Does tax competition soften regional budget constraint?

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Abstract

This paper analyses the impact of both horizontal and vertical tax competition on central government transfers towards regions as well as on the softness of the regional budget constraint. We show that tax interactions have no impact on the optimal central government grant whereas it hardens the regional budget constraint when the regional debt is not too heavy.

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1 Introduction

This paper studies the impact of horizontal and vertical tax competition on both regional and central budgetary decisions in a federation. Following Rodden, Eskeland and Litvack (2003), soft budget constraint can be defined as "the situation when an entity (say, a province) can manipulate its access to funds in undesirable ways". Hence, the inability of the rescuer to generate expectations of no bailout entails a soft budget constraint. Only few recent papers deal with both public finance literature and soft budget constraint (see the survey on soft budget constraint by Kornai, Maskin and Roland (2003)). Qian and Roland (1998) show that fiscal decentralization together with tax-base mobility may serve as a commitment device to harden budget constraints of state-owned enterprises in increasing the opportunity cost of bailouts. However in their paper the federal government does not act as a player so that whether public enterprises constraints are hard or soft is derived exogenously. Goodspeed (2002) shows that transfers from higher layers of government to lower layers generally involve a "common pool" effect since a part of the bailout must be paid for through increased taxes and then shared by all the regions. He endogenously derives a bailout behaviour on the part of the central government but ignores tax interactions among governments since transfers are financed through an immobile and exogenous tax base.

Our paper contributes to both the literature on soft budget constraint and fiscal federalism. Indeed we set up a simple model of central government transfer decisions with inter-temporal regional budgetary decisions when both horizontal and vertical tax externalities are at work. In that sense, our model is in line with Keen and Kotsogiannis (2002). The former externality results from horizontal tax competition among regions to attract mobile capital, the later arises from the co-occupation of the same tax base by central and regional governments (called vertical tax competition as well). We find that the benevolent central government is always inclined to increase grants in response to

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regional government borrowing (soft budget constraint) since it allocates grants in order to equalize marginal utilities of second period local public good consumption across the federation. Furthermore, tax interactions have no effect on the central government transfer behaviour whereas they harden the inter-temporal local budget constraint when the debt is not too heavy.

The paper is organized as follows. The next section outlines the basic model. The last section presents the results of the central and regional governments' decisions.

2 The Model

We consider a federation comprising a State, run by a central government and n regions governed by n regional governments. They interact in a two-period model. The regional governments move first and play as Nash competitors. They simultaneously choose their level of borrowing in period 1 (B_{i1}) and their tax rate in period 2 (τ_i) taking into account the reaction function of the central government to their choice of borrowing in period 1. Second, the central government chooses the level of transfers granted to regions in period 2 (g_{i2}). This sequence of actions means that the regional governments act as Stackelberg leaders *vis-à-vis* the central government. Finally, the representative consumer who is assumed to be immobile chooses between consumption and savings. As a result, there are three types of strategic tax interactions in this federation, coming from (i) a top down (or "common pool") vertical externality, (ii) a bottom up (or "tax base sharing") vertical externality and (iii) an horizontal (or tax competition) externality. We solve the model by backward induction.

2.1 Consumers

The utility of the representative two-period lived consumer of region i depends on the regional public good (G_{i1}, G_{i2}) and private good (c_{i1}, c_{i2}) consumptions:

$$U_i(G_{i1}, G_{i2}, c_{i1}, c_{i2}) = u_i\left(G_{i1}\right) + \delta u_i\left(G_{i2}\right) + w_i\left(c_{i1}\right) + \delta w_i\left(c_{i2}\right) \tag{1}$$

where $\delta \in [0,1]$ is a discount factor. At the first period, the region i's representative consumer is endowed with $\bar{w}_i$ units of good when young which she allocates between private consumption and savings:

$$\bar{w}_i = c_{i1} + S_i \tag{2}$$

where $S_i = s_i^i + \sum\limits_{j \neq i} s_i^j$ with $s_i^i \geq 0$ and $\sum\limits_{j \neq i} s_i^j \geq 0$. s_i^i stands for home investments whereas $\sum\limits_{j \neq i} s_i^j$ represents the investments made in the foreign regions. When old she consumes the proceeds of her savings:

$$c_{i2} = \sum_{j=1}^{n} \left(1 + r_j - \tau_j - \tau^c\right) s_i^j \tag{3}$$

where τ_j is the tax rate applied on savings by the government of region j and τ^c by the central government. Governments levy taxes according to the source principle[1]. Savings invested in region j is remunerated at the before-tax interest rate r_j.

The consumer maximises her utility (1) under her budget constraints (2) and (3). Integrating the arbitrage condition, the inter-temporal budget constraint of the consumer is $\overline{w}_i = c_{i1} + \frac{c_{i2}}{1+\rho}$. The optimality condition is given by $\left(\frac{\partial w_i}{\partial c_{i1}} / \frac{\partial w_i}{\partial c_{i2}}\right) = (1+\rho)\,\delta$.

[1] There are two polar principles of interjuridictional taxation: the residence (of the taxpayer) principle and the source (of income) principle. The source principle implies that all incomes originating in a region are taxed in this region regardless of the region of residence of the taxpayers.

2.2 Regional governments

Each regional government aims at maximising the utility function U_i of the representative consumer located in its region. At the first period the region i regional public good (G_{i1}) is financed by an exogenous central grant (g_{i1}) and borrowing (B_{i1}):

$$G_{i1} = g_{i1} + B_{i1} \tag{4}$$

At the second period the regional public good (G_{i2}) and the repayment of the regional public debt is financed on the one hand by the national transfers (g_{i2}) and on the other hand by the revenue of regional taxes:

$$G_{i2} = g_{i2} + \tau_i \sum_{j=1}^{n} s_j^i - (1 + r_i) B_{i1} \tag{5}$$

where $\sum_{j=1}^{n} s_j^i$ stands for the amount of investments made in region i.

2.3 Central government

The central government acts only in period 2. It is assumed to be benevolent and maximizes $W_i = \sum_{i=1}^{n} U_i$. The transfers granted to regions (g_{i2}) constitute its strategic variable. Its budget constraint is always balanced through the collection of taxes on national savings:

$$\sum_{i=1}^{n} g_{i2} = \tau^c \sum_{i=1}^{n} S_i = \tau^c \sum_{i=1}^{n} \sum_{j=1}^{n} s_i^j \tag{6}$$

2.4 Capital market

In each region a firm produces a good consumed by the representative agent of this region. The production function is $f(k_i)$ where k_i represents the stock of capital of region i. f is such that $f(k_i) \geq 0$, $f'(k_i) \geq 0$, $f''(k_i) < 0$ for $k_i > 0$. At the first period, the capital stock is given and denoted $\bar{k}$. The first-order condition of the firm is $1 + r_i = f'(k_i)$.

For each region i, the amount of capital k_i equalizes the total amount of savings $\sum_{j=1}^{n} s_j^i$ invested in the region. The capital market clearing condition of the federation is: $\sum_{i=1}^{n} k_i = \sum_{i=1}^{n} \sum_{j=1}^{n} s_i^j$.

The mobile capital relocates until it earns the same posttax return ρ in each region. The arbitrage condition on the capital market is given by

$$\rho = r_i - \tau_i - \tau^c = r_j - \tau_j - \tau^c \qquad \forall\, i, j \text{ and } i \neq j \tag{7}$$

which implicitly defines the demand for capital in region i as $k_i = K_i(\rho + \tau_i + \tau^c)$ with $K' = \frac{1}{f''} < 0$.

The national capital market clearing condition implies $\sum_{i=1}^{n} K_i(\rho + \tau_i + \tau^c) = \sum_{i=1}^{n} S_i(\rho)$.

Then the net return is a decreasing function of the aggregated tax rate[2]:

$$\frac{d\rho}{d\tau_i} = \frac{K_i'}{\sum_{i=1}^{n} S_i'(\rho) - \sum_{i=1}^{n} K_i'} < 0 \text{ and } \frac{d\rho}{d\tau^C} = \frac{\sum_{i=1}^{n} K_i'}{\sum_{i=1}^{n} S_i'(\rho) - \sum_{i=1}^{n} K_i'} \in [-1, 0]$$

[2] These results are equivalent to those of Keen & Kotsogiannis (2002).

3 Results

3.1 Central government program

The maximising program faced by the central government is the following:

$$\underset{g_2}{Max} W_i = \sum_i \left[u_i\left(G_{i1}\right) + \delta u_i\left(G_{i2}\right) + w_i\left(c_{i1}\right) + \delta w_i\left(c_{i2}\right)\right]$$
$$s.t.(2)\ (3)\ (5) \text{ and } (6) \tag{8}$$

Integrating the consumer's choice, the optimal transfer policy is given by following first-order conditions:

$$\delta \frac{\partial u_i}{\partial G_{i2}} + \delta \sum_{k=1}^{n} \frac{\partial u_k}{\partial G_{k2}} \left(\tau_k S_k' \frac{d\rho}{d\tau^c} - B_{k1}\left(\frac{d\rho}{d\tau^c} + 1\right)\right) \frac{1}{\sum_k S_k} - \sum_{k=1}^{n} \frac{\partial w_k}{\partial c_{k1}} \frac{d\rho}{d\tau^c} \frac{S_k'}{\sum_k S_k} +$$
$$\delta \sum_{k=1}^{n} \frac{\partial w_k}{\partial c_{k2}} \frac{d\rho}{d\tau^c} \frac{\left(S_k + (1+\rho) S_k'\right)}{\sum_k S_k} = 0 \qquad \forall i \tag{9}$$

Assuming an interior condition, these conditions simplify to

$$\frac{\partial u_i}{\partial G_{i2}} = \frac{\partial u_j}{\partial G_{j2}} \qquad \forall j \neq i \tag{10}$$

The optimal level of transfers is that which equalizes the marginal utility of the second period public good between regions. By the theorem of implicit functions we derive the relation between the grant of period 2 and the level of borrowing of the region i:

$$\left[\frac{\partial^2 u_i}{\partial G_{i2}^2} \frac{\partial G_{i2}}{\partial B_{i1}}\right] dB_{i1} + \left[\frac{\partial^2 u_i}{\partial G_{i2}^2} \frac{\partial G_{i2}}{\partial g_{i2}} - \frac{\partial^2 u_j}{\partial G_{j2}^2} \frac{\partial G_{j2}}{\partial g_{i2}}\right] dg_{i2} = 0 \quad \forall j \neq i \tag{11}$$

Lemma 1 *The reaction function of national transfer to a variation of borrowing for a region i is given by:*

$$(1 + r_i) = \frac{dg_{i2}^*}{dB_{i1}} \quad \forall i \tag{12}$$

Proof. Equation (11) can be rewritten as

$$\left[\frac{\partial^2 u_i}{\partial G_{i2}^2} \left(-\left(1 + r_i\right)\right)\right] dB_{i1} + \left[\frac{\partial^2 u_i}{\partial G_{i2}^2} + \frac{\partial}{\partial \tau^c} \frac{\partial u_i}{\partial G_{i2}} - \frac{\partial}{\partial \tau^c} \frac{\partial u_j}{\partial G_{j2}}\right] dg_{i2} = 0 \text{ for all } j \neq i$$

and from (10) we know that

$$\frac{\partial}{\partial \tau^c} \frac{\partial u_i}{\partial G_{i2}} = \frac{\partial}{\partial \tau^c} \frac{\partial u_j}{\partial G_{j2}} \quad \text{for all } j \neq i \tag{13}$$

■

Lemma 1 shows that the central government always finds it optimal to increase a region's period 2 allocation of grants when that region raises its borrowing in order to maintain an optimal level of regional public good consumption in period 2. In addition, the increase in the transfers granted to the borrowing region is financed through a rise of the central tax rate which implies a higher interest rate $\left(\frac{dr_i}{d\tau^c} > 0\right)$. This harms all the regions that face higher interest payments on their debt (due to a "common pool effect") and may drive them to reduce their supply of public good in period 2. In order to make up for these negative externalities, the central government put up the grants to each region[3] by the amount of the extra financial cost resulting from the rise of τ^c. However since the regional government i is in a way responsible for this negative externality affecting other regions, the central government makes it bear ultimately the additional cost of a rise of τ^c affecting each region $j (j \neq i)$.

3.2 Regional government program

Remember that each regional government i chooses its first-period level of borrowing as well as its second-period tax rate on savings:

$$\underset{\tau_i, B_{i1}}{Max}\ u_i(G_{i1}) + \delta u_i(G_{i2}) + w_i(c_{i1}) + \delta w_i(c_{i2})$$
$$s.t.(2)\ (3)\ (4)\ (5)\ (6)\ \text{and}\ (12)$$

The first order conditions combined with expression (12) and after manipulations give:

$$\frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} = \left(1 + r_i - \frac{dg_{i2}^*}{dB_{i1}}\right) + \frac{dr_i}{d\tau^c} \frac{B_{i1}}{\sum_{i=1}^{n} S_i} \sum_j \frac{dg_{j2}^*}{dB_{i1}} + \frac{\left(-\frac{dr_i}{d\tau_i} B_{i1} + S_i\right)}{\sum_{i=1}^{n} S_i} \frac{\frac{d\rho}{d\tau^c}}{\frac{d\rho}{d\tau_i}} \sum_j \frac{dg_{j2}^*}{dB_{i1}} \tag{14}$$

The right-hand side of this equation is the price faced by a regional government when borrowing. It measures the degree of softness of the regional budget constraint. Three main effects are at work which determine whether regional budget constraint is likely to be hard or soft.

i) The first effect results from lemma 1. Note that this effect vanishes since central government is adjusting its grants $\left(\frac{dg_{i2}^*}{dB_{i1}}\right)$ in order to allow the regional government to pay back the cost of borrowing $(1 + r_i)$.

ii) The second effect captures the vertical externality arising from the so-called "common pool effect" and directly works through B_{i1}: the additional transfers granted by the central government to all regions in response to a rise in B_{i1} are financed by an increase of the central tax rate τ^c , which leads to a higher interest rate r_i $\left(\frac{dr_i}{d\tau^c} > 0\right)$ in each region i and so weighs down the repayment of the regional debt. This effect goes towards hardening regional budget constraint.

iii) The third effect is operating through the reaction of regional government tax rate τ_i to an increase in τ^c and results from "tax-base sharing". We show that the regional government reacts in cutting its tax rate in order to internalise the central tax rise on its own tax base (since increasing τ^c results in decreasing both federal and regional tax base since $\frac{d\rho}{d\tau^c} < 0$)[4]. In addition the reaction of τ_i depends on the fierceness of horizontal competition among regions. In line with standard literature on tax competition (see for instance the survey by Wilson, 1999), we find that the fiercer tax competition is (the higher n is), the more τ_i is expected to decrease. Ceteris paribus, the decrease in τ_i results in driving down region i's tax revenue. At the same time, it impacts the debt repayment of region i through its effect on r_i but the sign of $dr_i/d\tau_i$ is *a priori* undetermined. As a result this third effect leads to either harden or soften the regional budget constraint.

[3]Note that $\frac{dg_{j2}}{dB_{i1}} = \frac{dg_{j2}}{dg_{i2}} \frac{dg_{i2}}{dB_{i1}} = (1 + r_i) \left(\frac{\partial^2 U_i}{\partial G_{i2}^2} / \frac{\partial^2 U_j}{\partial G_{j2}^2}\right) > 0$.

[4]Note that $\frac{d\tau_i}{dB_{i1}} < 0$.

Proposition 1 *If the regional debt is lower (resp. higher) than the regional tax base, the interplay of both vertical and horizontal tax competition hardens (resp. softens) the regional budget constraint.*

Proof. Without tax competition $\left(\frac{dr_i}{d\tau^c} = \frac{dr_i}{d\tau_i} = 0 \text{ and } \frac{\frac{d\rho}{d\tau^c}}{\frac{d\rho}{d\tau_i}} = 1\right)$, equation (14) becomes $\frac{\frac{\partial u_i}{\partial G_{i1}}}{\delta \frac{\partial u_i}{\partial G_{i2}}} = \frac{S_i}{\sum_{i=1}^{n} S_i} \sum_j \frac{dg^*_{j2}}{dB_{i1}}$. Thus, tax competition hardens the local budget constraint if and only if $\frac{dr_i}{d\tau^c} B_{i1} + \left(-\frac{dr_i}{d\tau_i} B_{i1} + S_i\right) \frac{\frac{d\rho}{d\tau^c}}{\frac{d\rho}{d\tau_i}} > S_i \Longleftrightarrow (B_{i1} - S_i)\left(1 - \frac{d\rho/d\tau^c}{d\rho/d\tau_i}\right)$, that is to say $B_{i1} < S_i$ since $\left(1 - \frac{d\rho/d\tau^c}{d\rho/d\tau_i}\right) < 0$. ■

When the region is not deeply in debt ($S_i > B_{i1}$), tax interactions harden the regional budget constraint. While the grant behaviour of the central government creates a soft budget constraint, both vertical and horizontal tax competition act as a deterrent to regional borrowing. Opposite effects are at work for $B_{i1} > S_i$.

According to these results the central government should settle a threshold for regional debt in order to favor regional fiscal responsibility.

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