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Fiscal Equalisation and the Soft Budget Constraint

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Fiscal Equalisation and the Soft Budget Constraint

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Abstract

This paper assesses the interactions of horizontal fiscal equalisation schemes with debt policy by sovereign regional governments. Local public goods are either financed by debt or taxation. A horizontal equalisation scheme alleviates regional public revenue disparities under horizontal and vertical tax competition. We show that fiscal equalisation schemes have no impact on the optimal central government grant whereas they can either soften or harden the regional budget constraint depending on the specific formulae. Revenue equalisation softens the budget constraint whereas tax base equalisation hardens the budget constraint of poor states.

Keywords: Fiscal federalism, public debt, soft budget constraint,
fiscal equalisation, tax competition

JEL Codes: E62, H7

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1 Introduction

This paper analyses the impact of horizontal fiscal equalisation schemes on both regional and national budgetary decisions in a federation. A soft budget problem arises when opportunistic behaviour of subnational governments, who strive for higher grants from the federal budget, meets the inability of the federal government to deny payments. According to Rodden et al. (2006), the soft budget problem is inherent to most federal regimes. Extent and course of action concerning defaulting jurisdictions depend on the specific institutions. In this paper, we turn to a specific institution present in many federal regimes: a fiscal equalisation scheme, which institutionalises horizontal payments for interregional revenue redistribution. We analyse the interdependency of a horizontal equalisation scheme and the incentive of decentralised jurisdictions to finance public goods through debt.¹

Financial equalisation is a constituent part of most federations. Beyond that, their subnational states are endowed with autonomous debt issuing rights. Making continuous use of debt financing goes along with increased interest payments and may cause budgetary distress. If a supporting jurisdiction comes to aid by granting bailouts, a soft budget problem emerges. Opportunistic local governments could be induced to reduce the tax burden of their own resources and to finance public goods by debt; confident that national government will grant payments.² A fiscal equalisation scheme deters tax setting by subnational governments. This affects the incentive to borrow and finance public goods through deficits.

This paper consists of four sections and a conclusion. The following section 2 describes the basic model and the reference scenario. Thereafter all three equalisation schemes are subsequently analysed in sections 3 to 5.

The concept of the soft budget phenomenon dates back to Kornai (1979).³ While Goodspeed (2002) already uncovered a “common pool effect” when bailout payments to subnational governments are financed by taxes affecting all jurisdictions, he neglected tax interactions amongst jurisdictions. Building on Goodspeed’s decentralised leadership model Breuillé et al. (2006) merge vertical and horizontal tax competition in line with Keen and Kotsogiannis (2002) creating a soft-budget-

¹The term “institutionalized fiscal equalization” marks horizontal payments amongst decentralized jurisdictions, which are directly linked to specific financial resources of the state.

²The term “discretionary” grants marks vertical payments from the national to regional governments, which are not linked to specific financial resources of the state.

³Oates (2005) offers a short literature review of the development of research on the soft budget problem. See Vigneault (2007) for a literature review on the matter within the fiscal federalism studies.

framework. They show that tax interactions have no impact on the optimal central government grant allocation but they harden the budget constraint when regional tax base outweighs regional debt.

This paper intends to contribute to the literature on soft budgets and fiscal institutions. Building on the framework of Breuillé et al. (2006) we incorporate two different schemes of horizontal fiscal equalisation suggested by Köthenbürger (2002) and a scheme suggested by Groneck and Plachta (2008). Köthenbürger (2002) analysed the efficiency aspects of fiscal equalisation in a classic horizontal tax competition framework in line with Zodrow and Mieszkowski (1986) or Wilson (1986). He shows that tax revenue equalisation exacerbates inefficient tax setting.⁴ Bucovetsky and Smart (2002) and (2006) could maintain another result of Köthenbürger in a more general setting. Tax base equalisation can induce efficient taxation by sovereign regional governments. The model presented here uncovers the incentive effects of borrowing induced by a fiscal horizontal equalisation scheme with distorting tax setting. The paper takes account of three different fiscal equalisation schemes:

- Revenue equalisation, representing Germany's constitutional design;
- Tax base equalisation, representing Canada's federal-provincial fiscal arrangements; and
- Expenditure equalisation

2 The base model

The course of action is based on the two period model similar to Goodspeed (2002). Regions finance the provision of public goods in the first period by fixed grants from the central government and additionally by debt. In the second period debt has to be amortized. Regions act as Nash competitors for mobile capital. Each region simultaneously sets tax rates on capital as in Keen and Kotsogiannis (2002). Decentralized leadership lets the central government act after local governments have made their decision upon taxes and debt.⁵ The central government pursues his own goals. Local governments are involved in a fiscal horizontal equalisation scheme, which specific form is decisive for the softness of the regional budget constraint. Three

⁴Cf. Barette et al. (2002).

⁵Decentralized leadership captures best the co-determination of national policies through lower and upper house in federally organized democracies.

different institutional arrangements are analyzed: Revenue equalisation, representing Germany's constitutional design; tax base equalisation, representing Canada's federal-provincial fiscal arrangements; and expenditure equalisation. The central government can grant payments to the regions to realise their own goals. In contrast to Goodspeed (2002) we explicitly account for the central government's need to generate revenue to finance transfers.

The household The representative household in region $i = 1, \dots, n$ gains utility from the consumption of local public goods (g_{i1}, g_{i2}) and private goods (c_{i1}, c_{i2}) in two periods:

$$U_i(c_{i1}, c_{i2}, g_{i1}, g_{i2}) = u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2}). \quad (1)$$

The subutility functions $u_i(\cdot)$ and $w_i(\cdot)$ fulfill the usual characteristics, marginal utility is positive and diminishing with increasing consumption. Parameter $\delta \in [0, 1]$ denotes a discount factor of second period utility. Households are endowed with exogenous income \bar{w}_i at the beginning of the first period, which is spent either for private consumption c_{i1} or saved in $S_i = s_i^i + \sum_{j \neq i} s_i^j$:

$$\bar{w}_i = c_{i1} + S_i. \quad (2)$$

Household savings s_i^j of region i are invested in j , s_i^i denotes savings invested in the home region. In the second period savings and interest r_i are taxed by regional tax τ_i and national tax τ_c . The sum of all savings in region j account to $S^j = \sum_{i=1}^n s_i^j$. Private consumption in the second period amount to

$$c_{i2} = \sum_{j=1}^n (1 + r_j - \tau_j - \tau_c) s_i^j. \quad (3)$$

Households are interregional immobile. Taxes are levied according to the source principle.

The capital market The capital market is modelled according to Keen and Kotsogiannis (2002). Capital is mobile between regions. Private savings are determined endogenously depending on the capital supply and demand functions. Capital supply depends on the production possibilities. The representative firm in region i produces output $F(K_i)$ using the sum of savings within the region $K_i = \sum_j s_j^i$. The production function $F(\cdot)$ is strictly concave and twice differentiable. Profit

maximisation yields the arbitrage condition $F'(K_i) = r_i$. The condition implicitly determines capital demand $K_i = K_i(r_i)$, which depends negatively on the before-tax interest rate r_i . Due to perfect capital mobility the net return ρ is equalised across regions:

$$\rho = r_i - \tau_i - \tau_c = r_j - \tau_j - \tau_c \quad \forall i, j. \quad (4)$$

Private savings $S_i(\rho)$ along with capital supply is determined through utility maximisation by households:

$$\max U_i = u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2}) \quad (5)$$

s.t.

$$\begin{aligned} \bar{w}_i &= c_{i1} + S_i \\ c_{i2} &= (1 + \rho) S_i. \end{aligned}$$

The consumption-savings decision is made under given taxes and public good bundle. The optimality condition reads:

$$\frac{\frac{\partial w_i}{\partial c_{i1}}}{\delta \frac{\partial w_i}{\partial c_{i2}}} = (1 + \rho). \quad (6)$$

As usual, the marginal rate of substitution between private consumption in first and second period must match the marginal rate of transformation.

Capital market clearing requires balancing capital demand and supply:

$$\sum_{i=1}^n K_i(r_i) = \sum_{i=1}^n S_i(\rho). \quad (7)$$

The influence of tax policy on net return is of great importance within the model. Discussing some aspects in advance eases reading, so we find that net return depends negatively on regional and national capital taxation.

$$\frac{d\rho}{d\tau_i} = \frac{K_i'}{\sum_{i=1}^n S_i'(\rho) - \sum_{i=1}^n K_i'} \in [-1, 0], \quad (8)$$

$$\frac{d\rho}{d\tau_c} = \frac{\sum_{i=1}^n K_i'}{\sum_{i=1}^n S_i'(\rho) - \sum_{i=1}^n K_i'} \in [-1, 0]. \quad (9)$$

A rise in the tax rate does not reduce net return in equal amount. Increasing capital costs leads to lower demand, hence marginal product and before-tax interest rate

rise.

$$\frac{dr_i}{d\tau_i} = 1 + \frac{d\rho}{d\tau_i} \in [0, 1], \quad (10)$$

$$\frac{dr_i}{d\tau_c} = 1 + \frac{d\rho}{d\tau_c} \in [0, 1]. \quad (11)$$

Horizontal and vertical tax externalities of a common tax base work through the uniform net return on capital ρ .

The regional government government activity on the regional level consists of imposing taxes, issuing debt, and supplying public goods. The regional government maximises utility of the representative household. In the first period the government has an exogenous revenue T_{i1} . Financing further provision of public goods G_{i1} is possible through deficit B_{i1} .⁶ The region can be involved in an horizontal fiscal equalisation scheme β_1 . Grants (contributions) to region i are denoted by $\beta_1^i > (<)0$. The budget constraint in the first period is

$$G_{i1} = T_{i1} + B_{i1} + \beta_1^i(\cdot). \quad (12)$$

In the second period a regional government also provides a public good G_{i2} .⁷ At the same time the government must repay debt including interest payments due $(1 + r_i) B_{i1}$. Hence, the intertemporal budget must be balanced. To finance payments and public goods a region can tax capital $(\tau_i K_i)$. Beyond that the region (possibly) receives grants T_{i2} from the national government. The regional budget can be involved in a horizontal fiscal equalisation scheme β_2 . Consistently grants (contributions) to region i are denoted by $\beta_2^i > (<)0$. The second period regional public budget is

$$G_{i2} + (1 + r_i) B_{i1} = T_{i2} + \tau_i S^i + \beta_2^i(\cdot). \quad (13)$$

The national government government activity on the national level consists solely of issuing grants to regions financed by a tax on capital τ_c in all regions. The national government is benevolent, maximising the utilitarian welfare function

$$\sum_{i=1}^n U_i. \quad (14)$$

⁶By simplification, debt is held by foreign investors, cf. Breuillé et al. (2006) and (2007), p. 8.

⁷All public goods in this model are local by nature, that is they exhibit no spillovers.

The grants to regions $T_{i2} \forall i$ serve as instruments in the second period.⁸ The government budget is

$$\sum_{i=1}^n T_{i2} = \tau_c \sum_{i=1}^n S_i = \tau_c \sum_{i=1}^n \sum_{j=1}^n s_i^j. \quad (15)$$

Horizontal tax competition for mobile capital affects governments to undersupply public goods as in Zodrow and Mieszkowski (1986). In this model vertical tax competition arises due to the national government occupying a common tax base. An increase of the regional or national tax rate varies the tax base of all jurisdictions.

2.1 The sequence of action

The sequence of action of regional and national governments and households is parted in three stages. On the first stage regional governments decide upon the level of public goods provided in the first period. Regions act as Nash competitors. The only instrument available for first period public consumption is debt. Regional governments are first movers to the national government, that is regions perfectly anticipate national government's subsequent action. The national government decides on stage two upon payments to regions, henceforth called vertical grants. This decision requires setting the national tax rate on capital. Simultaneously regions choose their tax rate for public good provision in the second period. All jurisdictions therefore act as Nash competitors. When setting tax rates, regions can be involved in a horizontal equalisation scheme specified below. They perfectly anticipate the functioning of the scheme. On the last stage households meet their consumption-savings decision.

The model is solved using backwards induction. The household's decision has been deduced above. Subsequently we turn to stage two to disclose the national government's incentive to grant payments. Concluding we uncover the opportunistic behaviour of the regional government. In doing so we differentiate cases without and with specific equalisation schemes.

2.2 The incentive to bail out

How tax competition of decentralised jurisdictions can harden the budget constraint has been uncovered by Breuillé et al. (2006).⁹ We shortly review their insights, that

⁸This model is consistent with Breuillé et al. (2006). Some minor mistakes are amended, such as the imprecise distinction between regional savings S_i and regional capital supply S^i .

⁹Cf. Qian and Roland (1998), who discuss the soft budget problem within a simple model of jurisdictional decentralisation without tax competition.

is to begin with, there is no equalisation scheme: $\beta_1^i = \beta_2^i = 0 \quad \forall i$. This scenario will serve as the base case for the following analysis. A soft budget constraint arises, when the national government responds to increased debt financed provision of public goods through regional governments by increasing vertical grants. The inability of the national government to commit to a no-bailout-policy is at the heart of the soft budget phenomenon. A region's decision upon fiscal policy is deterred if it can expect additional payments afterwards. In this model a hard budget constraint is denoted by $\frac{\partial T_{i2}}{\partial B_{i1}} = 0$. The inequality $\frac{\partial T_{i2}}{\partial B_{i1}} > 0$ on the other hand induces regional opportunistic behaviour.

This positive model entails a soft budget constraint solely due to the order of action. It doesn't contribute to the explanation of the phenomenon why a government cannot commit to a no-bailout-policy, but it helps to identify institutional arrangements fostering the extent of the problem. The national government's incentive to grant payments follows from the maximisation of the welfare function

$$\max_{\mathbf{T}_2} \sum_{i=1}^n [u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2})] \quad (16)$$

s.t.

$$c_{i1} = \bar{w}_i - S_i(\rho) \quad (17)$$

$$c_{i2} = (1 + \rho) S_i \quad (18)$$

$$G_{i1} = T_{i1} + B_{i1} \quad (19)$$

$$G_{i2} = T_{i2} + \tau_i S_i^i - (1 + r_i) B_{i1} \quad (20)$$

$$\sum_{i=1}^n T_{i2} = \tau_c \sum_{i=1}^n S_i \quad (21)$$

$$\forall i = 1, \dots, n.$$

Using transfers \mathbf{T}_2 as instruments the capital tax rate τ_c is deduced through the budget constraint (21). First order conditions of an interior solution are:

$$\frac{\partial u_i}{\partial G_{i2}} = \frac{\partial u_j}{\partial G_{j2}} \quad \forall j \neq i. \quad (22)$$

The national government chooses transfers to equate marginal utilities from the provision of second period public goods across regions. This corresponds to the common result in fiscal federalism. This solution serves to uncover the national government's reaction to an increase in regional borrowing. The reaction function

is given by¹⁰

$$\frac{dT_{i2}}{dB_{i1}} = 1 + r_i. \quad (23)$$

The national government increases transfers to borrowing jurisdictions. Additional debt and interest payments due are balanced through additional vertical grants. This guarantees equating marginal utility of public consumption. But the national government must increase their tax rate on capital to finance the bailout payment. Using (9) and (11) net return ρ decreases, the marginal productivity of capital r_i increases and capital demand declines. Finally interest on debt increases. This in turn can induce regions to lower their provision of public goods in the first period too. To make up for these externalities, the national government may be inclined to reduce grants to all regions $j \neq i$. The increase of interest payments on debt affects all regions including region i , hence also punishing the culprit region.

2.3 The regional government's opportunistic behaviour with tax competition

The soft budget constraint Turning to the first stage, regional governments choose public good bundles. The regional government maximises the representative's household utility

$$\max_{B_{i1}, \tau_i} u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2}) \quad (24)$$

s.t. eq. (17), (18), (19), (20), (21), (23). The first order conditions yield:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= \left[(1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} \right] + \frac{dr_i}{d\tau_c} \frac{B_{i1}}{\sum_{j=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \frac{-\frac{dr_i}{d\tau_i} B_{i1} + S_i \frac{d\rho}{d\tau_c}}{\sum_{j=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}}. \end{aligned} \quad (25)$$

The left hand side of eq. (25) denotes the marginal rate of substitution between public good consumption in the first and second period. The right hand side denotes the marginal rate of transformation and therefore the price of borrowing. The higher the price, the lower public borrowing and public good provision in period one. As discussed before, the national government increases transfers to regions with higher debt. At the same time, transfers to all other regions are lowered to make up

¹⁰Cf. Breuillé et al. (2006), p. 234.

for negative externalities of capital taxation. The sign of the sum of all adjusted transfers to the regions $\sum_j \frac{dT_{j2}^*}{dB_{i1}}$ is ambiguous. In accordance with Goodspeed (2002, pp. 414f.), we consider the case of an increased sum of vertical grants $\sum_j \frac{dT_{j2}^*}{dB_{i1}} > 0$.¹¹

The deviation from the hard-budget-policy A hard-budget-policy requires that no region can expect bailouts. In turn this affords a national government not reacting to higher deficits by local governments: $\frac{dT_{i2}}{dB_{i1}} = \frac{dT_{j2}}{dB_{i1}} = 0 \forall j \neq i$. The price of borrowing to regional governments is given by $\frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} = 1 + r_i$. Therefore three effects determine the softness of the budget constraint in eq. (25):

- The terms in brackets include the original price of borrowing $1 + r_i$ and the reaction function of the national government. Following eq. (23) this effect vanishes. This effect sincerely softens the budget constraint.
- The second term denotes the “common pool effect” of taxation. Higher transfer payments induced by higher borrowing afford an adjustment of the national tax rate on capital. This influences capital demand, the net return on capital diminishes while the before-tax interest rate r_i increases. This vertically induced effect increases the price of borrowing and therefore hardens the budget constraint.
- The third term denotes the “tax base sharing effect”. The common tax base induces regions to anticipate national government’s policy when setting taxes. An increase of the national tax rate on capital reduces the tax base to all regions. To make up for these externalities regions adjust tax rate in return. Since regions compete for mobile capital an increase in tax revenue is either achievable by higher tax rates or lower tax rates when broadening tax base. Therefore tax setting depends on the fierceness of horizontal tax competition. Tax setting influences tax base as well as the price of borrowing by changing the before-tax interest rate r_i . The sign of $\frac{dr_i}{dr_i}$ is undetermined. Therefore the tax base sharing effect on the price of borrowing is ambiguous.

All in all, the deviation from the hard budget depends on the extent of horizontal tax competition.

¹¹This assumption holds for all subsequently analysed cases.

2.4 The regional government's opportunistic behaviour without tax competition

Breuil  et al. (2006) uncover how tax competition effects the softness of the regional budget constraint. If capital is immobile, regions do not compete in taxes. Regional or national tax on capital does not alter the demand for capital, the marginal productivity of capital is non-varying $\frac{dr_i}{d\tau_i} = \frac{dr_i}{d\tau_c} = 0$. The net return on capital does not react different to tax setting of regional or national authorities. Savings cannot evade to other regions, that is $\frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} = 1$. Incorporating the no tax competition assumptions the price of borrowing is given by

$$\frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} = \left[(1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} \right] + \frac{S^i}{\sum_{j=1}^n S_j} \sum_j \frac{dT_{j2}^*}{dB_{i1}}. \quad (26)$$

Again the term in brackets vanishes due to eq. (23). Hence, Breuil  et al. (2006) conclude that tax competition hardens the budget constraint if the right hand side of eq. (25) is smaller than the right hand side of eq. (26):

$$\begin{aligned} & \frac{dr_i}{d\tau_c} \frac{B_{i1}}{\sum_{j=1}^n S_j} \sum_j \frac{dT_{j2}^*}{dB_{i1}} + \frac{-\frac{dr_i}{d\tau_i} B_{i1} + S^i \frac{d\rho}{d\tau_c}}{\sum_{j=1}^n S_j \frac{d\rho}{d\tau_i}} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ & > \frac{S^i}{\sum_{j=1}^n S_j} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \end{aligned} \quad (27)$$

This simplifies to $S^i > B_{i1}$.

When regional debt is lower (higher) than the regional tax base, tax competition hardens (softens) the budget constraint.¹² As long as debt is fairly low, regions cultivate their tax base. A burden on their tax base – induced through the ‘‘common pool effect’’ following higher debt – is to be avoided. But if debt exceeds tax base excessive borrowing is beneficial. Cultivating tax base is no priority. The result suggests to settle for a debt ceiling in order to foster regional fiscal discipline.

We now turn to the question, how a horizontal fiscal equalisation scheme effects regional borrowing incentives within this framework. The paper takes account of three different fiscal equalisation schemes: revenue equalisation representing Germany's constitutional design; tax base equalisation representing Canada's federal-provincial fiscal arrangements; and expenditure equalisation. We analyse these cases in order of appearance.

¹²Cf. Breuil  et al. (2006), p. 235.

3 Tax revenue equalisation

Tax revenue equalisation is the key characteristic of the German fiscal constitution. We take account of the German formula in a simplifying manner within the model discussed above.¹³ We consider a (partial) equalisation of capital tax revenue. In the period of taxation all regions are involved in a horizontal scheme $\beta_{2,faq}$ also applied by Köthenbürger (2002) and Baretta et al. (2002).¹⁴ Transfer payments for region i in the second period amount to¹⁵

$$\beta_{2,faq}^i = \alpha \left(\frac{1}{n} \sum_{j=1}^n \tau_j S^j - \tau_i S^i \right). \quad (28)$$

The intensity of equalisation is given by rate $\alpha \in [0, 1]$. S^j denotes tax base of region j and τ_j denotes the regional tax rate on capital. Horizontal grants for a region eligible for compensation amounts to the intensity rate multiplied with the deviation of the mean tax revenue $\frac{1}{n} \sum_{j=1}^n \tau_j S^j$ from the region's own tax revenue $\tau_i S^i$. This net scheme is revenue neutral, that is $\sum_{j=1}^n \beta_{2,faq}^j = 0$ holds. Regions with below average tax revenue receive grants, while regions with above average tax revenue are due to contribute payments. The second period public budget of a region is now given by

$$G_{i2} = T_{i2} + \tau_i S^i - (1 + r_i) B_{i1} + \alpha \left(\frac{1}{n} \sum_{j=1}^n \tau_j S^j - \tau_i S^i \right). \quad (29)$$

The sequence of action is unchanged. On the second stage, the national government's incentives to bail out borrowing regions is determined. The first order conditions of an interior solution are given by

$$\frac{\partial u_i}{\partial G_{i2}} = \frac{\partial u_j}{\partial G_{j2}} \quad \forall j \neq i.$$

The national government distributes vertical transfers to equate marginal utility arising from public good consumption in the second period across regions. The reaction function of the national government following an increase in public borrowing of region k is obtained through implicit differentiation of the optimality conditions.

¹³For a classification of fiscal horizontal equalisation schemes and their basic disincentive effects see Musgrave (1961).

¹⁴The subscript *faq* denotes “*Finanzausgleich*”, the German terminology of the horizontal fiscal equalisation scheme.

¹⁵In the first period $\beta_{1,faq}^i = 0 \quad \forall i$ holds.

In accordance with eq. (23) the reaction function is unaltered.

$$\frac{dT_{i2}}{dB_{i2}} = 1 + r_i.$$

The national government increases vertical grants to borrowing regions to account for their optimality conditions. Additional debt and interest payments due are completely compensated through vertical grants.

3.1 Tax competition

The regional government maximises the representative household's utility function

$$\max_{B_{i1}, \tau_i} u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2})$$

s.t. (17), (18), (19), (29), (21), (23). The first order conditions yield:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= \left[(1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} \right] + \frac{dr_i}{d\tau_c} \frac{B_{i1}}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \frac{S^i - \frac{dr_i}{d\tau_i} B_{i1} \frac{d\rho}{d\tau_c}}{\sum_{i=1}^n S_i \frac{d\rho}{d\tau_i}} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \alpha \frac{1 - n}{n} \frac{d\rho}{d\tau_c} \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}}. \end{aligned} \quad (30)$$

We are thus able to state the following proposition:

Proposition 1 *Tax revenue equalisation softens the budget constraint under tax competition. The price of borrowing decreases with an increase in the intensity of equalisation rate α .*

Proof. Subtracting the price of borrowing faced by region i if involved in a tax revenue equalisation scheme from the price of borrowing without fiscal equalisation by eq. (25) leaves only a single term. Due to $1 - n < 0$ the term is negative and therefore lowers the price of borrowing. The lower price induces regions to increase their provision of public goods in the first period through an increase in deficit. The intensity rate α amplifies the effect, independent of the region being a net payer or

net recipient. Differentiating the right hand side of eq. (30) with respect to α yields:

$$\frac{1 - n \frac{d\rho}{d\tau_c} S^i}{n \frac{d\rho}{d\tau_i} \sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} < 0$$

$$\forall n > 1.$$

The price of borrowing declines with an increase in the intensity rate. ■

This result shows that a tax revenue scheme has negative effects on fiscal discipline. Tax financing public goods is complicated because additional revenue is “taxed” by the equalisation scheme. To finance one additional Euro of public goods, tax revenue must increase by $\frac{1}{1-\alpha} > 1$ Euro (neglecting the effect on average tax revenue). Hence, we can conclude: the price of public goods provided through additional taxation increases if states are involved in a tax revenue equalisation scheme. Regions substitute period two public good provision, financed by taxation (and grants), with increased public provision in the first period, which is financed by additional borrowing. The “tax” on tax revenue is responsible for this disincentive effect. Increased vertical grants in the second period makes repaying debt burdens even more affordable.

Public goods are preferably financed by bailout payments from the national government. An increase of the regional tax rate within an tax revenue equalisation scheme results in higher payments for net payer or lower (horizontal) grants for net recipients. The region acts opportunistic when setting low tax rates and borrowing more. Because the national government cannot deny payments ex post to equate marginal utility from public consumption, regions are induced to miss out on fiscal discipline. The price of borrowing decreases with stronger horizontal tax competition, that is the higher the capital elasticity.

3.2 Without tax competition

To account for German circumstances, the analysis neglecting (strong) tax competition is of greater importance. If capital is immobile, regions do not compete in taxes. Regional or national tax on capital does not alter the demand for capital, the marginal productivity of capital is non-varying and $\frac{dr_i}{d\tau_i} = \frac{dr_i}{d\tau_c} = 0$ holds. The net return on capital does not react different to tax setting of regional or national authorities, that is $\frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} = 1$ holds. Incorporation the no tax competition assumptions

into eq. (30) reduces the price of borrowing to

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= \left[(1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} \right] + \frac{1}{n} \frac{S^i}{\frac{1}{n} \sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \frac{1}{n} \left(\alpha \frac{1-n}{n} \right) \frac{S^i}{\frac{1}{n} \sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}}. \end{aligned} \quad (31)$$

We are thus able to state the following proposition:

Proposition 2 *Tax revenue equalisation softens the budget constraint without tax competition. The price of borrowing decreases with an increase in the intensity of equalisation rate α , and with decrease in the (relative) tax base.*

Proof. Subtracting the price of borrowing faced by region i if involved in a tax revenue equalisation scheme according to eq. (31) from the price of borrowing without fiscal equalisation by eq. (26) leaves only a single term. Due to $1 - n < 0$ the term is negative and therefore lowers the price of borrowing. The lower price induces regions to increase their provision of public goods in the first period through deficit spending.

$$\begin{aligned} \left(1 + \frac{\alpha(1-n)}{n} \right) \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} &< \frac{S^i}{\sum_{j=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ \alpha(1-n) &< 0. \end{aligned}$$

The intensity rate α amplifies the effect, independent of the region being a net payer or net recipient. Differentiating the right hand side of eq. (31) with respect to α yields:

$$\frac{1-n}{n} \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} < 0.$$

Both conditions hold for $\forall n > 1$.

A marginal increase in the relative tax base increases the price of borrowing. Differentiating the right hand side of eq. (31) with respect to $\frac{S^i}{\frac{1}{n} \sum_{i=1}^n S_i}$ yields

$$\frac{1}{n} \left(1 + \alpha \frac{1-n}{n} \right) \sum_j \frac{dT_{j2}^*}{dB_{i1}} > 0,$$

which is positive, since $1 + \alpha \frac{1-n}{n} = \frac{(1-\alpha)n+\alpha}{n} > 0$ holds for $0 < \alpha < 1$. ■

Tax revenue equalisation exhibits negative effects on fiscal discipline independent of tax competition. The regions substitute the expensive provision of public goods

in the second period financed by taxation by increased borrowing to finance more public goods in the first period. Borrowing incentives rise with the intensity rate of the equalisation scheme.

A relative large tax base alleviates borrowing incentives. Although any region can externalise the debt burden on the national tax payer, a rich region with a large tax base will bear a larger share of the national tax burden than a poor region. This can analytically demonstrate the lower borrowing incentives of stronger economic powers.

Summing up, the analysis yields a debt incentive function

$$B_{i1} = B_{i1} \left(\alpha_i, \frac{S^i}{\frac{1}{n} \sum_{j=1}^n S_j} \right). \quad (32)$$

Theoretical reasoning suggests the partial derivative with respect to the intensity rate is positive and the partial derivative with respect to the relative tax base is negative. This model can offer theoretical support for Rodden’s (2003) statement: “[...] Germany’s complex, interdependent, collaborative style of federalism tends to dilute fiscal accountability and soften budget constraints.” (p. 164). And further on: “Perhaps the most important source of soft Land-level budget constraints in Germany is the Constitution itself. By simultaneously creating wide-ranging Land-level administrative autonomy, guaranteeing the equivalence of living conditions, and entrenching strong representation of the Länder in the federal policymaking process, the Constitution creates hurdles for the proper functioning of several fiscal discipline mechanisms.” (p. 181).

4 Tax base equalisation

Tax base equalisation is the key characteristic of the Canadian and to some extent of the Swiss federal fiscal arrangements. We take account of the Canadian formula in a simplifying manner within the model discussed above. We consider a (partial) equalisation of capital tax base. In the period of taxation all regions are involved in a horizontal scheme $\beta_{2,wka}$ also applied by Köthenbürger (2002) and Bucovetsky

and Smart (2006).¹⁶ Transfer payments for region i in the second period amount to¹⁷

$$\beta_{2,wka}^i = \alpha \bar{\tau} \left(\frac{1}{n} \sum_{j=1}^n S^j - S^i \right). \quad (33)$$

$\bar{\tau}$ represents a mean (regional) taxation rate:

$$\bar{\tau} = \frac{\sum_{j=1}^n \tau_j S^j}{\sum_{j=1}^n S^j}. \quad (34)$$

The institutional scheme equates differences in tax revenue resulting from different tax bases.¹⁸ The tax base serves an indicator of economic power. Regions with below (above) average tax bases are eligible (liable) to horizontal payments. These horizontal payments amount to the product comprising the mean taxation rate, the intensity of equalisation rate, and the deviation of the region's tax base from the mean tax base. A region having no own tax base is equipped with an average tax revenue. The equalisation scheme is revenue neutral, that is $\sum_{j=1}^n \beta_{2,wka}^j = 0$ holds.

The underlying economic-philosophic implication of this systems has been described by Musgrave (1961, p. 103): “[...] the societies of each state should be permitted to determine their own levels of fiscal activity, but [...] the central government should equalize the fiscal opportunities of the various states, or the potential levels which they might achieve with their own action.”

The regional public budget in the second period is now given by

$$G_{i2} = T_{i2} + \tau_i S^i - (1 + r_i) B_{i1} + \alpha \bar{\tau} \left(\frac{1}{n} \sum_{j=1}^n S^j - S^i \right). \quad (35)$$

The incentive of the national government to bailout borrowing regions is unaltered. Eq. (23) maintains its validity. To uncover borrowing incentives of the regional governments we turn immediately to the first stage, in which they decide upon the provision of public goods.

¹⁶The subscript *wka* denotes the abbreviation of “*Wirtschaftskraftausgleich*”, the German terminology of equalising economic power.

¹⁷In the first period $\beta_{1,wka}^i = 0 \forall i$ holds.

¹⁸Cf. Smart (2005) for a short description of the Canadian federal-provincial fiscal arrangements act.

4.1 Tax competition

The regional government maximises the representative household's utility

$$\max_{B_{i1}, \tau_i} u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2})$$

s.t. (17), (18), (19), (35), (21), (23). The first order conditions yield:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= (1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} + \frac{dr_i}{d\tau_c} \frac{B_{i1}}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} + \frac{S^i - \frac{dr_i}{d\tau_i} B_{i1} \frac{d\rho}{d\tau_c}}{\sum_{i=1}^n S_i \frac{d\rho}{d\tau_i}} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \alpha \left[S^i \frac{\frac{1}{n} \sum_{j=1}^n S^j - S^i \frac{d\rho}{d\tau_c}}{\left(\sum_{j=1}^n S^j\right)^2 \frac{d\rho}{d\tau_i}} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \right]. \end{aligned} \quad (36)$$

Eq. (36) shows the price of borrowing faced by region i . The higher the right hand side, the higher the cost of providing public goods in the first period. If the right hand side is low, the incentive to borrow is high. Therefore, the right hand side indicates the softness of the budget constraint. Subsequently we analyse the softness in comparison to the base case without fiscal equalisation and in comparison to the tax revenue equalisation scheme.

Base case without fiscal equalisation In comparison to the base case (eq. (25)) eq. (36) exhibits an additional term which can be of positive or negative sign. Therefore borrowing incentives may decrease or increase. The sign depends on the economic power of a region, which also decides upon the status of a region being net payer or net recipient. If a region exhibits a tax base S_i below average $\frac{1}{n} \sum_{j=1}^n S^j$ (net recipient), the sign becomes positive. This region is exposed to a higher price of borrowing. If a region exhibits a tax base above average (net payer), the sign becomes negative. This region is exposed to a lower price of borrowing.¹⁹

Proposition 3 *Tax base equalisation hardens (softens) the budget constraint for net recipients (payers) under tax competition. The intensity rate α amplifies the respective effect.*

¹⁹Interestingly, the European Stability and Growth Pact (Code of Conduct (2005)) envisages a mid-term budget rule for member states, which corresponds to the incentive scheme described. While low indebted countries and countries with a high growth potential are conceded with a deficit target of up to one percent of GNP, high indebted countries and countries with a lower growth potential are supposed to have a budget “close-to-balance or in surplus”.

Proof. Tax base equalisation softens the budget constraint if the price of borrowing by eq. (36) is lower than the price of borrowing without fiscal equalisation by eq. (25) :

$$\alpha \left[S^i \frac{\frac{1}{n} \sum_{j=1}^n S^j - S^i \frac{d\rho}{d\tau_c}}{\left(\sum_{j=1}^n S^j \right)^2} \frac{d\rho}{d\tau_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \right] < 0$$

$$S^i > \frac{1}{n} \sum_{j=1}^n S^j$$

The intensity rate softens the budget constraint if the right hand side of eq. (36) depends negatively on α and vice versa. The differentiated right hand side with respect to α is negative, only if

$$S^i > \frac{1}{n} \sum_{j=1}^n S^j$$

holds. Both conditions are met by net payers. The reverse holds for net recipients. They are exposed to a lower incentive to borrow. ■

The reason, that a region with a low tax base is exposed to a harder budget constraint, lies in the horizontal grants received from high tax base regions. As net recipients they are exposed to higher borrowing costs, which leads to a lower debt and a lower provision of public goods in the first period. Debt finances additional public goods in the first, taxation finances public goods in the second period. But first period debt effects on the one hand side second period horizontal transfer payments, due to the financing of bailout payments via the national tax on capital. Higher bailouts resulting in a higher national tax rate reduces the net return on capital affecting all tax bases in the federation. This happens independently of the status as net payer or net recipient.

On the other hand side taxation in the second period effects transfer payments differently depending on the status. Net recipients can increase the mean tax rate, which they appreciate due to higher grants. Net payers suffer from an increase in the mean tax rate due to higher payments. Therefore, net recipients can easily finance public goods in the second period because higher taxation is not “taxed away” as under the tax revenue scheme. On the contrary, taxation is rewarded by additional grants from the rich regions. Net recipients are induced to higher tax setting and lower borrowing.

Net payers can lower the mean tax rate through a reduction in their own tax rate. They appreciate a low mean tax rate due to lower payments. Therefore net

payers are induced to lower tax setting and higher borrowing. The effect works solely through the mean tax rate. Should the regions falsely anticipate the mean tax rate being constant, no deviating borrowing incentives in comparison to the base case without fiscal equalisation arise.

The tax base equalisation scheme strengthens fiscal discipline in “poor” economic regions, due to their reliance upon horizontal grants from richer regions. This reminds of the work of Huber and Runkel (2008). They demonstrate the advantage of country-specific budget rules in a model of asymmetric information. Accordingly, net recipients should be imposed to harder budget rules. The tax base equalisation scheme implicitly induces these incentives.

Base case tax revenue equalisation Net recipients are exposed to lower borrowing incentives in a tax base equalisation scheme in comparison to the base case without a fiscal equalisation scheme. Because the tax revenue equalisation exhibits higher borrowing incentives independently of the status of a region, net recipients are also exposed to lower borrowing incentives in a tax base equalisation scheme in comparison to the tax revenue scenario. Which equalisation scheme yields higher borrowing incentives for net payers is yet to be named.

We are able to state the following proposition:

Proposition 4 *A tax base equalisation scheme hardens the budget constraint in comparison to a tax revenue equalisation scheme with tax competition independently of the status of a region as net payer or net recipient.*

Proof. Tax base equalisation hardens the budget constraint, if the price of borrowing according to eq. (36) is higher than the price of borrowing according to eq. (30):

$$\alpha S^i \frac{\frac{1}{n} \sum_{j=1}^n S^j - S^i \frac{d\rho}{d\tau_c}}{\left(\sum_{j=1}^n S^j\right)^2} \frac{d\rho}{d\tau_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} > \alpha \frac{1-n}{n} \frac{d\rho}{d\tau_c} \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}}$$

$$\frac{S^i}{\sum_{j=1}^n S^j} < 1.$$

As long as a region cannot attract all mobile capital, borrowing incentives are always lower in a tax base equalisation scheme. ■

The tax base equalisation scheme is the incentive friendly alternative to the tax revenue equalisation scheme. The reason is found in the missing “tax” on tax

revenue. Additional tax revenue remains ceteris paribus in the source region. Still, the effect on the mean tax rate does distort borrowing incentives.

4.2 Without tax competition

To account for German circumstances, the analysis neglecting tax competition is of greater interest. But due to the results obtained above, which were not dependent on the extent of tax competition, all insights remain unchanged. Without tax competition $\frac{dr_i}{d\tau_i} = \frac{dr_i}{d\tau_c} = 0$ and $\frac{d\rho}{d\tau_c} = \frac{d\rho}{d\tau_i}$ holds. The price of borrowing according to eq. (36) simplifies to:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= (1 + r_i) - \frac{dT_{i2}^*}{dB_{i2}} + \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &+ \alpha \left[\frac{S^i \frac{1}{n} \sum_{j=1}^n S^j - S^i}{\left(\sum_{j=1}^n S^j\right)^2} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \right]. \end{aligned} \quad (37)$$

Base case without fiscal equalisation

Proposition 5 *Tax base equalisation hardens (softens) the budget constraint for net recipients (payers) without tax competition. The intensity rate α amplifies the respective effect.*

Proof. Tax base equalisation softens the budget constraint if the price of borrowing by eq. (37) is lower than the price of borrowing without fiscal equalisation by eq. (26):

$$\begin{aligned} \alpha \left[\frac{S^i \frac{1}{n} \sum_{j=1}^n S^j - S^i}{\left(\sum_{j=1}^n S^j\right)^2} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \right] &< 0 \\ S^i &> \frac{1}{n} \sum_{j=1}^n S^j \end{aligned} \quad (38)$$

The intensity rate softens the budget constraint if the right hand side of eq. (37) depends negatively on α and vice versa. The differentiated right hand side with respect to α is negative, only if

$$S^i > \frac{1}{n} \sum_{j=1}^n S^j$$

holds. Both conditions are met by net payers. The reverse holds for net recipients. They are exposed to a lower incentive to borrow. ■

Base case tax revenue equalisation The comparison of the incentive structure of a tax base equalisation to a tax revenue equalisation without tax competition yields the following proposition:

Proposition 6 *A tax base equalisation scheme hardens the budget constraint in comparison to a tax revenue equalisation scheme without tax competition independently of the status of a region as net payer or net recipient.*

Proof. Tax base equalisation hardens the budget constraint, if the price of borrowing according to eq. (37) is higher than the price of borrowing according to eq. (31):

$$\alpha S^i \frac{\frac{1}{n} \sum_{j=1}^n S^j - S^i}{\left(\sum_{j=1}^n S^j\right)^2} \sum_j \frac{dT_{j2}^*}{dB_{i1}} > \alpha \frac{1-n}{n} \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}}$$

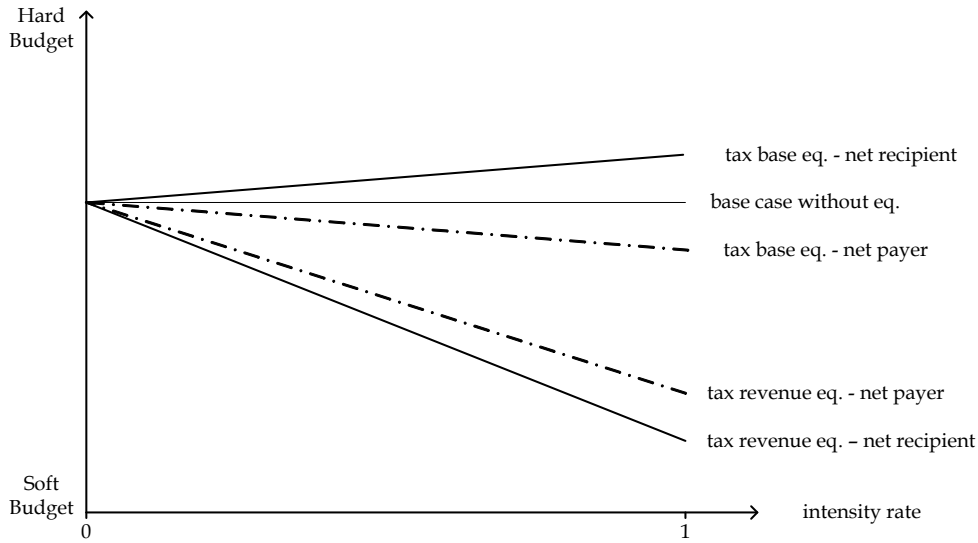
$$\frac{S^i}{\sum_{j=1}^n S^j} < 1.$$

As long as a region cannot attract all mobile capital, borrowing incentives are always lower in a tax base equalisation scheme. ■

These results allow for a ranking of borrowing incentives. Figure (1) illustrates the softness of the budget constraint with respect to the intensity of equalisation rate α . A “hard budget” exhibits low, and a ”soft budget” exhibits high borrowing incentives. The graphs distinguish between net payers and net recipients.

Tax revenue softens the budget constraint in comparison to the base case without fiscal equalisation. The effect increases in the intensity of equalisation rate. Net recipients are exposed to higher borrowing incentives, due to the circumstance that bailouts are financed to a greater share by the “rich” regions. Tax base equalisation exposes net recipients to lower borrowing incentives and net payers to higher borrowing incentives in comparison to the base case without fiscal equalisation. The budget constraint under tax base equalisation is in any case harder than under tax revenue equalisation.

Figure 1: Fiscal equalisation and the soft budget constraint



5 Expenditure equalisation

Groneck and Plachta (2008) offer an alternative horizontal equalisation scheme which intends to establish a debt brake in fiscal equalisation. This part assesses the theoretical reasoning of the scheme. The advisory council at the Department of the Treasury in Germany discussed the possibility to reform budget rules and prohibit the development of budgetary crisis by levying a due from all regional governments proportional to their deficit.²⁰ This corresponds to a tax on debt.²¹ A further proposal by Söllner (2000) suggests to accompany the Maastricht criteria on state level by a fiscal equalisation scheme incorporating not only tax revenue but also borrowing potential (p. 17).

On the basis of these inspirations we will subsequently analyse, how the inclusion of debt in a German type of equalisation scheme effects borrowing incentives. Equalising all state originating financial resources corresponds to equalising expenditure, hence we shall call this scheme expenditure equalisation for the ease of writing.²² The mechanism of the rule is the following: states with above average deficit – at equal tax revenue – are liable to higher payments (if net payer) or have to abstain from a share of grants (if net recipient). This analysis is focused on the question, in how far the soft-budget-phenomenon is affected.

²⁰Cf. Wissenschaftlicher Beirat beim Bundesministerium der Finanzen (2005), p. 25.

²¹Stähler (2007) discusses a similar proposal, whereby increased borrowing is necessarily accompanied by increased taxation.

²²This is technically not correct, due to the neglect of vertical grants.

A transfer system β_{sfa} is integrated into the base model presented above.²³ In contrast to the schemes already analysed, it is now necessary to consider first period equalisation. First period transfers – at equal exogenous revenue T_{i1} in all regions $i = 1, \dots, n$ – are given by

$$\begin{aligned}\beta_{1,sfa}^i &= \alpha \left(\frac{1}{n} \sum_{j=1}^n D_{1j} - D_{1i} \right) \\ &= \alpha \left(\frac{1}{n} \sum_{j=1}^n B_{1j} - B_{1i} \right),\end{aligned}\tag{39}$$

whereas deficit D_1 corresponds to the debt level at the end of the first period B_1 . Thus, in the first period deficits are (partially) equalised across states. Above average deficits are “taxed” with rate α .

Transfer payments in the second period are given by

$$\begin{aligned}\beta_{2,sfa}^i &= \alpha \left(\frac{1}{n} \sum_{j=1}^n (\tau_j S^j + D_{2j}) - (\tau_i S^i + D_{2i}) \right) \\ &= \alpha \left(\frac{1}{n} \sum_{j=1}^n (\tau_j S^j - B_{1j}) - (\tau_i S^i - B_{1i}) \right),\end{aligned}\tag{40}$$

whereas budget must be balanced after the second period with no debt being passed on. Second period deficit is therefore equal to the negative debt level at the end of period one $D_{2k} = -B_{1k}$. $\forall k$. In the second period expenditure is partially equalised.

The public budget constraint in period one amounts to:

$$G_{i1} = T_{i1} + B_{i1} + \alpha \left(\frac{1}{n} \sum_{j=1}^n B_{1j} - B_{1i} \right).\tag{41}$$

The public budget constraint in period two amounts to:

$$\begin{aligned}G_{i2} &= T_{i2} + B_{i1} + \tau_i S^i - (1 + r_i) B_{i1} \\ &\quad + \alpha \left(\frac{1}{n} \sum_{j=1}^n (\tau_j S^j - B_{1j}) - (\tau_i S^i - B_{1i}) \right).\end{aligned}\tag{42}$$

The incentive of the national government to bail out borrowing regions is unaltered. Eq. (23) maintains its validity. To uncover borrowing incentives of the regional governments we turn immediately to the first stage, in which they decide upon the provision of public goods.

²³The subscript *sfa* denotes the abbreviation of “*Schuldenbremse im Finanzausgleich*”, a German name advertising the scheme.

5.1 Tax competition

The regional government maximises the representative household's utility function

$$\max_{B_{i1}, \tau_i} u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2})$$

s.t. (17), (18), (41), (42), (21), (23). The first order conditions yield:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= \frac{n}{(1-\alpha)n + \alpha} \left[(1+r_i) - \frac{dT_{i2}^*}{dB_{i2}} + \frac{dr_i}{d\tau_c} \frac{B_{i1}}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \right. \\ &\quad + \frac{S^i - \frac{dr_i}{d\tau_i} B_{i1}}{\sum_{i=1}^n S_i} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &\quad \left. + \alpha \frac{1-n}{n} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} + \alpha \frac{1-n}{n} \right]. \end{aligned} \quad (43)$$

In comparison to the base case without fiscal equalisation two terms inside the square brackets and one factor outside have emerged. The second to last term inside the square brackets replicates the negative tax revenue equalisation effect, as described in section 3. Tax revenue equalisation increases the price of tax financed provision of public goods. Regions substitute expensive second period public consumption by first period consumption financed by borrowing. The last term in square brackets is also negative, due to $n > 1$. This effect results from repaying debt in the second period. High deficits in the first period result in low possible expenditure in the second period. This effect is in turn partially offset due to higher demands to the equalisation system resulting in higher grants for net recipient or lower payments for net payer states. The square brackets are multiplied with the factor $\frac{n}{(1-\alpha)n + \alpha} > 1 \forall n > 1, \forall 0 < \alpha < 1$. This last effect increases the price of borrowing.

The effect of the intensity of equalisation rate α is ambiguous.

Proposition 7 *Expenditure equalisation hardens (softens) the budget constraint if tax competition effects are strong (weak).*

Proof. Expenditure equalisation hardens the budget constraint, if the price of borrowing by eq. (43) is higher than the price of borrowing without equalisation by

eq. (25). This is true for

$$\left[\frac{dr_i}{d\tau_c} - \frac{dr_i}{d\tau_i} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} \right] \frac{B_{i1}}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} > 1. \quad (44)$$

■

Two effects determine the result: the “common pool effect” through $\frac{dr_i}{d\tau_c}$ and the “tax base sharing effect” through $\frac{dr_i}{d\tau_i} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}}$. The former reflects the influence of higher vertical grants (bailouts) due to increased borrowing, which affects the national tax rate on capital. This in turn affects capital demand, net return on capital decreases, the before-tax interest rate r_i increases. This vertical effect increases the price of borrowing, thus hardens the budget constraint. The latter effect is ambiguous due to multiple interactions, that is no clear cut prediction is possible, how regions alter their tax rates in expectation of the adjustment of the national tax rate on capital.²⁴ If horizontal tax externalities are strong, that is an increase in the regional tax rate results in a high outflow of tax base and a large increase in the before-tax interest rate r_i , the region will want to choose a moderate increase or even a reduction of their tax rate. Then $\frac{dr_i}{d\tau_c} - \frac{dr_i}{d\tau_i} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} > 0$ holds and the debt brake would work. If horizontal tax competition is weak, that is an increase in the regional tax rate results in a fairly low outflow of tax base and a moderate increase in the before-tax interest rate r_i , the region could be induced to choose a strong increase of their tax rate. Then $\frac{dr_i}{d\tau_i} \frac{\frac{d\rho}{d\tau_c}}{\frac{d\rho}{d\tau_i}} > \frac{dr_i}{d\tau_c}$ holds and the debt brake falls short of its name. As long as the “tax base sharing effect” doesn’t compensate the “common pool effect” expenditure equalisation hardens the budget constraint.

5.2 Without tax competition

Without tax competition holds. $\frac{dr_i}{d\tau_i} = \frac{dr_i}{d\tau_c} = 0$ and $\frac{d\rho}{d\tau_c} = \frac{d\rho}{d\tau_i}$. The price of borrowing according to eq. (43) simplifies to:

$$\begin{aligned} \frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} &= \frac{n}{(1-\alpha)n + \alpha} \left[(1+r_i) - \frac{dT_{i2}^*}{dB_{i2}} \right. \\ &+ \left(1 + \alpha \frac{1-n}{n} \right) \frac{S^i}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} \\ &\left. + \alpha \frac{1-n}{n} \right]. \end{aligned} \quad (45)$$

²⁴See section 2.3.

Proposition 8 *Expenditure equalisation softens the budget constraint without tax competition.*

Proof. Eq. (44) simplifies to

$$[0] \cdot \frac{B_{i1}}{\sum_{i=1}^n S_i} \sum_j \frac{dT_{j2}^*}{dB_{i1}} > 1.$$

This is a contradiction. Therefore, expenditure equalisation cannot harden the budget constraint. ■

6 Conclusion

This paper tackles the question which effects a fiscal equalisation scheme exerts on debt policy of sovereign regional governments. Tax revenue equalisation softens the budget constraint of a government independent of the status as net payer or net recipient. Borrowing incentives increase with the intensity rate and decrease with the relative tax base. Tax base equalisation hardens the budget constraint for net recipients in comparison to no fiscal equalisation. In turn it softens the budget constraint for net payers. Incentives to debt finance public goods are always lower under tax base equalisation in comparison to tax revenue equalisation. All results are independent of the intensity of tax competition. A third equalisation scheme, comprising tax revenue and deficits, can serve as a scheme to reduce borrowing incentives if horizontal tax competition is strong. Empirical testing is left for further research.

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