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Local capital tax competition and coordinated tax reform in an overlapping generations economy☆

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ABSTRACT

We extend the classic capital tax competition model to an overlapping generations economy and study the effects of a coordinated reform where capital tax rates across all locations are increased to alleviate the policy externality. Welfare across generations is examined and several new effects are derived. Simulations calibrated to US data indicate these effects may be as large as the spending effect of the classic model. The initial old generation, however, may not be better off, and an additional transfer from the initial young to the initial old may be required for the reform to be a Pareto improvement.

1. Introduction

We extend the literature on the horizontal capital tax competition problem to an overlapping generations economy (OGE), where capital is accumulated and the economy may evolve along an expansion path that differs from the optimal path. Each local government (LG) competes for a mobile capital tax base over time and local public spending is too low because of the policy externality. The impact of a coordinated local capital tax rate increase on the economy in the short run, on the transition path, and in the long run steady state, is studied. We also derive several new welfare effects of the reform and provide a simple sufficient condition so that all generations are made better off as a result of the reform. We simulate the steady state of the model and calibrate it to US data. The results indicate the new effects can be of the same order of magnitude as the welfare effect derived from the classic capital allocation model. However, the initial old generation may be worse off since the interest rate falls in response to the reform. An additional transfer from the initial young generation to the initial old generation may be required for the reform to be a Pareto improvement.

The static capital allocation model of Zodrow and Mieszkowski (1986), Wilson (1986), and Wildasin (1988, 1989) is the workhorse model in the tax competition externality literature.[1] There are a fixed number of locations and capital is mobile across locations, while labor is not. Consumers are endowed with a fixed amount of capital and some labor and firms use local capital and labor to produce output. Local governments impose a source-based tax on mobile capital, use the revenue to finance local spending, and essentially compete for the mobile tax base. The main result of the model is that local competition for mobile capital puts downward pressure on local public spending. In addition, welfare improves unambiguously because of a *spending effect* if all local governments raise their capital tax rate under a coordinated tax reform and increase local spending accordingly, ceteris paribus.[2] As a corollary, the coordinated tax rate increase is completely capitalized into the interest rate, which falls one-for-one with the tax rate, since the supply of capital is fixed. See Appendix A for a quick derivation of this result.

Krelove (1992) first extended these results to a two period setting where savings, and hence the supply of capital, is endogenous.[3]

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[1] See Wilson (1999) and Wilson and Wildasin (2004) for summaries of the tax competition literature. The capital allocation model is quite popular and versions of the model still provide insight and intuition on a variety of issues.

[2] A number of extensions of the classic model that can reverse the main results have been studied. For example, if some of the local tax burden can be exported to foreigners this may raise local public spending since some of the tax burden is shifted abroad. See the surveys in footnote 2. Sometimes the spending effect is labelled the tax base effect instead. If the budget is balanced, as is true in almost all analyses in this literature, and true for most states in the US, for example, it can also be thought of as a spending effect.

[3] For recent work using the two period model, see Keen and Kotsogiannis (2002, 2003, 2004).

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Consumers are endowed with some income in the first period and they save for the second period. In the second period they are endowed with labor which they supply in exchange for a wage. The saving of the first period becomes capital in the second period and consumers allocate their capital across locations at the beginning of the second period. Local governments impose their policy at the beginning of the first period taking into account the response of savings in the first period and the allocation of capital in the second period. Tax competition for the mobile tax base leads to lower public spending and a coordinated tax reform announced and implemented at the beginning of the first period will improve welfare because of the spending effect, but the reform is not completely capitalized if savings responds. It has not been pointed out, however, that if the reform comes as a surprise at the beginning of the second period, the supply of capital is fixed, and the results of the two period model revert to those of the one period model. The main welfare implication still holds, however; the spending effect unambiguously causes an improvement in welfare under a coordinated capital tax reform even if undertaken as a surprise at the beginning of the second period.

We extend these results to an OGE. First, we show that a tax reform involving a permanent, coordinated capital tax rate increase across all locations is completely capitalized into the interest rate in the first period of the reform since the supply of savings is fixed by past savings decisions, i.e., the interest rate falls one-for-one with the tax rate in the first period of the reform. Savings responds in the second period after the reform and the reform is no longer completely capitalized as the wage begins to fall. The interest rate and wage continue to fall on the transition path and in the steady state. In terms of the indirect welfare effects of the reform, the tax increase causes a wage effect, an interest income effect, and a future spending effect for the agent when old, in addition to the current spending effect when young that is comparable to the same effect in the static and two periods models. The interest income effect generally works in the opposite direction of the other effects. For the initial old generation there is only a positive spending effect and a negative interest income effect and their welfare may fall in response to the reform if the latter effect dominates the former. This cannot happen in the capital allocation model or its two period extension under symmetry.

The factor price effects involving the wage and the interest rate can be combined in the long run steady state to provide an alternative interpretation involving the expansion path of the economy. Under this reinterpretation, we show there is a distortion effect, since a source based tax on capital distorts the firm's investment decision and hence the path of the economy's development, and a dynamic efficiency effect, since such a reform will alter the total amount of capital being accumulated in the second-best equilibrium relative to the long run optimal path. We choose functional forms and calibrate the model to several features of US data, e.g., the ratio of state and local spending to GDP. The simulations indicate that the new effects may be as large as the spending effect in magnitude. In addition, the simulations indicate the initial old generation is worse off because of the reform due to the interest rate effect.

There is a related literature that uses the Ramsey model to study international taxation issues. Razin and Yuen (1996, 1999), Lejour and Verbon (1997), and more recently, Rauscher (2005), have studied the taxation of mobile capital within a dynamic, infinitely lived agent framework. Our paper is distinct from this literature for several reasons. We study a reform not considered in this work, namely, a coordinated reform designed to alleviate the policy externality problem. Second, use of the infinitely lived consumer framework leads to a well-known Euler equation for consumption where the marginal utilities of consumption over time cancel in the long run steady state. This will imply that it is not optimal to tax capital in the long run. This is not true in the OGE since consumption may differ when young and old in the steady state. Finally, our model allows us to study the impact of the reform on the welfare of different generations over time. For example, our simulation result that the initial old generation may be worse off because of the reform is important information that can help in redesigning the reform to make it a Pareto improvement. This sort of result is not possible in the Ramsey model's infinitely lived representative agent framework.

We present our model in Section 2. In Section 3 we present the optimal rules governing the allocation in the first-best and second-best cases. In Section 4 we study the impact of a coordinated increase in all local capital tax rates on the short run equilibrium, the long run equilibrium, and the transition path. The effects of the coordinated reform on welfare are discussed in Section 5. In Section 6 we simulate the model and provide some evidence on the magnitude of the new effects. Section 7 concludes the paper.

2. The model

Time is discrete and the economy lasts forever. There are $J>1$ identical locations. Capital is perfectly mobile, while labor is not. N_t identical agents are born at each location at time t, population grows at rate $1+n$, each agent lives for two periods, and is endowed with one unit of labor in the first period, which is supplied to the labor market in exchange for a wage. Output per worker of the private good at time t is produced by a well behaved, constant returns technology according to $f(k_t)$, where k_t is capital per worker, and where a location subscript has been omitted. The private good can be converted into a local public good on a one-for-one basis and the public good does not confer any spillover effects across locations.

Identical firms produce the private good. The firm chooses k_t to maximize profit per worker, $f(k_t)-(r_t+\delta+\tau_t)k_t-w_t$, where r_t is the real interest rate, δ is the depreciation rate, τ_t is the local source based capital tax rate, and w_t is the local wage. Thus,

$$f_k(k_t) = df/dk_t = r_t + \delta + \tau_t = r_{nt}, \tag{1}$$

where r_{nt} is the net user cost of capital. The capital demand function, $K(r_{nt})$, solves Eq. (1). The response to the net user cost is $K_r = dk_t/dr_{nt} = 1/f_{kk} < 0$, where $d^2f/dk_t^2 = f_{kk} < 0$. Profit is zero so the wage function is given by

$$w_t = f(K(r_{nt})) - r_{nt}K(r_{nt}) = W(r_{nt}). \tag{2}$$

The response of the wage to the net user cost of capital is $dw_t/dr_{nt} = W_r = -k_t$.

The well-behaved utility function of the consumer is $U^t(c_{1t}, c_{2t+1}, g_t, g_{t+1})$, where c_{1t} is consumption in the first period of life at time t, c_{2t+1} is second period consumption, and g_i is the local public good available at time i. Utility is additively separable so savings does not depend on the public good. Partial derivatives are denoted with a subscript, e.g., $\partial U/\partial c_{1t} = U_1$, and so on. The consumer's budget constraints are $w_t - c_{1t} - s_t = 0$ and $(1+r_{t+1})s_t - c_{2t+1} = 0$, where s is retirement savings. The consumer chooses consumption and savings to maximize utility subject to the budget constraints. The first order condition is $U_1/U_2 = (1+r)$ and the solution is a savings function, $S(w_t, r_{t+1})$. Savings is increasing in labor income if consumption in both periods is a normal good, $\partial s/\partial w = S_w > 0$.[4] Savings is increasing in the interest rate if the substitution effect dominates, $\partial s/\partial r = S_r > 0$. The indirect utility function of the consumer is defined as, $v^t = U(w_t - S(w_t, r_{t+1}), (1+r_{t+1})S(w_t, r_{t+1}), g_t, g_{t+1})$ and has the usual derivative properties. The marginal willingness-to-pay for the public good when young and old, respectively, is $m^t{}_1 = U_3/U_1$ and $m^t{}_2 = U_4/U_2$.

There are N_0 initial old agents in the first period at each location. Each is endowed with s_0 units of capital, which is fixed at $t=1$. Utility is represented by a well behaved function, $u(c_{21}, g_1)$. The indirect utility function is then given by $v^0 = u((1+r_1)s_0, g_1)$, where $c_{21} = (1+r_1)s_0$.

[4] It is straightforward to show that if the cross partial derivative U_{12} is non-negative, consumption is a normal good. It follows immediately that savings is increasing in first period income and decreasing in second period income. This certainly follows for the additively separable case.