therefore called *Gemeinschaftsteuern* (shared taxes).

The fiscal constitution act (*Finanzverfassungsgesetz*) of 23 December 1955 instituted a "horizontal" tax revenue sharing arrangement among the states covering revenues from all state taxes plus half of the local taxes collected by municipalities. From 1956 onwards, it guaranteed every state a minimum of 88.75 percent of the federal average per capita revenue from this tax base. By 1959, this minimum had been increased to 91 percent. In 1967, the federal government started paying supplementary transfers (*Bundesergänzungszuweisungen*) to states with low tax capacities.

Länderfinanzausgleich was reformed in 1969, assigning half of the revenue from corporate income tax, 42.5 percent of the revenue from personal income tax, and 70 percent of the revenue from VAT to the federal government. The horizontal tax revenue sharing arrangement guaranteed each state now a minimum of 95 percent of federal average per capita revenues from all taxes included in the arrangement, i.e., all state taxes and half of the revenue from local taxes. Over the next two decades, the federal share of personal and corporate income tax remained virtually unchanged, but the federal share of VAT was adjusted numerous times, fluctuating between 70 and 65 percent between 1970 and 1990. After the reunification in 1990, the VAT share was reduced to 63 percent by 1994. From

[5]See Artikel 72, Paragraph 2, Absatz 3, and Artikel 106, Paragraph 3, Absatz 2, of the German *Grundgesetz* (constitution).

1991 to 2004, the federal government, the West German state governments including West Berlin, and the West German local governments also contributed to the unification fund ("Fonds Deutsche Einheit") to finance infrastructure projects in East Germany. In 1995, the German fiscal system was reformed again to integrate the states of former East Germany fully into LFA. This entailed a significant change in the formula for distributing VAT income. The federal share of VAT revenue dropped from 63 percent (1994) to 56 percent (1995), and then to 50.5 percent (1996,1997), with the respective remainder going to the state governments. Since 1998, local governments also receive a share of around two percent of VAT revenue, which is taken from the states' share. In more recent years, the federal share has stabilized at around 53 percent and the state government share at around 45 percent.

LFA is a three stage process. At the first stage, the states' share of total national VAT revenue is redistributed among all states in the following manner: 75% of it is distributed among the states on an equal per-capita basis, which already implies redistribution since per-capita incidence of VAT revenue differs significantly from state to state. The remaining 25 percent are used to make payments to states with per capita revenues from all state taxes of less than 92% of the federal average. If the amount available for redistribution is not high enough, transfers are cut accordingly. If the amount available is more than what is needed, the remainder is distributed among the financially strong states on a per-capita basis.

At the second stage, tax capacities and resource needs are calculated for all states. Tax capacity is determined by the sum of state tax revenues[6] and 50 percent of the local taxes collected on a state's territory. Resource needs are calculated as the average per capita tax revenues in Germany multiplied by the population of the respective state.[7] The difference between tax capacity and resource needs determines whether a state pays or receives additional transfers under the LFA ("horizontal" transfer payments between states). Financially weak states receive payments which lift them to at least 92 percent of federal average per capita tax revenues. If a state's revenues are between 92 and 100 percent of the federal per capita average, it receives transfers that amount to 37.5 percent of that difference. If a state's tax revenues are above 102 percent of the national average, it pays a contribution to LFA. For per capita revenues between 102 and 110 percent of the federal average, the contribution is equal to 70 percent of the difference, for per capita revenues above 110 percent of the federal average, the contribution is 100 percent of the difference between the state's revenues and the federal average. As a result, the differences in per capita tax revenues among the states after redistribution are reduced and range between 95 percent and 104.4 percent of the federal average.

At the third stage, payments from the federal government to the states are made to further reduce the differences in per capita tax revenues. These supplementary transfers 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.

When the LFA was reformed again in 1995 to integrate the new East German states, the fiscal equalization mechanism was modified as follows: For per capita revenues between 100 and 101 percent of the federal average the contribution is now 15 percent of the difference, for per capita revenues between 101 and 110 percent of the federal average, it is 66 percent of the difference, for per capita revenues above 110 per cent of the federal average, it is 80 percent of the difference. Contributing states must be left with at least 95 percent of the average per capita revenues after redistribution. Together with the supplementary payments, all states have at least 99.5 percent of the average per capita revenues.

[6]This sum now includes the VAT revenue assigned to a state in the first stage.

[7]At this stage, the special financial needs of the city states Hamburg and Bremen (and later Berlin) are recognized by attributing them with larger than actual populations.

4 Empirical Methodology and Results

4.1 Methodology

We use the framework of Mélitz and Zumer (2002) to estimate the stabilization and redistribution properties of the German *Länderfinanzausgleich*. Their proposed framework takes the following form:

$$Y_{i,t} = \alpha_d + \beta_d X_i + \beta_s (X_{i,t} - X_i) + \varepsilon_{i,t}; \qquad i = 1,\dots,M; t = 1,\dots,T \quad (1)$$

where X_{it} is the ratio of per capita state income in state *i* at time *t* to the national average of per capita state incomes at time *t*. X_i is the sample period average, $Y_{i,t}$ is the ratio of per capita *disposable* state income in state *i* at time *t* to its national average. For our purposes, X_{it} refers to state income before and Y_{it} to state income after the application of fiscal equalization. Equation (1) postulates two influences on (relative) disposable state income Y_{it}. First, the coefficient β_d describes the effect of a change in the (relative) long-run average state income on the (relative) long-run average disposable state income. Hence, a coefficient of β_d=1 implies no redistribution at all, while β_d =0 implies "full redistribution". Second, the coefficient β_s relates deviations of (relative) state income at time *t* from the (relative) long-run average state income to deviations of (relative) disposable state income from its (relative) long-run average and describes the insurance aspect of the federal fiscal system. Again, (1-β_s) indicates the degree of stabilization provided by the fiscal system.
Melitz and Zumer decompose equation (1) into two parts to illustrate this point:

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

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

where η_i and μ_{it} are new disturbance terms, and Y_i is the sample period average for state *i* of Y_{it}. We use panel data analysis and estimate equations (2) and (3) using four different definitions of disposable state income variable which are described in more detail below.

4.2 Data

In this section, we provide a more detailed description of the variables used in the panel data analysis to estimate the amount of risk sharing and redistribution of tax revenues provided by the German *Länderfinanzausgleich*. We construct two different data sets: The first consists of annual data of the 10 West German states (excluding West-Berlin) from 1970 to 1994. We choose the year 1994 – rather than the year of the German reunification, 1990 – as the cut-off year, because the five East German states were only included in the *Länderfinanzausgleich* starting in 1995; the second data set contains annual data of all 16 German states covering the period from 1995 to 2006. Both panel data sets are balanced.
We follow the previous literature and construct the variable *state income* by adding net national income at factor prices and all tax revenues with incidence in the state. These tax revenues include all federal (*Bundessteuern*), state (*Landessteuern*), and local taxes (*Gemeindesteuern*), plus taxes shared between all three levels of government (*Gemeinschaftsteuern*).
Since the fiscal equalization mechanism proceeds in several steps, we use four different variations of the explanatory variable representing *disposable state income*. The first variation includes state

income as defined above minus all federal taxes, minus the federal share of the shared taxes, minus the federal share of the local business tax (*Gewerbesteuerumlage*). Hence, this variable is the sum of net national income at factor prices plus all state and local taxes that remain with either the state or the state's local governments. The law on the German *Länderfinanzausgleich* governs the next two steps in the redistribution of tax revenue. In a first step, VAT is redistributed: Hence, the second variation of disposable state income includes the VAT transfer (+) or payment (–) of a state. The VAT transfer/payment is the difference between the combined state and local share of VAT by tax incidence and the VAT revenue assigned to a state by the *Länderfinanzausgleich* described in section 2. In the second step of the *Länderfinanzausgleich*, states make transfer payments amongst each other: These state-to-state ("horizontal") transfers/payments based on resource needs and tax capacity are now also included into the third variation of disposable state income.[8] Finally, the forth variation of disposable income additionally includes any additional federal grants paid to a state (*Bundesergänzungszuweisungen*).
For the period 1970-1994, we used national accounting data provided to us by the (StatLABW1998). Data on tax revenues before and after redistribution come from publications of the German federal statistical office (StatBA1977; StatBA1989; StatBA2000). Very detailed tax data on the local, state, and federal level for the years 1991 to 1994 was provided by the Statistical Office of Baden-Württemberg. Data on VAT redistribution and state-to-state transfers is provided in the annual publications of the Bundesrat (Bundesrat). All nominal variables for this sample period are deflated with the West German GDP deflator with base year 1991.
For the period 1995-2006, we used national accounting data provided online by the German federal and state statistical offices (StatLABW2008) which was computed using a standardized European Union methodology (ESVG1995). Very detailed tax data on the local, state, and federal level for the years 1995 to 2002 was provided by the Statistical Office of Baden-Württemberg, data for the years 2003 to 2006 was available online from the German Federal Statistical Office (StatBW). Data on VAT redistribution and state-to-state transfers is published annually by the German Bundesrat (Bundesrat). Given the detailed data, we were able to construct GDP deflators for the individual states (also with base year 1991) for the data from the year 1995 to 2006. Hence, the nominal variables for this time period were deflated by these state-specific GDP deflators. With population data from the national accounts, we then converted all variables into real per capita terms.

4.3 Descriptive Statistics

Table 1 reports some basic statistics for the sample period 1970 to 1994. All data are expressed in constant 1991 Euros.[9] This table contains only data for the West German states. In 1970, real GDP per capita among the 10 West German states ranged from 82 to 171 percent of the average real GDP per capita, with the standard deviation amounting to around 16 percent of average real GDP per capita. Over the next two and a half decades, this range somewhat narrowed with per capita real incomes between 83 and 167 percent of the average. The standard deviation from the average remained virtually unchanged with 15 percent of average per capita real GDP. It is noteworthy that per capita VAT transfer and state-to-state transfer receipts do not seem to have changed significantly as a percentage of average GDP over time. State-to-state transfer payments have even fallen in both

[8]See section 3 for a more detailed description of this mechanism.
[9]The Euro was only introduced in 1999 (as an accounting unit), but we converted the Deutsche Mark values in the early sample period to Euros to make a comparison across the two sample periods possible. Data from the national accounts for the two time periods are not comparable, however, because different accounting methods were used.

absolute value and as a percentage of GDP. However, federal transfers have noticeably gone up (in both absolute value and as a percentage of GDP), particularly in 1994.[10]

[Table 1 about here]

In Table 2, we report these same basic statistics for the data set from 1995 to 2006, when all 16 states of the re-unified Germany were included in the *Länderfinanzausgleich*. Looking at per capita real GDP, the gap between the poorest and richest states appears to be narrowing over time. Not unexpectedly, transfer payments – especially from VAT revenue – have increased significantly compared to the earlier time period. Hence, the inclusion of the much poorer states of East Germany led to the expected response of the fiscal equalization mechanism.

[Table 2 about here]

In the analysis below, we focus on two questions: How much insurance against asymmetric shocks and how much redistribution does the German fiscal system provide? While there are no payments directly to individuals in response to income shocks, transfers under the *Länderfinanzausgleich* might still respond to asymmetric shocks (by insuring state income) and, thus, provide insurance against such shocks to the entire state.

4.4 Redistribution of Income

We estimate the redistributive properties of the German fiscal system with cross-section equation (2), where $(1-\beta_d)$ corresponds to the degree of redistribution that the system provides. The results are presented in table 5. For the time period from 1970 to 1994, we find that the degree of redistribution of the fiscal system ranges from about 31.2% to 36.9%, depending on which elements of the system are included. This result is lower than von Hagen's (1992) result for the US fiscal system of 47 %, but in the same range as Melitz and Zumer's (2002) and Bayoumi and Masson's (1995) results for France and Canada, respectively. The contribution of the *Länderfinanzausgleich* itself is around 5.7%, with the most important component of it being the redistribution of VAT revenue with a contribution of 4.3% followed by the horizontal transfer payments between states with about 1.1%. Federal grants (*Bundesergänzungszuweisungen*) play no significant role here.[11]
Since the *Länderfinanzausgleich* was extended to include the new East German states in 1995 (five years after the German reunification), we estimate the time period 1995 to 2006 in a separate regression. To the best of our knowledge, the only study looking at this time period is Juessen2006, but his focus are regional labor markets instead of states; and he does not provide any point estimates for the redistributive properties of the German fiscal system. In our study, we find that the degree of redistribution ranges from 21% to 35%, implying slightly decreased redistributive effectiveness overall, but a significantly increased contribution of the *Länderfinanzausgleich* itself with about 14%. Given the greater income disparities amongst German states when the new states of the former East Germany are included, this result confirms the redistributive efficacy of the fiscal system and of the *Länderfinanzausgleich* in particular. As before, of the components of the *Länderfinanzausgleich*, the contribution of VAT redistribution is largest (about 9.7%), this time followed by federal grants (about 2.7%). Horizontal transfer payments contribute only about 1.6%. However, one issue to be kept in mind here is that between 1991 and 2004, the West German states were also making indirect

[10]Also, during this time period, Hessen and Bavaria were the only states that changed their positions from large net recipients to large net contributors to the system. The position of the remaining states did not change importantly.
[11]These results are robust to using shorter sample periods. Results are available upon request.

transfer payments to East Germany by contributing to the *Fonds Deutsche Einheit* (German Reunification Fund). The *Fonds Deutsche Einheit* by definition served a redistributive function, but we are not aware of the existence of state-specific data for the recipient states to be able to estimate the effects of these transfer payments.

To summarize, the German fiscal system is quite effective in achieving its main goal of creating comparable living standards throughout Germany. And, as we would expect, the system seems to be more effective the less equal the income distribution among states is, exemplified by the difference in results for pre- and post-reunification data.

[Table 5 about here]

4.5 Stabilization of Income

Now we turn to estimating equation (3) where $(1-\beta_s)$ corresponds to the degree of stabilization that the German fiscal system provides. Our results are presented in table 6. We show that in the period 1970 to 1994, the degree of stabilization ranges between 29.8% and 41.6%. This result is in line with Kellermann (2001). The contribution of the *Länderfinanzausgleich* itself is of around 11.8%, which is about twice as high as the estimate of Buettner (2002). The difference is likely a result of the fact that we use actual transfer amounts of VAT, rather than approximations as Buettner (2002) does. In our study, the redistribution of VAT revenue contributes about 3.3% of stabilization; the horizontal transfer payments between states, however, contribute about 6.8%, the largest part. Federal grants to states play the smallest role with about 2.9%.

[Table 6 about here]

For the post-reunification period 1995 to 2006, the insurance properties of the fiscal system dramatically increase to a range of 71.1% to 73.6%. This result is in stark contrast to Juessen (2006), who finds an insignificant or even destabilizing role of the German fiscal system. The strong insurance effect of the fiscal system in our study is mainly due to the "automatic stabilizer" effect of taxation of the tax revenue sharing between the different levels of government. The contribution of the *Länderfinanzausgleich* is fairly small, declining to about 2.5%: Of that, VAT distribution contributes about 0.4%, horizontal transfer payments about 0.5%, and federal grants about 1.6%. But this is to be expected since the primary and explicitly stated purpose of the *Länderfinanzausgleich* is long-term redistribution rather than short-term stabilization.

4.6. Redistribution of State Tax Revenues

In this section, we consider the properties of Germany's fiscal system in a different dimension. Rather asking to what extent it leads to a redistribution and insurance of per capita disposable incomes, we ask to what extent it serves to redistribute and insure per capita state government revenues. While the previous sections focus on the importance of fiscal equalization for consumers in 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 revenues.

Table 7 shows the results for redistribution of state revenues. Before 1995, almost 60 percent of all income differences were eliminated at the stage of sharing tax revenues. VAT redistribution added another 15 percent, state-to-state transfers three percent. Federal grants actually increased revenue inequality among the states.

From 1995 on, the relative importance of tax sharing and LFA changed dramatically. Tax sharing only eliminated 32.5 percent of income differences, while VAT redistribution adds 36.5 percent and state-to-state transfers five percent. Federal grants contribute virtually nothing to the redistribution

of revenues. Overall, the system has become slightly less redistributive than before the includion of the East German states.

4.7. Insurance of Tax Revenues

Table 8 shows our results for insurance against asymmetric state tax revenue shocks. Before unification, tax sharing absorbed 56 percent of all asymmetric shocks to state tax revenues. Subsequent stages of fiscal equalization added more insurance, and the system including federal grants provided perfect insurance against such shocks. After unification all asymmetric shocks are already absorbed at the level of tax sharing. Federal grants now weaken the insurance effect. In sum, fiscal equalization serves to perfectly insure states against asymmetric shocks to their tax revenues.

5 Conclusion

The theoretical literature shows that, apart from pure income redistribution, fiscal equalization can be motivated by considerations of regional risk sharing among consumers living in different states. Regional risk sharing may aim at insuring consumer incomes against asymmetric, region-specific shocks. Alternatively, regional risk-sharing may aim at insuring state budgets against asymmetric tax revenue shocks, enabling states to smooth the provision of local public goods over time.

Our empirical analysis explores the insurance and redistributive properties of the fiscal equalization mechanism in Germany, using data from 1970 to 2006, and hence covering pre- and post-reunification Germany. Fiscal equalization in Germany is a formula-based mechanism redistributing tax revenues between the states, augmented by vertical payments from the federal government to individual states. It is an outflow of the constitutional mandate to secure equal living conditions for all citizens in the country. To the best of our knowledge, our study is the first one analyzing both stabilization and redistributive properties of the fiscal system of pre-unification Germany. It is also the first study directly comparing the effectiveness of the German fiscal system pre- and post-reunification.

Comparing the period 1970-1994 to 1995-2006, we find that the fiscal system is effective in redistributing regional state income, and that this effectiveness has slightly increased in the post-reunification period. The fiscal equalization mechanism specifically designed for this purpose – the *Länderfinanzausgleich* – contributed about 5 and 14 percent, respectively, to the long-term smoothing of income differences between states. It therefore played and continues to play an important role in securing comparable living standards across Germany.

The fiscal system's second purpose as an insurance mechanism for disposable state income is also quite pronounced. The main component of the insurance mechanism is played by the tax-revenue sharing scheme between the different levels of government which acts as an "automatic stabilizer" for disposable state income. The overall fiscal system smoothes about 42 percent of short-term income differences before unification. After unification, this effect climbs to around 74%. Compared to studies of other developed countries, this estimate of the insurance effect is very high. However, given the volatility in the economic development of East Germany during this period, this result may not be too surprising.

We also consider the role of fiscal equalization as a mechanism to redistribute and insure state tax revenues. Here, we find that fiscal equalization in Germany is far more effective than with regard to state disposable income. Equalization largely eliminates per capita state revenues and perfectly insures state governments against asymmetric revenue shocks.

Conventional fiscal federalism interprets equalization as a mechanism to equalize and improve the welfare of consumers living in different regions of a federation. The fact that equalization in Germany is more effective in redistributing and insuring government revenues than disposable

incomes is surprising from this perspective. It may be a result of the fact that equalization is the result of negotiations and agreements among the state and the federal governments and that politicians are more interested in securing equal and safe budgets for themselves than for the citizens they represent.

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6 Tables

Table 1: Basic Statistics 1970-1994.

Year	Variable	Average	Std. Dev.	Maximum	Minimum
1970	**Gross Domestic Product**	12,942.27	2,043.55	10,673.85	22,174.13
	Net national income	10,177.25	1,550.24	8,228.12	16,983.01
	Total tax revenue	2,930.01	1,496.27	1,996.68	10,734.71
	VAT transfer	-3.71	117.44	-502.43	184.34
	State-to-state transfers	0.00	63.28	-204.22	152.91
	Federal grants	1.98	2.75	0.00	7.57
1980	**Gross Domestic Product**	16,711.16	2,417.64	14,222.43	28,444.22
	Net national income	12,891.84	1,799.05	10,892.14	20,902.04
	Total tax revenue	4,166.18	1,824.97	2,745.61	14,200.00
	VAT transfer	-6.46	152.47	-784.65	143.11
	State-to-state transfers	0.00	69.95	-136.42	186.09
	Federal grants	16.01	21.32	0.00	55.93
1990	**Gross Domestic Product**	20,300.27	3,082.82	16,875.95	33,441.32
	Net national income	15,694.01	2,460.70	13,054.69	25,468.07
	Total tax revenue	4,530.46	1,770.59	2,802.12	13,532.56
	VAT transfer	-8.72	203.01	-599.34	278.52
	State-to-state transfers	0.00	105.78	-135.13	497.33
	Federal grants	26.01	47.41	0.00	199.36
1994	**Gross Domestic Product**	20,836.16	3,207.54	17,230.39	34,866.71
	Net national income	15,630.91	2,579.84	12,567.42	25,823.43
	Total tax revenue	5,114.96	2,056.89	3,411.83	16,688.09
	VAT transfer	-114.94	217.31	-1,023.35	119.33
	State-to-state transfers	0.00	71.51	-142.63	389.47
	Federal grants	53.12	183.66	0.00	1,435.81

Notes: All values in the table are per capita values in *constant 1991 Euros*. Average values are calculated as averages weighted by respective state population. *Total tax revenue* refers to the sum of federal, state, and local taxes with tax incidence within a state's border.

Table 2: Basic Statistics 1995-2006.

Year	Variable	Average	Std. Dev.	Maximum	Minimum
1995	**Gross Domestic Product**	19,875.77	4,660.57	10,641.35	34,143.84
	Net national income	15,017.86	3,056.21	8,309.51	19,470.82
	Total tax revenue	4,472.52	2,364.84	1,143.32	17,100.91
	VAT transfer	-19.30	382.58	-1,282.29	713.62
	State-to-state transfers	-5.19	157.65	-163.71	539.72
	Federal grants	127.76	222.21	0.00	1,425.11
2000	**Gross Domestic Product**	21,817.94	5,184.91	12,169.30	37,107.45
	Net national income	16,123.25	3,344.14	8,742.88	20,723.28
	Total tax revenue	5,317.35	2,663.47	1,420.24	18,812.02
	VAT transfer	-55.63	536.61	-1,768.98	880.90
	State-to-state transfers	-7.61	228.42	-402.51	710.22
	Federal grants	130.48	209.40	0.00	1,325.25
2006	**Gross Domestic Product**	23,049.85	5,349.63	13,492.00	38,580.95
	Net national income	17,399.75	3,726.13	9,344.21	23,409.90
	Total tax revenue	5,207.29	2,353.90	1,539.61	16,965.18
	VAT transfer	-48.29	531.84	-2,156.43	845.41
	State-to-state transfers	-6.87	200.62	-326.69	629.58
	Federal grants	130.07	240.65	0.00	670.25

Notes: All values in the table are per capita values in *constant 1991 Euros*. Average values are calculated as averages weighted by respective state population. *Total tax revenue* refers to the sum of federal, state, and local taxes with tax incidence within a state's border.

Table 3: Basic Statistics 1995-2006, East German states.

Year	Variable	Average	Std. Dev.	Maximum	Minimum
1995	**Gross Domestic Product**	12,981.48	3,488.74	10,641.35	19,981.02
	Net national income	9,817.01	2,274.15	8,309.51	14,364.39
	Total tax revenue	1,932.97	1,172.06	1,143.32	4,276.98
	VAT transfer	537.42	250.62	42.51	713.62
	State-to-state transfers	228.91	153.93	132.48	539.72
	Federal grants	416.20	31.66	386.92	476.09
2000	**Gross Domestic Product**	14,077.73	2,832.77	12,169.30	19,794.40
	Net national income	10,242.88	1,745.62	8,742.88	13,714.20
	Total tax revenue	2,158.82	1,029.44	1,420.24	4,210.58
	VAT transfer	671.08	308.51	54.47	880.90
	State-to-state transfers	300.30	202.43	183.40	710.22
	Federal grants	427.31	35.23	391.08	493.00
2006	**Gross Domestic Product**	15,086.77	1,918.69	13,492.00	18,725.85
	Net national income	10,707.28	1,184.77	9,344.21	12,929.70
	Total tax revenue	2,318.59	1,103.85	1,539.61	4,483.08
	VAT transfer	600.81	239.02	150.14	845.41
	State-to-state transfers	271.06	181.68	164.24	629.58
	Federal grants	603.08	42.13	532.87	670.25

Notes: All values in the table are per capita values in *constant 1991 Euros*. Average values are calculated as averages weighted by respective state population. *Total tax revenue* refers to the sum of federal, state, and local taxes with tax incidence within a state's border. The sample consists of the 5 East German states and Berlin.

Table 4: Basic Statistics 1995-2006, West German states.

Year	Variable	Average	Std. Dev.	Maximum	Minimum
1995	**Gross Domestic Product**	21,780.13	2,757.33	18,551.15	34,143.84
	Net national income	16,454.46	978.03	13,550.45	19,470.82
	Total tax revenue	5,174.01	2,117.60	3,428.44	17,100.91
	VAT transfer	-173.08	245.34	-1,282.29	100.00
	State-to-state transfers	-69.85	76.50	-163.71	377.35
	Federal grants	48.09	182.80	0.00	1,425.11
2000	**Gross Domestic Product**	23,879.13	3,420.92	19,765.83	37,107.45
	Net national income	17,689.17	1,299.82	15,535.37	20,723.28
	Total tax revenue	6,158.45	2,310.17	3,687.79	18,812.02
	VAT transfer	-249.15	401.50	-1,768.98	253.08
	State-to-state transfers	-89.61	152.26	-402.51	594.66
	Federal grants	51.43	159.63	0.00	1,325.25
2006	**Gross Domestic Product**	25,073.98	3,839.53	20,410.03	38,580.95
	Net national income	19,100.90	1,666.63	16,608.11	23,409.90
	Total tax revenue	5,941.56	1,994.81	3,904.01	16,965.18
	VAT transfer	-213.28	453.78	-2,156.43	311.97
	State-to-state transfers	-77.52	132.14	-326.69	513.78
	Federal grants	9.83	29.17	0.00	242.81

Notes: All values in the table are per capita values in *constant 1991 Euros*. Average values are calculated as averages weighted by respective state population. *Total tax revenue* refers to the sum of federal, state, and local taxes with tax incidence within a state's border. The sample consists of the 10 West German states (excluding Berlin).

Table 5: Redistribution of state income in Germany.

Dependent variable *Disposable state income after ...*	1970-1994 $1-\beta_d$	1970-1994 adjusted R^2	1995-2006 $1-\beta_d$	1995-2006 adjusted R^2
…transfer of federal tax share	0.314 (0.038)***	0.98	0.21 (0.089)***	0.95
+ VAT redistr. among states	0.357 (0.039)***	0.97	0.307 (0.096)***	0.92
+ state-to-state transfers	0.366 (0.041)***	0.97	0.323 (0.096)***	0.92
+ federal grants	0.369 (0.042)***	0.97	0.35 (0.094)***	0.92

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. The robust standard errors in parentheses pertain to β_d. Constants are omitted. 1970-1994: 10 observations; 1995-2006: 16 observations.

Table 6: Stabilization of state income in Germany.

Dependent variable	1970-1994		1995-2006	
Disposable state income after …	$1-\beta_s$	adjusted R^2	$1-\beta_s$	adjusted R^2
…transfer of federal tax share	0.298 (0.050)***	0.44	0.711 (0.091)***	0.24
+ VAT redistr. among states	0.331 (0.053)***	0.39	0.715 (0.090)***	0.26
+ state-to-state transfers	0.399 (0.054)***	0.33	0.72 (0.089)***	0.26
+ federal grants	0.416 (0.057)***	0.3	0.736 (0.084)***	0.22

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. The robust standard errors in parentheses pertain to β_s. 1970-1994: 250 observations; 1995-2006: 192 observations.

Table 7: Redistribution of state tax revenue in Germany.

Dependent variable *Disposable state income after ...*	1970-1994 $1-\beta_d$	1970-1994 adjusted R^2	1995-2006 $1-\beta_d$	1995-2006 adjusted R^2
…transfer of federal tax share	0.596 (0.027)***	0.91	0.325 (0.080)***	0.91
+ VAT redistr. among states	0.746 (0.020)***	0.84	0.69 (0.042)***	0.84
+ state-to-state transfers	0.78 (0.025)***	0.83	0.741 (0.041)***	0.78
+ federal grants	0.717 (0.026)***	0.88	0.743 (0.078)***	0.63

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. The robust standard errors in parentheses pertain to β_d. Constants are omitted. 1970-1994: 10 observations; 1995-2006: 16 observations.

Table 8: Stabilization of state tax revenue in Germany.

Dependent variable *Disposable state income after …*	1970-1994		1995-2006	
	$1-\beta_s$	adjusted R^2	$1-\beta_s$	adjusted R^2
…transfer of federal tax share	0.564 (0.062)***	0.90	1.008*** (0.03)	0.98
+ VAT redistr. among states	0.725 (0.052)***	0.95	0.994*** (0.01)	0.99
+ state-to-state transfers	0.896 (0.047)**	0.99	0.997*** (0.01)	0.99
+ federal grants	1.016*** (0.02)	0.95	0.989*** (0.01)	0.99

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. The robust standard errors in parentheses pertain to β_s. 1970-1994: 250 observations; 1995-2006: 192 observations.