Expenditure Competition and a Soft Budget Constraint[1]

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Abstract

This paper offers a two-period small open economy model with publicly provided production inputs. The model confirms that if government's and consumers' relative preferences for second period utility coincide, while at the same time the public cost of borrowing and the consumers' return on saving are identical, lump-sum taxation and public debt are equivalent methods of financing public input provision. However, if the public cost of borrowing and the consumers' return on saving do not match, debt financing similarly as capital taxation can depending on circumstances lead to under- or over-provision of public inputs in a small open economy. Furthermore, if the government cannot ex ante commit to a certain expenditure level, the difference between the government's and consumers' discount rate can also result into under- or over-provision of public inputs.

Keywords: *capital mobility, public input provision, public debt*

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Introduction

Apart from concentrating on the optimal levels of tax rates the capital tax competition literature shows that countries might also compete for capital inflows via the provision of public goods which can be used as inputs in the production process, the so-called industrial public goods or public inputs (see e.g. Zodrow and Mieszkowski, 1986; Bayindir-Upmann, 1998; Fuest, 1995; Rauscher, 1997). Nevertheless, according to our knowledge, in the tax competition literature it has so far always been assumed that governments are restricted by a fixed budget constraint, that is, that the stock of public inputs provided by a given country must in each period match its tax revenues (for surveys, see e.g. Wilson, 1999; Krogstrup, 2004).

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[1] The views expressed here are the responsibility of the author and do not necessarily represent the views of the European Commission.

However, governments can and usually do partially finance their expenditures through debt. Hence, the amount of public inputs offered by a country in a certain period does not necessarily have to match its tax revenues in this period as it is usually assumed. Of course, in the Ricardian debt-neutral world public deficits do not play a role as it is only the level of public spending not the method of financing it that matters. Such a debt-neutrality is based on the optimal intertemporal consumption path which does not react to temporal tax decreases as long as these have to be compensated by equivalent future tax increases.

There are nonetheless various reasons for Ricardian equivalence to fail, like the access burden of taxation, liquidity constraints, the rule-of-thumb consumption behaviour, the finiteness of life or the uncertainty over life expectancy.[2] These causes are usually associated with a 'primary burden of the debt', that is, they reduce the long-run welfare level by putting a higher weight of public expenditure financing on future tax payers. The failure of Ricardian equivalence seems to be also confirmed by empirical studies (for a quantitative review, see e.g. Stanley, 1998).

Nevertheless, with respect to the literature analysing competition in public input provision it is crucial to understand how relaxing the assumption of an exogenously given path of public expenditures might affect the validity of Ricardian equivalence. Or in other words, introducing the possibility of budget deficits into expenditure competition literature raises the question of how the opportunity to use debt financing affects the incentives for public input provision. Moreover, apart from the standard problem of whether and to what extent is the decision making of the current generation influenced by its potential impact on the well-being of future generations there now comes up an additional issue of how much is the current government concerned with the welfare of the future generations.

Bohn (1992) considers the impact of endogenous public spending on Ricardian equivalence in a model with distortionary taxation. As in this framework higher taxes increase the marginal cost of public funds, rational consumers expect that future tax increases will be accompanied by public spending reductions and therefore as a reaction to debt financed tax reduction increase their current consumption. To simplify his analyses Bohn (1992), however, assumes that the interest rate is constant, the rate of time preference equals the interest rate and that the government's and the consumers' objective functions are identical.

Conversely, the tax competition literature shows that the differences in the public and private objective functions are decisive in determining the welfare implications of tax competition (see e.g. Edwards and Keen, 1996; Rauscher, 1997).

[2] For a textbook analysis of the Ricardian equivalence debate see Romer (1996).

Moreover, the Ricardian equivalence literature reveals that if the private and social discount rates differ, saving adjustments induced by debt financed tax cuts do not match future tax increases (for a recent survey, see Ricciuti, 2003). This paper therefore offers a two-period small open economy model with publicly provided production inputs where the public cost of borrowing, the private return on saving as well as the consumers' and the government's discount rate can all differ.

A Two-Period Small-Open-Economy Model

A small open economy is considered. There is a single aggregate good which can be either consumed or used as a production input. The aggregate good is produced using capital, K, and local public input, G, according to a neoclassical production function, $F(K, G)$, exhibiting non-increasing returns to scale with F_K, $F_G > 0$, F_{KK}, $F_{GG} < 0$ and $F_{KG} > 0$, where the subscripts indicate the respective derivatives.

A two-period framework is analysed with superscripts 1 and 2 indicating respective periods. As capital is always perfectly mobile between the small open economy and the rest of the world profit per unit of capital has to in each period equal the current world rate of interest, $R^{1,2} \in (0, 1)$, hence

$$F_K^1 = R^1 \tag{1}$$

$$F_K^2 = R^2 \tag{2}$$

A stock of capital located in the small open economy is thus implicitly function of $R^{1,2}$ and $G^{1,2}$.

Consumers' Saving Decision

The consumers can save or borrow in order to optimise their consumption levels in the 2 periods, C^1 and C^2, given by

$$C^1 = (1-S)\left(F^1(K^1, G^1) - P^1 - K^1R^1\right) \tag{3}$$

$$C^2 = F^2(K^2, G^2) - P^2 - K^2R^2 + (1+R^2)S\left(F^1(K^1, G^1) - P^1 - K^1R^1\right) \tag{4}$$

with C^1, $C^2 \geq 0$, where P^1, $P^2 \geq 0$ are the lump-sum taxes, S is the saving/borrowing rate while $K^{1,2}$ $R^{1,2}$ is the profit earned by foreign capital in the respective period. Domestic residents do not possess any capital in the first period.

The optimal saving/borrowing rate is determined by the consumers' effort to maximise their inter-temporal utility function,

$$U = U^1(C^1) + \phi_C U^2(C^2) \tag{5}$$

where $U(C)$ is the instant utility function with $U_C > 0$ and $U_{CC} < 0$, and $\phi_C \in (0, 1)$ is the relative weight consumers put on the second period utility when making their saving/borrowing decision in the first period.

Government's Problem

The government of a small open economy can finance its first period supply of public inputs, G^1, either with lump-sum taxation, $P^1 \geq 0$, or with borrowed resources, $D \geq 0$, that is

$$G^1 = P^1 + D \tag{6}$$

In the second period, the small open economy has to return all the resources it borrowed in the first period, D, plus the per unit borrowing cost, R^1, while it can again generate public revenues through lump-sum taxation, $P^2 \geq 0$, so that

$$G^2 = P^2 - (1 + R^1)D \tag{7}$$

The government sets P^1, P^2 and D in a way to maximise citizens' welfare over the 2 periods according to

$$U = U^1(C^1) + \phi_G U^2(C^2) \tag{8}$$

where $\phi_G \in (0, 1)$ reflects the relative weight that the government in the first period puts on the consumers' welfare in the second period.

Equilibrium Provision of Public Inputs

Two types of first period interaction between the government and consumers, Nash and Stackelberg equilibrium, are considered in this paper. In the Nash equilibrium, the government and consumers simultaneously determine the saving rate and the first period provision of public inputs. This concept can be justified by the fact that since the first period can in the context of this model last for some years both the government and consumers have enough time to adjust their first period decisions until the Nash equilibrium is reached.

In the Stackelberg equilibrium, it is assumed that the government initially determines the first period public input provision and afterwards consumers decide upon their saving level. This concept is often used in public finance literature to highlight the fact that the government's flexibility in the fiscal policy determination is limited and thus its decisions cannot be reversed instantaneously.

Nevertheless, consumers take P^1 and D as given both in the Nash and in the Stackelberg equilibrium as these are either being determined simultaneously or have already been determined before. Furthermore, under both scenarios second period public input provision is determined after both sides have made their first period decisions. Solving by backward induction the second period public input provision can thus in both cases be established first. Maximising (8) with respect to P^2 while taking P^1, D and S as given leads to

$$\phi_G U_C^2 \left(F_K^2 K_{P^2}^2 + F_G^2 - 1 - K_{P^2}^2 R^2 \right) = 0 \tag{9}$$

Rewriting equation (9) while taking into account equation (2) implies that

$$F_G^2 - 1 = 0 \tag{10}$$

As F_G^2 is only a function of K^2 and G^2 which are in turn only functions of D and P^2 consumers take second period public input provision as given both in the Nash and in the Stackelberg equilibrium.

Maximising (5) with respect to S while taking P^1, P^2 and D as given shows that

$$U_C^1 \left(-1\right)\left(F^1(K^1, G^1) - P^1 - K^1 R^1 \right) + \phi_C U_C^2 (1 + R^2)\left(F^1(K^1, G^1) - P^1 - K^1 R^1 \right) = 0 \tag{11}$$

and thus that

$$\phi_C (1 + R^2) = \frac{U_C^1}{U_C^2} \tag{12}$$

which is a standard result for intertemporal consumption optimisation with first period consumption decreasing in the rate of return/cost of borrowing R^2 and in the weight put on the second period utility ϕ_C.

Nash Equilibrium

In this case the government makes its first-period decision simultaneously with consumers and thus it takes S as given. As K^2 and G^2 are functions of D but not of P^1 the government takes into account the impact of its first period decision on P^2 only when deciding upon D. Maximising (8) with respect to P^1 and D gives

$$\begin{gathered} U_C^1 \left(1 - S\right)\left(F_K^1 K_{P^1}^1 + F_G^1 - 1 - K_{P^1}^1 R^1 \right) + \\ + \phi_G U_C^2 \left(F_K^2 K_{P^1}^2 - K_{P^1}^2 R^2 + S(1 + R^2)(F_K^1 K_{P^1}^1 + F_G^1 - 1 - K_{P^1}^1 R^1) \right) = 0 \end{gathered} \tag{13}$$

$$\begin{gathered} U_C^1 (1 - S)\left(F_K^1 K_D^1 + F_G^1 - K_D^1 R^1 \right) + \phi_G U_C^2 \\ \left(F_K^2 K_D^2 + F_G^2 (P_D^2 - (1 + R^1)) - P_D^2 - K_D^2 R^2 + S(1 + R^2)\left(F_K^1 K_D^1 + F_G^1 - K_D^1 R^1 \right) \right) = 0 \end{gathered} \tag{14}$$

Rewriting equations (13) and (14) while both taking into account (1), (2) and (10) and substituting for $\frac{U_C^1}{U_C^2}$ from (12) implies that

$$F_G^1 - 1 = 0 \tag{15}$$

$$\left(\frac{\phi_C}{\phi_G}\left(1-S\right)+S\right)(F_G^1) = \frac{(1+R^1)}{(1+R^2)} \tag{16}$$

Equations (10) and (15) imply that if P^1 and P^2 are set optimally then $F_G^{1,2} = 1$ which is the standard result in the tax competition literature that usually describes the optimal provision of public inputs. Equation (16), however, indicates that using debt financing has the same implications for public input provision as lump-sum taxation only for special constellations of exogenous parameters ϕ_C, ϕ_G, R^1, R^2.

If $\phi_G = \phi_C$ and $R^1 = R^2$ then equation (16) reduces to $F_G^1 = 1$, hence, if government's and consumers' relative preference for second period utility coincide while at the same time the public cost of borrowing, R^1, and the consumers' return on saving, R^2, are identical, debt financing also ensures the optimal provision of public inputs. In this case the Ricardian equivalence also holds in the model with endogenous provision of public inputs, that is, lump-sum taxation and public debt are equivalent methods of financing public input provision.

However, if $R^1 = R^2$ while $\phi_G \neq \phi_C$ equation (16) shrinks to

$$\left(\frac{\phi_C}{\phi_G}\left(1-S\right)+S\right)(F_G^1) = 1 \tag{17}$$

and thus if the government puts a higher (lower) weight on second period utility than citizens, $\phi_G > \phi_C (\phi_G < \phi_C)$, public inputs are in the first period always relatively under(over)-supplied, $F_G^1 > 1 (F_G^1 < 1)$, compared to the lump-sum tax financed levels of provision.

Furthermore, if $\phi_G = \phi_C$ while $R^1 \neq R^2$, equation (16) reduces to

$$F_G^1 = \frac{(1+R^1)}{(1+R^2)} \tag{18}$$

that is, if the public cost of borrowing is larger (smaller) than the consumers' return on saving, public inputs are in the first period always under(over)-provided, $F_G^1 > 1 (F_G^1 < 1)$. Hence, if the government's and consumers' discount rate do not coincide or if the government's borrowing cost differs from the consumers' saving returns, the equivalence between debt and lump-sum-tax financing of public input provision breaks down.

Stackelberg Equilibrium

In this case the government when determining the first period public input provision must in addition to the impact of D on P^2 also take into account how its choice of P^1 and D affects the consumers' saving decision. Maximising (8) with respect to P^1 and D thus now requires that

$$\begin{aligned} &U_C^1\left((1-S)(F_G^1-1)+(-S_{P^1})(F^1-P^1-K^1R^1)\right)+ \\ &+\phi_G U_C^2\left(S_{P^1}(1+R^2)(F^1-P^1-K^1R^1)+S(1+R^2)(F_G^1-1)\right)=0 \end{aligned} \tag{19}$$

$$\begin{aligned} &U_C^1\left((1-S)F_G^1+(-S_D)(F^1-P^1-K^1R^1)\right)+ \\ &+\phi_G U_C^2(F_G^2(P_D^2-(1+R^1))-P_D^2+S_D(1+R^2)(F^1-P^1-K^1R^1)+S(1+R^2)F_G^1)=0 \end{aligned} \tag{20}$$

In order to determine S_{P^1} and S_D equation (12) has also to be differentiated with respect to P^1 and D giving

$$\begin{aligned} &\phi_C(1+R^2)U_{CC}^2\left(S_{P^1}(1+R^2)(F^1-P^1-K^1R^1)+S(1+R^2)(F_G^1-1)\right)= \\ &=U_{CC}^1\left((1-S)(F_G^1-1)+(-S_{P^1})(F^1-P^1-K^1R^1)\right) \end{aligned} \tag{21}$$

$$\begin{aligned} &\phi_C(1+R^2)U_{CC}^2(F_G^2(P_D^2-(1+R^1))-P_D^2+S_D(1+R^2)(F^1-P^1-K^1R^1)+ \\ &+S(1+R^2)F_G^1)=U_{CC}^1\left((1-S)F_G^1+(-S_D)(F^1-P^1-K^1R^1)\right) \end{aligned} \tag{22}$$

Solving equations (21) and (22) for S_{P^1} and S_D and then substituting the results into (19) and (20) while taking into account (1), (2) and (10) leads to

$$F_G^1-1=0 \tag{23}$$

$$F_G^1=\frac{(1+R^1)}{(1+R^2)} \tag{24}$$

Equations (23) is identical to (15) implying that when lump-sum taxation is used to finance public expenditures then the level of first-period public input provision does not depend on the ability of the government to commit to a certain expenditure level. However, comparing equations (16) and (24) reveals that when public expenditures are financed through debt then the level of first-period public input provision is influenced by the government's ability to commit.

Equation (24) shows that contrary to the Nash equilibrium the difference between the government's and consumers' discount rate does not affect the debt-financed first-period public input provision in the Stackelberg equilibrium. This can be explained be the fact that since the government expects that citizens will adjust their saving rate in response to its decision on the size of public debt it assumes that the inter-temporal consumption distribution will in the end be solely determined by the consumer's discount rate and thus it does not try to impose its own preference for inter-temporal consumption distribution.

Conclusion

The model confirms that if government's and consumers' relative preferences for second period utility coincide while at the same time the public cost of borrowing and the consumers' return on saving are identical then lump-sum taxation and public debt are equivalent methods of financing public input provision. In this case it might be optimal for a small open economy to finance increased public input provision through loans from international investors or institutions.

However, if the public cost of borrowing are larger/smaller than the consumers' return on saving then the debt-financing can lead to an under/over-supply of public inputs compared to the lump-sum-tax-financed level of provision. Furthermore, if the government cannot ex ante commit to a certain expenditure level then the difference between the government's and consumers' discount rate can also result into under- or over-provision of public inputs. The model thus demonstrates that similarly to tax competition, debt financing can also affect optimal provision of public inputs.

References

[1] WILSON, J. D. (1999): Theories of Tax Competition. National Tax Journal, *52*, Issue 2, pp. 269 – 305.

[2] KROGSTRUP, S. (2004): A Synthesis of Recent Developments in the Theory of Capital Tax Competition. [EPRU Working Paper Series 2004-02]. Copenhagen: EPRU.

[3] ZODROW, G. R. – MIESZKOWSKI, P. (1986): Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods. Journal of Urban Economics, *19*, No. 3, pp. 356 – 370.

[4] BAYINDIR-UPMANN, T. (1998): Two Games of Interjurisdictional Competition When Local Governments Provide Industrial Public Goods. International Tax and Public Finance, *5*, pp. 471 – 487.

[5] FUEST, C. (1995): Interjurisdictional Competition and Public Expenditure: Is Tax Co-ordination Counterproductive? Finanzarchiv NF, *52,* pp. 478 – 496.

[6] RAUSCHER, M. (1997): Interjurisdictional Competition and the Efficiency of the Public Sector: The Triumph of the Market over the State? [CEPR Discussion Paper, No. 1624.] London: CEPR.

[7] ROMER, D. (1996): Advanced macroeconomics. New York: McGraw-Hill.

[8] STANLEY, T. D. (1998): New Wine in Old Bottles: A Meta-Analysis of Ricardian Equivalence. Southern Economic Journal, *64*, No. 3, pp. 713 – 727.

[9] BOHN, H. (1992): Endogenous Government Spending and Ricardian Equivalence. The Economic Journal, *102*, pp. 588 – 597.

[10] EDWARDS, J. – KEEN, M. (1996): Tax Competition and Leviathan. European Economic Review, *40*, pp. 113 – 134.

[11] RICCIUTI, R. (2003): Assessing Ricardian Equivalence. Journal of Economic Surveys, *17*, No. 1, pp. 55 – 78.