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HOW MUCH FISCAL EQUALISATION?

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Abstract

We treat fiscal equalisation as an insurance device against regional tax revenue variance. This insurance comes at the price of a moral hazard: regional government will spend too little effort on the development of the local tax base. In a simple bargaining model with two identical regions we show that *less than total* fiscal equalisation combined with lump sum transfers will be optimal. Taking a step back to the constitutional bargaining behind some veil of ignorance which determines the fallback position for later negotiations, we show that writing *total* fiscal equalisation into the constitution will be optimal.

Keywords: Fiscal equalisation, constitutional bargaining, moral hazard

JEL Classification: H72, H77

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Introduction

Levels of fiscal equalisation with respect to tax revenues between the Länder in Germany are very high. This has sparked a debate about the future of fiscal equalisation in Germany. In a recent decision, the German constitutional court ruled that the current system of fiscal equalisation needs to be changed by 2003. Against this background, the question of the optimal fiscal equalisation is a timely issue.

In many federal countries[1] the fiscal equalisation programme aims to equalise differences in tax revenue by reducing the gap between the actual tax revenues of a state and the per capita tax revenue average across all states. In order to give a rough idea of the current arrangements in Germany to assess the relevance of our considerations, we compare tax revenues before and after equalisation for the Länder in Germany in 1996 in figure 1. We find that the tax revenues per capita in each state (Bundesland) are almost levelled to the average of all Länder.

Insert Figure 1

Figure 1 shows that since the pre-equalisation/post-equalisation slope is even negative, we have a reversed ranking of the states measured by the amount of their tax revenues. This explains the current discontentment with the German system. The high degree of fiscal equalisation in Germany implies a high implicit marginal tax on tax revenues because higher tax revenues in a state reduce the amount of equalising transfers received by this state (or increase the transfers to be paid to poorer states). In the German federal system, tax rates and the definition of tax bases are uniform across

states because they are determined by federal law. While states are not able to levy taxes independently, they are nevertheless responsible for collecting taxes. Thus, the implicit taxes in this equalisation system mainly affect the effort of the state governments to collect taxes enforcing the tax code. Standard economic theory suggests that the higher the marginal implicit tax on tax revenue is the lower the state's level of tax enforcement and, hence, tax revenue will be.

Huber and Lichtblau (1997) calculated the size of the implicit tax rate for different states due to fiscal equalisation. They found that in Germany a gross increase in tax revenues by DM 1 million leads to net (post fiscal equalisation) increases in disposable tax revenues of anything between 100 000 DM and 300 000 DM. This translates into implicit marginal tax rates between 70 and 90 percent[2]. Baretti, Huber and Lichtblau (2000) analysed the distortion induced by these implicit tax rates on the fiscal decisions of the states, i.e. tax enforcement. Since tax rates are set uniformly by the federal government, tax enforcement is measured as the ratio between tax revenues and the gross domestic product in the states. The authors estimate that the implicit tax rate due to fiscal equalisation reduces total German tax revenues by up to 10 percent. This indicates that the fiscal equalisation system significantly distorts the states' fiscal decisions on tax enforcement. As a consequence, there is an increasing number of authors calling for a reduction in the level of fiscal equalisation in Germany[3].

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[1] Fiscal equalisation of tax revenues takes place in, for instance, Australia, Canada, Denmark, Germany, Switzerland.

[2] Figure one suggests implicit tax rates even above 100 percent. This discrepancy is due to additional federal transfers ("Bundesergänzungszugweisung") that Huber and Lichtblau (1999) do not take into account in their study of fiscal equalisation in the stricter sense ("Länderfinanzausgleich").

[3] See Leibfritz et al. (2000), a report of the Ifo Institute, Munich, for the federal ministry of finance or Vesper (2000).

The issue of fiscal equalisation is also highly relevant in a European context. For a long time, the European Union has had a system of fiscal transfers with clear net contributors and net recipients. But what is still lacking are fair and binding rules that formalise the system of fiscal equalisation on a European level. These rules will need to take into account the positive insurance as well as the negative incentive effects of fiscal equalisation which is a system of "bail out" of some sort. If and when Europe moves towards closer political integration, a European constitution will have to be agree upon which lays down, amongst others, the rules of fiscal equalisation to be used between member states.

The theoretical analysis of the Canadian equalisation system by Smart and Bird (1996) and Smart (1998) suggests that equalising federal transfers distorts the tax policy incentives of subnational governments. By raising the tax rates applied to elastic tax bases, provinces can depress the base. Because the fiscal transfers in Canada are inversely related to the tax base and not to tax revenues, provinces have an incentive to depress the tax base with excessively high tax rate. This equalisation system differs from the one analysed in our paper both because in Canada provinces have the autonomy to levy tax rates independently and because in Germany fiscal equalisation only depends on tax revenues and not on the tax base.

The basic set-up of Lockwood (1999) is more similar to our model, but his focus is on public goods provision whereas we concentrate on the moral hazard incentives induced by insurance against tax revenue shocks.

Our paper now splits the question of fiscal equalisation into two separate issues. Firstly, we use a simple model to calculate an optimal bargaining solution for the

problem of fiscal equalisation for given fallback positions. The model is based on two identical countries with identical bargaining strength and a standard exponential risk-utility function negotiating with each other. We obtain the usual insurance result: *less than total* fiscal equalisation combined with lump sum transfers will be optimal. Secondly, we look at the preceding constitutional process behind some veil of ignorance which determines the fallback position in post-constitutional negotiations. Here we get the result that *total* fiscal equalisation should be written into the constitution. This total equalisation can be interpreted as an insurance against uncertain lump sum transfers.

Thus, our answer to the problem of fiscal equalisation is twofold. Firstly, a high level of fiscal equalisation at the constitutional level is desirable. Secondly, this constitutional rule should not be implemented in practice but should only be used as the fallback position on the basis of which lower levels of fiscal equalisation with compensating lump sum transfers will be negotiated.

The Model

We consider a fiscal equalisation system in an economy with two states. Each state has an uncertain tax revenue due to regional economic uncertainty. Bureaucrats and politicians are risk averse with respect to this uncertainty as described by the following exponential risk-utility function:

(1) $\quad U_i(\tilde{I}_i) = -\exp\{-r_i \cdot \tilde{I}_i\}$

with the stochastic variable $\tilde{I}_i$ denoting the uncertain tax revenues of state i, and r_i as constant absolute risk aversion. If $\tilde{I}_i$ is normally distributed, then the expectation value of the risk-utility function (the certainty equivalent) is given by:

(2) $E[U_i(\tilde{I}_i)] = -\exp\{-r_i \cdot (E[\tilde{I}_i] - \frac{r_i}{2}Var[\tilde{I}_i])\}$

Monotone transformation yields the mean-variance utility that is used from now on:

(3) $C(\tilde{I}_i) = E[\tilde{I}_i] - \frac{r_i}{2}Var[\tilde{I}_i]$

States can increase their tax revenue by fostering the tax base in their respective area. Thus, the effort of the local policy to build and strengthen the tax sources determines the tax revenues.[1]. We assume that the fostering of tax sources creates effort costs. We assume these effort costs to take the following quadratic form:

(4) $c(e_i) = \frac{e_i^2}{2}$

Fiscal equalisation means that each state keeps a proportion of its tax revenues and redistributes the remaining part of the tax revenues to the other states. In a two-state economy after fiscal equalisation, the net revenue of state 1 is given by a proportion of its own tax revenues, the reverse proportion of its neighbours tax revenues minus the effort costs due to the enforcement of tax sources:

$$(5) \quad \tilde{I}_1 = a(e_1 + \tilde{e}_1) + (1-a)(e_2 + \tilde{e}_2) - \frac{e_1^2}{2}$$

where $\tilde{e}_i$ is a normally distributed random variable denoting the stochastic shock affecting state i's income: $\tilde{e}_i \sim N(m_i, s_i^2)$. e_i denotes the fiscal state´s effort to enforce tax sources and a denotes the degree of smoothing regional tax revenue shocks. Because of our symmetry assumption, analogous equations for state 2 can always be obtained by interchanging the indices 1 and 2 throughout this paper. For a given degree of equalisation state 1's decision problem is:

$$(6) \quad \underset{e_1}{Max} \quad C_1(e_1) = a(e_1 + m_1) + (1-a)(e_2 + m_2) - \frac{r_1}{2} \cdot [a^2 \cdot s_1^2 - (1-a)^2 s_2^2] - \frac{e_1^2}{2}$$

The first-order condition yields the optimal level of effort for state 1:

$$(7) \quad \frac{\partial C}{\partial e_i} = 0 \Rightarrow e_i = a$$

When choosing a there is a trade-off between incentive compatibility and insurance against tax revenue shocks. Optimal incentives to foster the bureaucratic effort are set by $a = 1$, which means that every state can keep its full tax revenues and redistribution between the states is realised by lump-sum transfers. However, $a = 1$ implies no insurance at all. Only for $a < 1$ there is insurance. Hence: the higher the risk aversion of the states, the smaller the optimal degree of fiscal equalisation. High

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[1] In Germany such a type of policy is called "Standortpolitik".

risk aversion makes fiscal equalisation attractive as a means of diversifying the risk of uncertain tax revenues.

Round table negotiation

We consider a round-table negotiation between the two states and derive the indirect utility function of state 1 by inserting the optimal level of effort from equation (7) into the utility function in (6):

$$(8) \quad C_1^{FE}(a) = a - \frac{a^2}{2} + a(m_1 - a\frac{r_1}{2}s_1^2) + (1-a)(m_2 - (1-a)\frac{r_1}{2}s_2^2)$$

Now, let the states negotiate on the degree of equalisation. Assuming Nash bargaining with equal bargaining power for both states, they maximise joint welfare by choosing an optimal level of fiscal equalisation. They then distribute the resulting surplus equally with respect to their fallback positions by choosing appropriate lump-sum transfers T_i with $T_1 + T_2 = 0$. Then the indirect utility function of state 1 is given by:

$$(9) \quad C_1^{FE}(a, T_1) = a - \frac{a^2}{2} + a(m_1 - a\frac{r_1}{2}s_1^2) + (1-a)(m_2 - (1-a)\frac{r_1}{2}s_2^2) + T_1$$

The optimal degree of equalisation maximising the joint utility of both states in a fiscal equalisation system is given by (note that $T_1 + T_2 = 0$):

$$(10) \quad \begin{aligned} &\underset{a}{Max}\ W^{FE}(a) = C_1^{FE}(a, T_1) + C_2^{FE}(a, T_2) \\ &= 2a - a^2 + m_1 + m_2 - \frac{r_1}{2}[a^2 s_1^2 + (1-a)^2 s_2^2] - \frac{r_2}{2}[a^2 s_2^2 + (1-a)^2 s_1^2] \end{aligned}$$

The first-order condition yields the welfare maximising level of fiscal equalisation:

$$(11) \quad \boldsymbol{a}^* = \frac{2 + r_1 \boldsymbol{s}_2^2 + r_2 \boldsymbol{s}_1^2}{2 + r_1 \boldsymbol{s}_2^2 + r_2 \boldsymbol{s}_1^2 + r_1 \boldsymbol{s}_1^2 + r_2 \boldsymbol{s}_2^2}$$

Obviously, if the states are risk-neutral $(r_i = 0, \ i = 1,2)$ it is optimal not to have fiscal equalisation at all and only redistribution via lump-sum transfers instead. In this case, the trade-off between incentive compatibility and insurance vanishes and the optimal welfare is only affected by incentives that induce the highest effort by the states. In the case of risk aversion $(r_i > 0, \ i = 1,2)$, the optimal degree of fiscal equalisation will be $\boldsymbol{a}^* < 1$. Note that for states with identical risks $(\boldsymbol{s}_1^2 = \boldsymbol{s}_2^2)$ or identical risk attitudes $(r_1 = r_2)$ the optimal degree of equalisation will be $1 > \alpha^* > 1/2$. This means that each state will have to give up less than half of its tax revenues if it wants to be insured optimally against tax revenue shocks. Fiscal equalisation will typically be less than complete. Less than complete insurance in the presence of moral hazard is a standard result from insurance theory.

The welfare gain made by replacing a non-optimal level of fiscal equalisation α by $\boldsymbol{a}^*$ is given by:

$$(12) \quad \Delta W^{FE} = C_1^{FE}(\boldsymbol{a}^*, T_1) + C_2^{FE}(\boldsymbol{a}^*, T_2) - C_1^{FE}(\boldsymbol{a}) - C_2^{FE}(\boldsymbol{a}) > 0$$

Due to Nash bargaining with equal bargaining strength, this surplus is distributed equally with respect to the fallback position and hence:

(13) $C_i^{FE}(\boldsymbol{a}^*, T_i) = C_i^{FE}(\boldsymbol{a}) + \dfrac{\Delta W^{FE}}{2}$, $i = 1,2$

With equations (12) and (13) the level of lump-sum transfers can be deduced:

$$
\begin{aligned}
T_1(\boldsymbol{a}, \boldsymbol{a}^*) &= C_1^{FE}(\boldsymbol{a}) - C_1^{FE}(\boldsymbol{a}^*) + \dfrac{\Delta W^{FE}}{2} \\
(14) \quad &= \dfrac{(\boldsymbol{a}^* - \boldsymbol{a})}{4}\{(\boldsymbol{a}^* + \boldsymbol{a})(r_1 - r_2)(\boldsymbol{s}_1^2 + \boldsymbol{s}_2^2) - 2(r_1\boldsymbol{s}_2^2 - r_2\boldsymbol{s}_1^2) + 4(\boldsymbol{m}_2 - \boldsymbol{m}_1)\} \\
&= -T_2(\boldsymbol{a}, \boldsymbol{a}^*)
\end{aligned}
$$

Inserting $T_1(\boldsymbol{a}, \boldsymbol{a}^*)$ in (9) yields the utility of state 1 depending on the initial and the optimal degree of equalisation:

$$
\begin{aligned}
C_1^{FE}(\boldsymbol{a}^*, \boldsymbol{a}) &= \boldsymbol{a}^* - \dfrac{\boldsymbol{a}^{*2}}{2} + \boldsymbol{a}\boldsymbol{m}_1 + (1 - \boldsymbol{a})\boldsymbol{m}_2 \\
(15) \quad &+ \dfrac{r_1}{4}[\boldsymbol{s}_1^2(\boldsymbol{a}^{*2} - \boldsymbol{a}^2) + \boldsymbol{s}_2^2((1 - \boldsymbol{a}^*)^2 - (1 - \boldsymbol{a})^2)] \\
&+ \dfrac{r_2}{4}[\boldsymbol{s}_2^2(\boldsymbol{a}^2 - \boldsymbol{a}^{*2}) + \boldsymbol{s}_1^2((1 - \boldsymbol{a})^2 - (1 - \boldsymbol{a}^*)^2)]
\end{aligned}
$$

In this section we have demonstrated that it is generally welfare improving to engage in the round table negotiation and that the optimal level of fiscal equalisation as given in (11) does not depend on the level of fiscal equalisation given in the constitution.

Optimal Constitution

Solving the negotiation game backwards, we now examine at the constitutional problem. We place ourselves behind a veil of ignorance by assuming that at the constitutional stage μ_i, the expected value at the post-constitutional stage, is uncertain behind the veil of ignorance and has variance $\text{var } \mu_i$. In this situation the two countries negotiate their respective fallback positions to be written into the constitution. In the previous section we have shown that post-constitutional negotiations yield a level of fiscal equalisationα^* that is independent of the fallback position. Only the lump-sum transfers depend on the fallback. Behind the veil of ignorance, these lump-sum transfers themselves become risky. The optimal default fiscal equalisation α^{**} to be written into the constitution now tries to deal with that risk efficiently.

We assume that μ_1 and μ_2 are uncorrelated and normally distributed behind the veil of ignorance. The sum of expected utilities at the constitutional level is therefore given by:

$$
\begin{aligned}
(16) \quad & E(C_1) + E(C_2) - \frac{r_1}{2}Var(C_1) - \frac{r_2}{2}Var(C_2) = -\frac{r_1}{2}(\boldsymbol{a}^2\, Var\boldsymbol{\mu}_1 + (1-\boldsymbol{a})^2\, Var\boldsymbol{\mu}_2) \\
& -\frac{r_2}{2}(\boldsymbol{a}^2\, Var\boldsymbol{\mu}_2 + (1-\boldsymbol{a})^2\, Var\boldsymbol{\mu}_1)
\end{aligned}
$$

Maximising this expression, tedious calculations on the basis of the first-order condition yield the optimal level of fiscal equalisation:

$$(17) \quad \boldsymbol{a}^{**} = \frac{r_1 \, Var\boldsymbol{m}_2 + r_2 \, Var\boldsymbol{m}_1}{(r_1 + r_2)(Var\boldsymbol{m}_1 + Var\boldsymbol{m}_2)}$$

With identical attitudes to risk ($r_1 = r_2$) or identical risk ($Var\boldsymbol{m}_1 = Var\boldsymbol{m}_2$), complete fiscal equalisation should be written into the constitution:

$$(18) \quad \boldsymbol{a}^{**} = 1/2$$

The intuition for this runs as follows: the effort levels are not affected by the constitution since they are only affected by the post-constitutional α^* which is independent of the constitution. The constitutional α^{**} only determines the transfer payments resulting from the post-constitutional negotiation. Ex-ante, these transfer payments are risky. From equation (15) we can see that this risk ultimately due to ex-ante risk in μ_1 and μ_2 is best diversified (at no effort distortion cost) with $\alpha^{**} = 0.5$.

This completes the argument that there is not one but two levels of optimal fiscal equalisation: a high level of fiscal equalisation written into the constitution and a lower one to be negotiated in the post-constitutional stage.

Conclusion

This paper suggests that simply lowering the degree of fiscal equalisation might be too simplistic a cure to the incentive problem posed by the Länderfinanzausgleich in Germany today. At the same time as lowering the degree of year by year fiscal

equalisation, writing total fiscal equalisation ($\alpha^{**} = 1/2$) into the constitution as a fall

back position ought to be considered on the basis of this model.

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Figure 1:
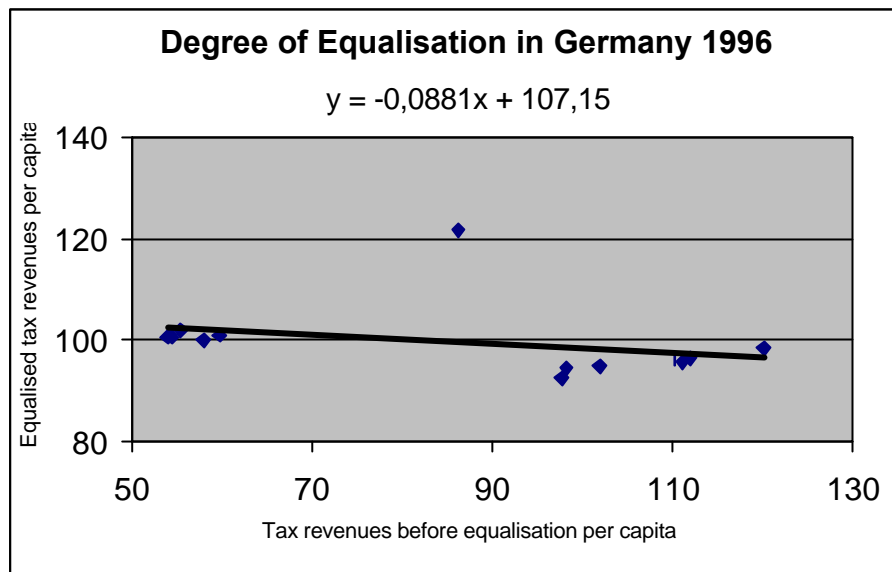
Data description: cross-section data of per capita tax revenues of the Länder (without city states) in

Germany in the year 1996 before and after fiscal equalisation. Source: Huber/Lichtblau (1997).

The Sarre is an outlier with post-equalisation level above 120 due to exceptional bail-out payments