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Fiscal Flows and Financial Markets: To what Extent Do They Provide Risk Sharing within Sweden?

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Abstract

The objective of this paper is to analyze the amount of risk sharing that takes place between regions in Sweden. Based on a similar empirical specification as suggested by ASDRUBALI *et al.*, 1996, we find that the capital market is the largest source of risk sharing of an exogenous change in gross regional product in Sweden. Still, roughly 20 percent of a change in regional output is smoothed among the regions through the fiscal system. There is also some evidence that there are regional differences in the sense that regions located in the south rely more on the capital market as a source of insurance against shocks in output, while the tax and transfer systems provide a larger extent of risk sharing for regions located in the north.

JEL classification: E62, H20, H77, R50

Keywords: risk sharing, taxes, transfers, intergovernmental relations, capital market

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1. Introduction

The objective of this paper is to analyze the channels and extent of risk sharing[1] in Sweden. The empirical work in this area of research has largely been triggered by the discussions about establishing the European Monetary Union (EMU). Economic activity does to a large extent take place under uncertainty where regions may be hit by asymmetric shocks, i.e. some regions are positively affected by the shocks while others are negatively affected. In the presence of a monetary union, the member countries can no longer use flexible exchange rates as an instrument for stabilizing economic fluctuations of this kind but, instead, have to rely on fiscal mechanisms and other market institutions to smooth output and consumption variations.[2]

As long as regional shocks are asymmetric or uncorrelated, there is room for sharing the risk among a group of regions for stabilizing purposes, resembling the idea of insurance. In modern economies there is usually a wide range of alternatives to choose between when to insure risk, from regular insurance or insurance via forward markets where agents act in order to buy and sell commodities at a fixed price for future delivery. The degree of risk sharing via financial markets is rather low on the national level; 5 percent using data on members of the European community (Belgium, Denmark, France, Germany, and the Netherlands) and 12.7 percent using data on non-member countries (Austria, Canada, Finland, and the US) for the period 1971-1993 (KALEMLI-OZCAN *et al.*, 2003). However, regional data show that there is much more risk sharing going on within countries. KALEMLI-OZCAN *et al.*, 2003, present estimates for six federal nations where the average degree of insurance via the financial markets for these federations is 48.2 percent, with a low of 21.6 percent for Japan and a high of 76.4 percent for Italy. Comparing different channels for risk sharing, ASDRUBALI *et al.*,

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1996, and ATHANASOULIS and VAN WINCOOP, 2001, find that the main channel for spreading risk across regions within the US is via the capital market, by diversifying ownership through ex ante investments.

Another important mechanism for risk sharing is provided through national taxes and transfers of the fiscal system. The fiscal system also plays an important role in terms of redistribution. While there are obvious redistributional purposes behind some programs, the motivation behind, e.g., unemployment benefits is to ease the effects of income variations over time. For many reasons, full risk sharing is usually not considered an optimal strategy. Since the design of the tax-transfer system is based on political decisions, the political process will be important for the decision on the balance between redistribution and stabilization, taking into account the fact that 'low-risk' and 'high-risk' regions have different preferences regarding this balance (PERSSON and TABELLINI, 1996b). The effectiveness of using taxes and transfers for stabilizing purposes is also limited by the mobility of workers. If the cost of mobility is relatively low, then the effect of the shock will be cushioned by the fact that the inhabitants of the affected region will migrate, hence making policy redundant (see, e.g., BOADWAY and WILDASIN, 1990, and LEE, 1998). The ability of the tax-transfer system to insure against risk may also be limited when there are inefficiencies such as horizontal (e.g., spillover effects) and vertical (e.g., tax-base sharing) externalities (see LOCKWOOD, 1999, and ARONSSON and WIKSTRÖM, 2003, respectively). The matter is further complicated by obvious problems of moral hazard related to risk sharing, which again precludes full risk sharing from being an optimal strategy (PERSSON and TABELLINI, 1996a).

Most of the empirical literature has focused on the fiscal system as shock absorber. ASDRUBALI *et al*., 1996, present results that are similar to those by VON HAGEN, 1992,

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while according to SALA-I-MARTIN and SACHS, 1992, the fiscal system plays a much larger role. Going beyond US borders, DECRESSIN, 2002, analyzes redistribution and risk sharing in Italy, while BUETTNER, 2002, and VON HAGEN and HEPP, 2001, apply a variant of the approach developed by ASDRUBALI *et al*., 1996, on German data. MÉLITZ and ZUMER, 1999, compare results on data from the US and Canada with results on data from the UK and Italy, and in a later study, MÉLITZ and ZUMER, 2002, also include France. According to these studies, the stabilization effects in Germany, France and the UK are approximately at the same level as in the US, whereas there is comparatively less risk sharing in Italy and Canada. These results are interesting, especially considering the fact that both, e.g., Germany and Canada have extensive transfer systems with the aim to reduce disparities between states and provinces.[3]

The differences in results have been debated, and one factor that has been addressed as underlying these differences concerns the accounting of data, especially transfers. Hence, the debate and the fact that there is still no consensus in the results, makes risk sharing a highly interesting topic. Since previous work has found that international risk sharing is limited (SØRENSEN and YOSHA, 1998; KALEMLI-OZCAN *et al.*, 2003), it is especially interesting to analyze various types of national institutional systems. This paper contributes with empirical evidence on risk sharing in the somewhat different institutional structure of Scandinavian fiscal federalism, here represented by Sweden.[4] Here we will estimate the degree of risk sharing by analyzing effects of changes in gross regional product. We will therefore make use of the broader definition of transfers, which, in contrast to a previous study on Swedish data by ANDERSSON, 2004, allows us to also include intergovernmental fiscal flows. In line with, e.g., Germany and Canada, Sweden has an extensive system of intergovernmental transfers aimed at equalizing fiscal disparities between counties and

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municipalities, respectively, and which might potentially also be of importance for risk sharing. In addition, our data set allows us to estimate smoothing due to agents holding claims on the financial markets. Hence, we are able to conduct a broader analysis of the importance of the institutional platform. During the time period of study, the tax and transfer systems were subject to major changes and the financial markets were deregulated, which makes it possible to analyze whether these reforms have had any impact on the extent to which the capital market and the fiscal system stabilize output variation among regions. Further, we also test for the possibility of regional differences in the actual extent of risk sharing that takes place in Sweden, which previous results on Swedish income data suggest is the case (ANDERSSON, 2004).

The paper proceeds as follows. Section 2 presents the empirical model. The empirical results are based on a similar specification suggested by ASDRUBALI *et al*., 1996, which facilitates a way to measure the extent to which the capital market and the fiscal system, respectively, mitigate the influence of a shock to output. This is done by estimating the correlation between the variation in gross regional product and net factor income and net taxes, respectively. The analysis is carried out on a panel of Swedish regions (counties) for the period 1985-2001. Section 3 contains a description of the data set. The results are also presented in Section 3. The paper concludes with Section 4.

2. The empirical model

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Let us formalize the discussion by considering the following general relationship

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$$\ln\left(\frac{Y_{it}}{Y_t}\right) = \alpha_i + \gamma \ln\left(\frac{X_{it}}{X_t}\right) + \mu_{it} \tag{1}$$

where X_{it} is gross regional product in region *i* at time *t* and Y_{it} is the disposable value of X_{it}. It is important to realize that even in the case of full risk sharing, regions may be affected by national shocks. This can be controlled for by either introducing time fixed effects or by dividing each variable by its respective aggregate (national) value, where the latter is chosen here.

A value of $\gamma = 0$ indicates full risk sharing, since the variation in gross product is not at all reflected in *Y*. This means that a change in gross regional product is fully absorbed by capital and/or fiscal institutions, which leaves income after risk sharing unaffected. However, if $\gamma = 1$, there is full pass-through in the system, i.e., the variation in gross product is fully reflected in disposable income, which suggests that there is no risk sharing. In other words, $1-\gamma$ $(=\beta)$ indicates the extent of risk sharing that is provided in the economy. Taking the first difference of equation (1) gives us

$$\Delta \ln\left(\frac{Y_{it}}{Y_t}\right) = \delta_i + \gamma \Delta \ln\left(\frac{X_{it}}{X_t}\right) + \eta_{it} \tag{2}$$

where δ_i is a regional term, which captures possible drift elements of the disturbance term (MÉLITZ and ZUMER, 2002). Both (1) and (2) have been used in the literature to estimate the degree of risk sharing.

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In this paper we are interested in decomposing risk sharing (i.e. $(1-\gamma)=\beta$) into smoothing provided via the capital market and the fiscal system, respectively. ASDRUBALI *et al.*, 1996, show that this is feasible by realizing that according to standard accounting, regional product (*X*) minus regional income (*RI*) is net factor income, i.e., net income received from other regions by for instance holding claims. In turn, regional income (*RI*) minus disposable regional income (*DRI*) is net taxes, i.e., net contribution to the fiscal system. Hence, the slope of the regression of net factor income on the gross regional product, β_K, indicates to what extent the capital market is involved in stabilizing a shock to output. In the same manner, the slope of the regression of net taxes on the variation in gross regional product, β_F, indicates the amount of risk sharing that is provided by the fiscal system. We control for national shocks by dividing each variable by its respective aggregate (national) value; $X_t=\sum_i X_{it}$, $RI_t=\sum_i RI_{it}$, $DRI_t=\sum_i DRI_{it}$. More formally, estimates of β_K and β_F are obtained by estimating the following equations, which henceforth will be at the center of our attention,

$$\begin{aligned}\Delta\ln\left(\frac{X_{it}}{X_t}\right)-\Delta\ln\left(\frac{RI_{it}}{RI_t}\right)&=d_{K,i}+\beta_K\Delta\ln\left(\frac{X_{it}}{X_t}\right)+\varepsilon_{it}\\ \Delta\ln\left(\frac{RI_{it}}{RI_t}\right)-\Delta\ln\left(\frac{DRI_{it}}{DRI_t}\right)&=d_{F,i}+\beta_F\Delta\ln\left(\frac{X_{it}}{X_t}\right)+\upsilon_{it}\end{aligned}\qquad(3)$$

where β_K and β_F are interpreted as the incremental smoothing obtained via the channels of financial markets and fiscal flows, respectively. Note that we, in contrast to most of the previous studies in this literature, also allow for regional fixed effects in equation (3).

3. Empirical analysis

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3.1 Data

The Swedish public sector is structured into three levels of government; local governments (municipalities), regional governments (counties) and the central or national government. The municipalities provide a variety of services such as child care, education and care of the elderly, while the counties' main responsibility is health care. The central government is mainly responsible for the provision of national public goods, such as the defense, and redistribution.

The data set is a panel covering the period 1985-2001 and 21 regions. The 21 regions consist of a total of 289 municipalities, where the number of municipalities in the regions varies between 1, since the county and municipality of Gotland coincide, and 51 in the county of Västra Götaland. We also note that there is a large difference in density between regions, where the county of Stockholm has a density of 240.5 inhabitants per square kilometer while the density in Norrbotten county is 2.5. Data originate from national accounts data and income-tax returns, where the latter have been aggregated to regional level. All monetary values have been deflated by the consumer price index (1980=100), and are divided by population to calculate per capita values.

Data on gross regional products (X) are not available prior to 1985, which puts a limiting constraint on the length of the time period. Regional personal income is given by the combined income (wages, proprietor's income, rents and dividends) for all municipal residents in the region, including legal persons. In accordance with ASDRUBALI *et al*., 1996, regional income (RI) is defined as regional personal income plus nonpersonal national taxes and interest on local and regional funds, minus direct transfers to the households (which are

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assessable for taxation and therefore included in regional personal income). The regional income measure includes profits reported by firms, but not retained earnings which is normally included in gross regional income.[5] Hence, when comparing gross regional product with our measure of income we should subtract retained earnings from the former. Unfortunately, data on retained earnings are not available at the regional level. As ATHANASOULIS and VAN WINCOOP, 2001, point out this is not necessarily a problem since the main share of retained earnings is usually used for reinvestments and will therefore contribute to future dividends, which are included in regional income though.

The tax payment variable is measured as the real per capita tax payment to the national government by residents (including legal persons) in the municipality, including employment income tax, capital income tax, property tax, tax on real estate, social security, and excise taxes.[6] It is important to note that in Sweden most of the employment income tax is collected by the local (and regional) governments (where the total of regional and local tax rates ranged between 27.15 and 33.17 percent in 2001), and, hence, not included in this analysis. A resident only pays national employment tax (a tax rate of between 20 and 25 percent) on income above a certain level (approx. SEK 290,000 in annual income).[7]

The central government distributes transfers to the lower levels of governments in the form of grant-in-aid, operating grants and investment grants. National transfers to the households made up about 20 percent of the national budget in the beginning of the 1980s and about 30 percent at the end of the 1990s. These transfers consist of child allowances, housing allowances, pension, sickness benefits, study allowances, unemployment benefits, and social allowances. The transfer variable used in the analysis is measured as the real per capita

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transfer payments distributed by the central government to the municipalities, counties, and the households as listed above.

Table 1 presents summary statistics of the variables used in the analysis. The county of Stockholm reports the highest output and income per capita, while we note that the lowest value of gross regional product and regional income per capita are registered for the counties of Södermanland and Gotland, respectively. Figures 1 and 2 illustrate the relationship between real per capita gross regional product and regional income for the counties of Stockholm and Norrbotten, respectively. These two counties are chosen on the basis of being very different in terms of density and business structure, as well as geographical location. According to the figures, there is a somewhat closer relationship between output and income in the county of Stockholm than in the county of Norrbotten. This is a general pattern when dividing counties into southern and northern regions. The highest value of national tax payments per capita is registered for Stockholm, while the county of Uppsala receives the least transfer payments per capita. The island of Gotland and the county of Jämtland have the lowest tax payments per capita. The counties of Jämtland and Norrbotten have received highest amounts of transfer payments.

TABLE 1 ABOUT HERE

FIGURE 1 ABOUT HERE

FIGURE 2 ABOUT HERE

3.2 Results

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The results are based on panel data estimation methods using the within estimator (FE) and generalized least squares (GLS).[8] The FE estimations assume a common AR1 process for all regions, while the GLS estimations allow for a panel-specific AR1 process.[9] In the GLS estimations we also allow for a heteroskedastic error structure. Table 2 presents the results of estimating (3).

TABLE 2 ABOUT HERE

According to Table 2, and the FE estimations, the capital market absorbs approximately 59 percent of a change in gross regional product. The GLS estimations, specifically also taking heteroscedasticity into account, suggest a slightly higher absorption of 61 percent. In an international comparison, this is a rather high number, though within the range of results on various federal states reported by KALEMLI-OZCAN *et al*., 2003. Changes in net income mainly capture events on the capital market, given that employment income due to commuting across county borders is limited. Thus, if commuting is substantial, we would overestimate risk sharing via the financial markets. Since the division of Swedish counties does not necessarily mirror the functional local labor markets, which consist of groups of municipalities, it is possible that the estimated degree of smoothing via the capital market presented here also captures commuting. However, the counties are often larger than a single labor market region and, except for the case of Stockholm, do rarely contain municipalities belonging to a different county. Hence, most of the commuting takes place within the county and it is therefore reasonable to believe that commuting across regions is limitied.

Turning to the results of the importance of the fiscal system in Table 2, we find that the fiscal system picks up about 20 percent of a shock to gross regional product. This result is robust

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using both FE and GLS. Thus, if gross regional product in Sweden would decrease by 1 krona (SEK), tax payments to the central government would decrease and transfer payments increase in such a way that disposable income falls by only 80 öre. The smoothing provided by the central government can further be decomposed into effects of tax payments and transfer payments. The results are presented in Table 3 and indicate that taxes play a larger role in the smoothing process than transfers do. The difference in importance of taxes and transfers is however not statistically significant.

TABLE 3 ABOUT HERE

In the beginning of the 1990s there were major changes made in the tax and transfer systems in Sweden; in 1991 a major tax reform was implemented, and then in 1993 the transfer system underwent major changes. In order to check the sensitivity of the results with respect to this matter, we re-run the regressions separately for the periods 1985-1993 and 1993-2001. Looking at the extent of risk sharing provided by the fiscal system, the FE estimates presented in Table 4 show that national tax and transfer payments pick up approximately 15 percent of a shock to output in the first time period, while it appears as if the fiscal system provides more insurance after the implementation of the new tax and transfer systems, approximately 20 percent. There is however no support for a statistical difference between the two time periods, which is in line with the more stable results over time given by the GLS estimations. Thus, the results suggest that the reforms have not had any effect on the degree of stabilization provided by the fiscal flows in Sweden.

According to Table 4, the FE estimations show that risk sharing via the capital market has decreased from 67 percent to 60 percent between the two time periods, while the GLS

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estimations suggest a stable absorption of approximately 60 percent in the two time periods. In the second part of the 1980s, the Swedish capital and currency markets were deregulated. Since it usually takes time before a previously regulated market becomes fully integrated, it is reasonable to expect the importance of the capital market in providing risk sharing to increase with time, which appears to be contradicted by the results in Table 4. However, a Chow test shows that there is no support for a statistical difference between the two time periods, which may indicate that the adjustment/integration has already taken place.

TABLE 4 ABOUT HERE

Previous results on Swedish income data show that there are regional differences regarding the extent of smoothing of a change in personal income that is provided by the fiscal system in Sweden (ANDERSSON, 2004). Unfortunately, we do not have access to output data on the local (municipality) level, which would facilitate a full analysis of regional differences. However, it is often considered the case that the Swedish system provides different degrees of insurance for the northern and southern regions, and, therefore, we test for the possibility that the regions enjoy different degrees of risk sharing depending on geographical location. More specifically, this is done by introducing interaction terms in equation (3), i.e.,

$$\begin{aligned}\Delta\ln\left(\frac{X_{it}}{X_t}\right)-\Delta\ln\left(\frac{RI_{it}}{RI_t}\right)&=d_{K,i}+\beta_{S,K}\left(D^S\Delta\ln\left(\frac{X_{it}}{X_t}\right)\right)+\beta_{N,K}\left(D^N\Delta\ln\left(\frac{X_{it}}{X_t}\right)\right)+\kappa_{it}\\ \Delta\ln\left(\frac{RI_{it}}{RI_t}\right)-\Delta\ln\left(\frac{DRI_{it}}{DRI_t}\right)&=d_{F,i}+\beta_{S,F}\left(D^S\Delta\ln\left(\frac{X_{it}}{X_t}\right)\right)+\beta_{N,F}\left(D^N\Delta\ln\left(\frac{X_{it}}{X_t}\right)\right)+\omega_{it}\end{aligned} \quad (4)$$

where $D^S=1$ for regions located in the south (otherwise 0) and $D^N=1$ for northern regions (otherwise 0).[10]

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The results are presented in Table 5. Both the FE and the GLS estimates suggest that the capital market is more dominant in smoothing a shock to output in regions located in the south than in northern regions; the estimated coefficients are statistically different from each other. If all regions are well integrated in the sense that capital is equally mobile across Sweden, then the capital market would also be equally important as a source of stabilization for both the north and the south. Apparently this is not the case in practise. One possible explanation for this result is that the south part of Sweden is an economically larger region with a more diversified business structure, and asset portfolio, than the north. Further, the GLS results indicate that the fiscal system is a more important source of stabilization for northern regions than regions in the south.[11] However, note that in the FE estimations we cannot reject the null hypothesis that the degree of risk sharing through the fiscal system is equal for regions in the north and in the south.

TABLE 5 ABOUT HERE

So, how does the results based on Swedish data presented in this paper compare with results for other countries? Using data on the US and Canada, MÉLITZ and ZUMER, 2002, are able to compare the importance of the tax-transfer systems in stabilizing a shock to gross output. The authors find that stabilization amounts to approximately 13 percent in Canada and 12 percent in the US, which is less than the results presented in this paper. Allowing for regional differences, it appears as if fiscal stabilization varies between approximately 18 and 27 percent in Sweden (see Table 5). Further, and interestingly enough, the results presented in this paper indicate that the capital market partakes to a greater extent in stabilizing a shock to

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output in Sweden than results on the US by ASDRUBALI *et al.*, 1996, and ATHANASOULIS and VAN WINCOOP, 2001.[12]

4. Concluding remarks

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The objective of this paper is to analyze the amount of risk sharing of output that takes place between regions in Sweden. By applying a similar empirical specification as suggested by ASDRUBALI *et al.*, 1996, but including regional fixed effects, we find that the capital market is the largest source of risk sharing of gross regional product in Sweden. Still, roughly 20 percent of a change in regional output is smoothed among the regions through the fiscal system. There is also some evidence that there are regional differences in the sense that regions located in the south rely more on the capital market as a source of insurance against shocks in output while the tax and transfer systems provide a larger extent of risk sharing for regions located in the north. The results also suggest that the changes made in the tax and transfer systems in the beginning of the 1990s and the deregulation of the financial markets have not had any major impact on the extent of risk sharing in Sweden (the overall amount of risk sharing is stable over time).

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[1] Throughout the paper, we will use the terms risk sharing and stabilization interchangeably.

[2] See VON HAGEN, 1998, for a more thorough overview of the different strands of literature.

[3] Evaluating the equalization system in Canada, BOADWAY and HAYASHI, 2004, find that the system contains destabilizing elements, which may generate more variability in revenue of the provinces than would be the case in the absence of the equalization system.

[4] In Sweden, the size of the public sector is, in an international comparison, very large. The provision of many services, such as child care, education and health care, has been decentralized to the subnational level. The national government tries to monitor the lower levels of government via legislation as well as via the intergovernmental transfer system. The main source of revenue for the local governments is income taxation.

[5] Gross regional income is not available at the regional level.

[6] Unfortunately, we do not have access to social security payments and excise tax payments at the regional level, but only aggregate national values. We therefore have to re-construct these payments. Since excise taxes constitute a fixed share of sales, we use the regional share of sales as a distribution factor to construct regional excise tax payments. Regarding social security, we use total wages at the regional level as a distribution factor. We also correct for the fact that parts of the northern regions have been granted a reduction in social security payments for the years prior to 2000.

[7] In 2001, municipal (the sum of local and regional) and national income tax payments on employment represented 27.5 and 2.9 percent, respectively, of all tax payments in Sweden. Social security is the single largest contributor with 33.9 percent of all tax payments. Note also that the local and regional governments are only allowed to tax employment income.

[8] The model has also been estimated with random effects, where the results are similar to those obtained using GLS. A Hausman specification test shows that the fixed effects model is preferred to the random effects model.

[9] Woolridge tests for autocorrelation in panel data show that the hypothesis of no first-order autocorrelation can be rejected on a 5-percent level of significance. The econometric software STATA is used to estimate the parameters. The following estimator of ρ is used: $\rho_{tscorr} = \varepsilon' \varepsilon_{t-1} / \varepsilon' \varepsilon$, where ε is the vector of residuals and ε_{t-1} the vector of lagged residuals.

[10] Northern regions include the counties of Gävleborg, Västernorrland, Jämtland, Västerbotten and Norrbotten, while southern regions include the counties of Stockholm, Uppsala, Södermanland, Östergötland, Jönköping, Kronoberg, Kalmar, Gotland, Blekinge, Skåne, Västra Götaland, Värmland, Örebro, Västmanland, and Dalarna.

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[11] Summary statistics show that transfers (taxes) constitute 36 (48) percent of disposable regional income in southern regions and 41 (45) percent in northern regions.

[12] ATHANASOULIS and VAN WINCOOP, 2001, criticize the approach by ASDRUBALI *et al*., 1996, on two accounts. First, one should also control for predictable components of growth when estimating the degree of risk sharing. Second, risk sharing should be measured as the reduction in the standard deviation of residual risk obtained when comparing the growth rate of gross regional product with the growth rates of regional income (financial markets) and disposable regional income (fiscal system), respectively. Regarding the latter point, the difference is that in the approach by ASDRUBALI *et al*., 1996, the correlation between income before and after risk sharing also enters and risk sharing, or smoothing, is interpreted as the incremental reduction in covariance between the two income measures. We therefore first re-run equation (3) and include an information set containing the following variables: the log of initial real per capita gross regional product, the five-year lagged population growth rate, fertility measured as births per thousand women, the average per capita migration and the one-year lagged growth rate of real per capita gross regional product (change in logs). Our results are not affected when these predictable components are included in our regressions. Next, we also find that the reduction in the standard deviation of residual risk after risk sharing via the fiscal system is in line with the results presented in the main text. However, the reduction in the standard deviation of residual risk from gross regional product to regional income (financial markets) is substantially lower than the results in the main text show. This is explained by the relatively low correlation between the growth rates of gross regional product and regional income.

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Table 1 Summary statistics, real per capita values in SEK, 1985-2001

	Mean	Std.dev
Gross regional product	73,465	9,855
Regional income	56,085	11,152
National tax payments	23,916	4,519
National transfer payments	18,800	3,722

Note: In 1980-prices.

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Table 2 Stabilization of gross regional product in Sweden, 1985-2001

	FE		GLS	
	β_K	β_F	β_K	β_F
Coefficient	0.593	0.201	0.611	0.202
Std.dev	0.066	0.019	0.038	0.014
R^2	0.204	0.300		
ρ	-0.165	-0.335		
Log L			848.03	1195.04

Note: Results are based on estimations of equation (3) and include regional fixed effects. The FE estimations include a common AR1 process for all panels, while the GLS estimations allow for a panel-specific AR1 process. The GLS estimations also control for heteroscedasticity.

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Table 3 Components of stabilization of gross regional product in Sweden by the central government, 1985-2001

	FE		GLS	
	Coefficient	Std.dev	Coefficient	Std.dev
Transfers	0.095	0.024	0.094	0.014
Taxes	0.115	0.054	0.116	0.014

Note: Regional fixed effects are included in the regressions. The FE estimations include a common AR1 process for all panels, while the GLS estimations allow for a panel-specific AR1 process. The GLS estimations also control for heteroscedasticity.

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Table 4 Stabilization of gross regional product in Sweden, material divided into subperiods of 1985-1993 and 1993-2001

	FE				GLS			
	1985-1993		1993-2001		1985-1993		1993-2001	
	β_K	β_F	β_K	β_F	β_K	β_F	β_K	β_F
Coeff	0.673	0.153	0.600	0.204	0.599	0.195	0.605	0.213
Std.d	0.090	0.054	0.100	0.020	0.060	0.026	0.047	0.014
R^2	0.359	0.107	0.186	0.425				
ρ	-0.284	-0.481	-0.147	-0.337				
LogL					404.23	512.19	468.84	715.19

Note: Regional fixed effects are included in the regressions. The FE estimations include a common AR1 process for all panels, while the GLS estimations allow for a panel-specific AR1 process. The GLS estimations also control for heteroscedasticity.

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Table 5 Stabilization of gross regional product in Sweden, material divided into southern and northern regions, 1985-2001

	FE				GLS			
	Coeff	Std.d	Coeff	Std.d	Coeff	Std.d	Coeff	Std.d
$\beta_{S,K}$	0.678	0.074			0.713	0.042		
$\beta_{N,K}$	0.278	0.141			0.353	0.069		
$\beta_{S,F}$			0.186	0.022			0.183	0.015
$\beta_{N,F}$			0.258	0.042			0.272	0.028
R^2	0.217		0.302					
ρ	-0.159		-0.332					
LogL					856.88		1198.57	
F	6.33		2.27					
χ^2					20.42		8.18	

Note: Results are based on estimations of (4) and include regional fixed effects. The FE estimations include a common AR1 process for all panels, while the GLS estimations allow for a panel-specific AR1 process. The GLS estimations also control for heteroscedasticity. The F- and χ^2-tests refer to testing $H_0 : \beta_{S,.} = \beta_{N,.}$ in equation (4). Counties included in the south and in the north, respectively, are listed in footnote 14.

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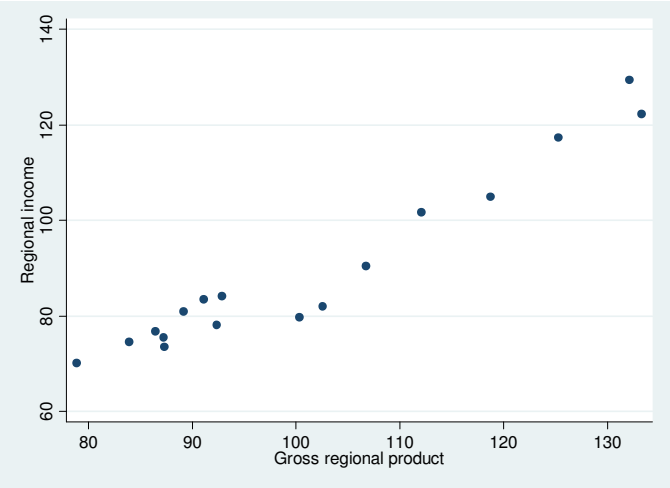
Figure 1 Regional income vs. regional gross product, Stockholm county, 1985-2001



Note: Values are reported in real per capita terms (1980=100), thousand SEK.

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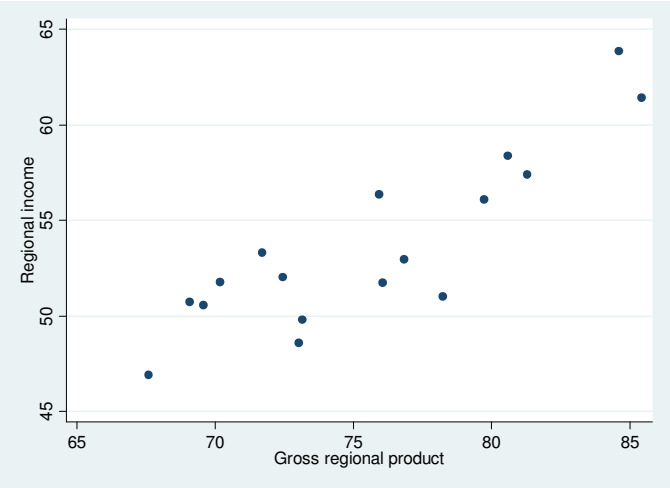
Figure 2 Regional income vs. regional gross product, Norrbotten county, 1985-2001



Note: Values are reported in real per capita terms (1980=100), thousand SEK.

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