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TAX COMPETITION AND REGIONAL TRADE UNION

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Abstract

The conventional wisdom in the tax competition literature is that the optimal capital tax rate for local government is zero when head taxes on immobile residents are available. However, the zero tax-rate is incompatible with the phenomenon that we actually observe. In this paper, we depart from the full employment tax competition model and present a model of a tax competition with a regional trade union to explain the behavior of local government choosing a non-zero tax rate. Furthermore, it turns out that local governments are likely to overprovide public goods when the trade union's preferences are characterized by a high elasticity of substitution between wage and employment rates.

[Keywords] tax competition, regional trade union, unemployment

[JEL Classification Code] H21, H72, J51

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1 Introduction

One clear result in the tax competition literature is that when head taxes on immobile residents are available, the optimal capital tax rate for local government is zero[1]. The essential reason for this is that capital taxation results in *fiscal externalities* through interregional capital mobility, while a head tax on residents does not [Wildasin (1989)]. However, a zero tax-rate is incompatible with the phenomenon which we actually observe. In most countries, local governments use a capital tax even if resident taxes are available. Furthermore, competition among states and local governments is sparked by using tax and regulatory policies on capital [Kenyon and Kincaid (1991)].

These non-zero tax competitions which result in a positive tax rate on capital can be described within the traditional framework by assuming that head taxes are exogenously constrained in their use, or are for use up to a sufficient level. In this case, local government uses both a resident head tax and a capital tax, with the result that the local public goods will be underprovided due to fiscal externalities. We also observe that local government subsidies (levies negative taxation on) capital. For instance, local governments have given special treatment to capital in various ways to attract the owners of capital. These local policies have really provided subsidies to mobile capital so that capital inflows increase the welfare of residents. The traditional literature has not clearly explained what incentive local government has in setting a non-zero tax rate, when it is not constrained from using a head tax[2]. What this paper stresses as the reason why tax competition models cannot explain local governments' practice of setting non-zero capital tax rates is that the behavior of governments is analyzed in the framework of a perfect labor market.

More recent studies, notably Lejour and Verbon (1996), Fuest and Huber (1999), Boadway et al. (2002), Lozachmeur (2003), Leite-Monteiro et al. (2003), and Sato (2004) have departed from the assumption of full employment in their fiscal competition analyses. While the causes of unemployment differ between

[1] There is a large body of research on interregional tax competition. A partial list includes Zodrow and Mieszkowski (1986), Wilson (1986), and Wildasin (1989). See Wilson (1999) and Wildasin and Wilson (2003) for a general review of the tax competition model.

[2] The exceptions are Coates (1993), DePater and Myers (1994) and Ogawa (2000).

the analyses of Lejour and Verbon (1996) and Fuest and Huber (1999), they both analyze the implication of unemployment for the welfare-effect of tax coordination in the tax competition model. By assuming an other cause of unemployment, Boadway et al. (2002) and Sato (2004) examine the non-full employment model of interregional tax competition. They incorporate a job-search and recruiting-friction model into the tax competition framework to examine the efficiency of local tax settings. Lozachmeur (2003) and Leite-Monteiro et al. (2003) examine how fiscal competition affects the choice of unemployment insurance and the efficiency of equilibrium, with, the former analysis focusing on capital mobility and the latter on labor mobility.

The aim of this paper is different from those cited above, but we follow them in agreeing that the labor market is imperfect; however, we postulate that it is imperfect in the sense that unemployment exists due to a regional trade union. In our analysis, we can obtain the result that local government chooses non-zero tax rates on capital even if taxation on residents is available. This result supports the possibility that local governments use the capital tax as a strategic policy variable, and that they choose inefficient tax rates. In the second part of this paper, we analyze the efficiency of local public goods provision when the head taxes on residents are restricted to use. It turns out that local governments tend to overprovide public goods when the trade union's preferences are characterized by a high elasticity of substitution between wage and employment rates.

This paper is organized as follows. Section 2 introduces the model. We incorporate an imperfect labor market into a standard tax competition framework. In section 3, we then consider the local government policies. The policy alternatives are viewed in the context of a tax competition framework with labor market imperfections, and we show that local government has an incentive to choose a non-zero tax rate on capital. In section 4, we compare the decentralized equilibrium with the Pareto optimal condition to examine the efficiency of local public goods provision. Section 5 offers concluding remarks.

2 The Model

Technology. The model is one of tax competition among small regions with a regional trade union. There are n small regions, denoted by subscript $i = 1, 2, ..., n$. In each region i, there are immobile residents, and the regional population is denoted by N_i. To simplify the notation, we normalize as $N_i = 1$ without any loss of generality.

The economy has a fixed stock of capital, $\bar{K}$, which is perfectly mobile among regions. Denoting the amount of capital located in region i as K_i, the total supply of capital is fixed at $\bar{K}$ such that

$$\bar{K} = \sum_{i=1}^{n} K_i = \sum_{i=1}^{n} \theta_i \bar{K}. \tag{1}$$

We here assume that residents in region i own the fraction $\theta^i \in (0, 1)$ of the capital stock in the economy. The production of private goods requires using capital and labor with constant returns to scale technology, $Y_i = F(K_i, L_i) = L_i f(k_i)$, where L_i is the amount of labor and $k_i \equiv K_i/L_i$. In the following analysis, we use the Cobb-Douglas type of technology represented by $F(K_i, L_i) = K_i^a L_i^{1-a}$, where $0 < a < 1$.

Local government. Local government provides local public goods, g_i, which yield benefits to residents. Private goods can be used as an input to produce local public goods, and units can be chosen so that the public goods provision in region i can be measured in terms of units of private goods. The budget constraint on local government requires that the cost of providing local public goods must be equal to the sum of the revenue from capital (unit) tax, $\tau_i K_i$, and the head tax levied on residents, h_i. Thus, the budget constraint is

$$g_i = \tau_i K_i + h_i. \tag{2}$$

Firms. Profit-maximizing input decisions imply

$$r + \tau_i = f'(k_i) = a k_i^{a-1}, \tag{3}$$

$$w_i = f(k_i) - f'(k_i)k_i = (1-a)k_i^a, \qquad (4)$$

where r is the market net return on capital, τ_i is the unit tax rate on capital, and w_i is the wage rate. Competition among regions is expressed by the assumption that each local government takes r as given. Equation (3) implicitly defines $k_i = k(\tau_i)$ with

$$k_i'(\tau_i) \equiv \frac{\partial k_i}{\partial \tau_i} = \frac{1}{f''(k_i)} = \frac{1}{a(a-1)k_i^{a-2}} < 0. \qquad (5)$$

Regional trade union. In each region, there is a single trade union. Following Corneo and Marquardt (2000) and Imoto (2003) among others, we assume that the union pursues two goals: high wages and high rate of employment. A regionally monopolistic trade union bargains over wages and the employment rate by accounting for the labor demand determined by (3) and (4). Formally, the optimization problem for the union is to maximize the objective function of the wages and the employment rate represented by

$$V_i = \left[\beta_i(w_i - \bar{w}_i)^\sigma + (1-\beta_i)(1-\mu_i)^\sigma\right]^{1/\sigma}, \qquad (6)$$

subject to

$$(1-\mu_i) = \left(\frac{\bar{w}_i}{w_i}\right)^{1/a}, \qquad (7)$$

where $-\infty < \sigma < 1$ and $\beta_i \geq 0$. (7) is obtained by using (4). In (6) and (7), $\bar{w}_i$ denotes the competitive wage, and $1-\mu_i(=L_i)$ represents the employment rate in region i[3].

The particular shape of the convex indifferent curves generated by a CES objective function depends on the value of σ. As $\sigma \to -\infty$, the substitution between wages and employment is impossible in the limit for the union. The CES utility function becomes the Cobb-Douglas function for $\sigma = 0$, so that the union's objective function has a constant unit elasticity of substitution. In the limiting case of $\sigma \to 1$, the indifference curves become a straight line so that wages and employment are perfect substitutes.

[3] Thus, the unemployment rate is $\mu_i = 1 - L_i$ since we have assumed $N_i = 1$.

The first-order condition is

$$\begin{aligned}\frac{dV_i}{dw_i} &= [\beta_i(w_i - \bar{w}_i)^\sigma + (1-\beta_i)(1-\mu_i)^\sigma]^{1/\sigma - 1} \\ &\times \left(\beta_i(w_i - \bar{w}_i)^{\sigma-1} - \frac{1-\beta_i}{a}\left(\frac{\bar{w}_i}{w_i}\right)^{\sigma/a}\frac{1}{w_i}\right) = 0, \end{aligned} \tag{8}$$

which is written as[4]

$$(1-\beta_i)(1-\mu_i)^\sigma = a\beta_i(1-(1-\mu_i)^a)^{\sigma-1}((1-a)k_i^a)^\sigma. \tag{9}$$

This yields the unemployment rate schedule $\mu_i(k_i)$ with

$$\mu_i'(k_i) \equiv \frac{d\mu_i}{dk_i} = -\frac{a\sigma}{\sigma(1-L_i^a) + aL_i^a(\sigma-1)}\frac{L_i(1-L_i^a)}{k_i}. \tag{10}$$

From (5) and (10), we can obtain the effects of local tax changes on the unemployment rate as follows:

Lemma. The effects of a tax rate change on changes in the unemployment rate are classified into three scenarios[5].

Scenario 1: $\sigma < 0$. $\mu_i'(k_i) < 0$, so that μ_i increases as τ_i increases.

Scenario 2: $\sigma = 0$. $\mu'(k_i) = 0$, so that μ_i has no relationship with τ_i.

Scenario 3: $0 < \sigma < \hat{\sigma} \equiv a/(1/L_i^a - (1-a))$. $\mu'(k_i) > 0$, so that μ_i decreases as τ_i increases.

The decision to attract investment by reducing tax rates is often motivated by the concern of fighting unemployment and enhancing job creation. This case corresponds to Scenario 1. However, it might be also the case that capital and labor has strong substitute relationship, and that capital expels labor from the

[4] Notice that, in this model, full employment equilibrium as examined in the traditional tax competition model can be described by assuming $\beta_i = 0$, since we obtain $\mu_i = 1$ as $\beta_i = 0$ in (9).

[5] We might consider a fourth scenario, i.e., the case of $\hat{\sigma} \leq \sigma < 1$. However, we exclude this case from the following analysis since the second-order condition for the union's optimization problem is not satisfied. See Appendix for the second-order condition.

job market job. It is in Scenario 3 that invested capital raises the unemployment rate.

Households. In each region, there are immobile residents with quasi-linear preferences $u_i = x_i + v(g_i)$ defined over consumption of a private numeraire good, x, and a local public good, g, where $v' \equiv dv/dg_i > 0, v'' \equiv d^2v/dg_i^2 < 0$. The residents are classified into two types of workers: employed ($j = e$) and unemployed ($j = u$). Since we have assumed identical individuals in the region, all employed and unemployed workers earn a return from capital and are taxed by the local government. Unemployment is seen as just an unfortunate accidentjust an accident for each worker, in which those fortunate enough to be employed receive wages while the jobless workers earn no wage income. Thus, the budget constraints of the employed and unemployed workers are given by

$$x_i^j = \begin{cases} w_i + r\theta_i\bar{K} - h_i & \text{if } j = e. \\ r\theta_i\bar{K} - h_i & \text{if } j = u. \end{cases} \tag{11}$$

3 Equilibrium

The local government i maximizes the utilitarian form of welfare in its region, $W_i = \mu_i u_i^u + (1 - \mu_i)u_i^e$, subject to (2) and (11). (2) can be rewritten by $g_i = \tau_i(1 - \mu_i)k_i + h_i$. Formally, the maximization problem is given by

$$\begin{aligned} \max_{\tau_i, h_i} \quad W_i &= \mu_i u_i^u + (1 - \mu_i)u_i^e \\ &= (1 - \mu_i)[f(k_i) - k_i f'(k_i)] + r\theta_i\bar{K} - h_i + v(\tau_i(1 - \mu_i)k_i + h_i), \end{aligned}$$

subject to $\mu_i(k_i)$ and $k_i(\tau_i)$. Since the head tax is a local government choice variable, the first-order conditions for h_i will be

$$\frac{\partial W_i}{\partial h_i} = v'(g_i) - 1 = 0 \tag{12}$$

As for the optimization of the capital tax rate, τ_i, (5) and (10) permit us to establish the effect of a change in τ_i as follows:

$$
\begin{aligned}
\frac{\partial W_i}{\partial \tau_i} &= -\mu_i'(k_i)k_i'(\tau_i)w_i - k_i(1-\mu_i) \\
&\quad + v'(g_i)\left[(1-\mu_i)k_i + \tau_i k_i'(\tau_i)\left(-\mu_i'(k_i)k_i + (1-\mu_i)\right)\right] \qquad (13)
\end{aligned}
$$

To derive the optimal capital tax rate for local government when a head tax is available, we evaluate equation (13) at $\tau_i = 0$. Substituting $\tau_i = 0$ and $v'(g_i) = 1$ into (13), we have

$$
\frac{\partial W_i}{\partial \tau_i}|_{\tau_i=0} = -w_i \mu_i'(k_i)k_i'(\tau_i) \qquad (14)
$$

From (14), the equilibrium capital tax rates when a head tax is available are classified into three possible scenarios.

Scenario 1 ($\sigma < 0$). $\tau_i < 0$ since $\mu_i'(k_i) < 0$.

Scenario 2 ($\sigma = 0$). $\tau_i = 0$ since $\mu_i'(k_i) = 0$.

Scenario 3 ($0 < \sigma < \hat{\sigma}$). $\tau_i > 0$ since $\mu_i'(k_i) > 0$.

Summarizing the results we have the following.

Proposition 1. Assume that local governments can impose a head tax on immobile residents. When $\sigma < 0$ ($\mu_i'(k_i) < 0$), local governments provide subsidies on capital, $\tau_i < 0$. If $\sigma = 0$ ($\mu_i'(k_i) = 0$), then they choose a zero tax rate, $\tau_i = 0$. If $0 < \sigma < \hat{\sigma}$ ($\mu_i'(k_i) > 0$), they impose a tax on capital, $\tau_i > 0$.

Since local governments use the capital tax rate as a policy variable, capital is inefficiently allocated across the region, except for the case of $\sigma = 0$. The basic argument that local government chooses a non-zero tax rate on capital can be made as follows: when $\sigma < 0$ (Scenario 1), an increase in k_i accompanied by a reduction in τ_i decreases μ_i since $\mu_i' < 0$. That is, a reduction in the tax rate has a positive impact on the residents' welfare in region i, so that local government chooses a negative tax rate on capital. Scenario 2 is the simplest one. When $\sigma = 0$, the capital tax rate has no impact on the amount of capital available in the region, and that it does nothing to raise the employment rate.

Therefore, local government does not use the capital tax as a policy variable, $\tau_i = 0$. When $0 < \sigma < \hat{\sigma}$ (Scenario 3), the reduction in the tax rate increases k_i. However, in this case an increase in k_i raises μ_i since $\mu_i' > 0$. Residents are deprived of their jobs as local government decreases the capital tax rate so as to attract capital. In this case, local government chooses a positive tax rate to protect jobs[6].

4 Efficiency

Now we consider the efficiency of local public goods provision when the governments are restricted to using the head tax on residents.

From (13), we have

$$\begin{aligned} v'(g_i) &= \frac{k_i(1-\mu_i) + \mu_i' k_i' w_i}{k_i(1-\mu_i) - \mu_i' k_i' \tau_i k_i + \tau_i k_i'(1-\mu_i)} \\ &= \frac{1 - \eta_i \epsilon_i \left(\frac{1-a}{a} \frac{r+\tau_i}{\tau_i} \right)}{1 + \epsilon_i + \eta_i \epsilon_i}, \end{aligned} \tag{15}$$

where

$$\eta_i \equiv \frac{d(1-\mu_i)}{dk_i} \frac{k_i}{(1-\mu_i)} = \frac{a\sigma(1-L_i^a)}{\sigma(1-L_i^a) + aL_i^a(\sigma-1)}, \tag{16}$$

is the elasticity of the employment rate with respect to the capital located in the region, and

$$\epsilon_i \equiv \frac{\partial k_i}{\partial \tau_i} \frac{\tau_i}{k_i} \tag{17}$$

is the capital demand elasticity with respect to the tax rate. When the labor market is perfect, $\eta_i = 0$, (15) is reduced to the conventional result of under-provided public goods, $v'(g_i) = 1/(1+\epsilon_i) > 1$. However, if the labor market is not perfect and local governments are restricted from imposing a head tax on residents, we obtain the following result from (15) and Lemma obtained in

[6] As referred in the previous footnote, the model corresponds to the traditional tax competition model with full employment when $\beta_i = 0$. In this case, $\mu_i^0 = 0$, so that local government chooses a zero-tax rate on capital, $\tau_i = 0$.

Section 3.

Proposition 2. When $\sigma \leq 0$, the local government chooses an inefficiently low capital tax rate. However, when $\sigma > 0$, the local government might choose an inefficiently high tax rate on capital. Specifically, as σ approaches $\hat{\sigma}$, local government is likely to choose an inefficiently high rate of capital tax.

Proof. Assume we are on the left-side of Laffer curve, $1 + \epsilon_i(1 + \eta_i) > 0$. When $\sigma \leq 0$, $\mu_i' \leq 0$ and $\eta_i \geq 0$. Using $\epsilon_i < 0$ and $\eta_i \geq 0$, from (15), we have $v'(g_i) > 1$. Next, we consider the case of $\sigma > 0$ ($\eta_i < 0$). Public goods are overprovided when

$$1 - \eta_i \epsilon_i \left(\frac{1-a}{a} \frac{r + \tau_i}{\tau_i} \right) < 1 + \epsilon_i (1 + \eta_i),$$

which can be rewritten as

$$-\eta_i > \frac{a\tau_i}{(1-a)r + \tau_i} \equiv \hat{\eta}_i \in (0, 1). \tag{18}$$

From (16), we have

$$\begin{aligned} -\eta_i &= -\frac{a\sigma(1-(1-\mu_i)^a)}{\sigma(1-(1-\mu_i)^a) + a(1-\mu_i)^a(\sigma-1)} \\ &= -\frac{a}{1 + \frac{a(1-\mu_i)^a(\sigma-1)}{(1-(1-\mu_i)^a)\sigma}}. \end{aligned}$$

We now define $\tilde{\sigma} \equiv a(1-\mu_i)^a/[1 + a - (1-\mu_i)^a]$, which satisfies $\hat{\sigma} > \tilde{\sigma}$. Then we obtain

$$\lim_{\sigma \to \tilde{\sigma}} (-\eta_i) = 1. \tag{19}$$

Therefore, (18) holds as $\sigma \to \hat{\sigma}$. The range of σ that leads local government to choose an inefficiently high tax rate is formally given by $\tilde{\sigma} \leq \sigma < \hat{\sigma}$. □

Proposition 2 implies that when the labor market is perfect or capital inflow brings about new jobs, local public goods are undersupplied. However, capital strongly substitutes for labor, and that capital inflow induced by the capital tax rate reduction eliminates jobs in the region, local government might choose an inefficiently high tax rate.

The sources of inefficiency can be identified by two kinds of externalities; (i) positive (fiscal) externality and (ii) negative externality. In our model, the local government ignores the external effects of its tax change on the other regions' tax revenue [Wildasin (1989)]; although a tax increase in region i affects region j's fiscal budget as $t_j(\partial[(1-\mu_j)k_j]/\partial t_i)$, local government i does not take that into account. The existence of fiscal externality leads to an under-taxation on capital since it causes positive externality, $t_j(\partial[(1-\mu_j)k_j]/\partial t_i) = -\tau_j k_i'(\tau_i)(1-\mu_j)(\eta_j+1) > 0$[7].

In an environment of an imperfect labor market there is a second source of inefficiency that might cause negative externality. When local government i changes its capital taxation it affects the well-being of the residents of the other region j through the expected wage income in region j, but does not account for this external effect in its decision-making. The external effect is expressed as

$$\frac{\partial(1-\mu_j)w_j}{\partial\tau_i} = -k_i'(\tau_i)w_j(1-\mu_j)(\eta_j+a)k_j^{-1}. \tag{20}$$

As long as $\eta_j \geq 0$, $\partial[(1-\mu_j)w_j]/\partial\tau_i > 0$ and an increase in the tax rate causes positive externality. However, when $\eta_j + a < 0$ an increase in capital tax rate causes negative externality on the other region j, and in cases where the negative externality dominates the positive (fiscal) externality, the equilibrium tax rate would be set at an inefficiently high level.

5 Concluding Remarks

By incorporating the behavior of a regional trade union to examine the effects of labor market imperfection on the equilibrium of the tax competition model, we present a revised model in which local government deviates from a zero capital tax. Moreover, the overprovision of public goods might prevail when capital inflow induced by the capital tax rate reduction eliminates jobs in the region.

[7] Notice that $\eta_j + 1 > 0$ for all $\sigma < \hat{\sigma}$.

The key point made by our results is not concerned with the existence of unemployment (see the case of $\sigma = 0$), but rather with how the labor demand react to capital inflow through a reduction in the capital tax rate. In an environment where the economy contains preferences or a technology that brings about a labor demand reduction when capital moves into the region, local government tends to impose a positive tax on capital and to overprovide public goods.

Although our model is very general in some respects, it must be noted that the efficiency results achieved here rely on a variety of simplifying assumptions. However, it should also be noted that some of our assumptions could be relaxed without changing the main result of this paper. Specifically, although we derive our propositions by characterizing the preferences of a trade union using the CES utility function, we can also derive the same result if we assume a CES production function and a Cobb-Douglas utility function for the trade union.

Appendix

Given the first-order condition represented by (9), the second-order condition is given by

$$\frac{(1-\beta)(1-\mu_i)^\sigma}{a}\left(\frac{a(\sigma-1)+(a+\sigma)[1-(1-\mu_i^a)]}{1-(1-\mu_i)^a}\right) < 0,$$

which can be rewritten as

$$\sigma < \frac{a(1-\mu_i)^a}{1+a-(1-\mu_i)^a} \equiv \bar{\sigma}_i. \tag{21}$$

Taking a logarithm for (9), we have

$$\begin{aligned}\ln a + \ln\beta + (\sigma-1)\ln[1-(1-\mu_i)^a] \quad &+ \quad \sigma[\ln(1-a) + a\ln k_i] \\ &= \quad \ln(1-\beta) + \sigma\ln(1-\mu_i).\end{aligned} \tag{22}$$

The differentiation of (22) with respect to k_i and $1-\mu_i$ yields

$$\eta_i\left[\frac{\sigma[1-(1-a)(1-\mu_i)^a] - a(1-\mu_i)^a}{1-(1-\mu_i)^a}\right] = a\sigma. \tag{23}$$

From (23), we obtain the features that $\eta_i > 0$ if $\sigma < 0$ and $\eta_i = 0$ if $\sigma = 0$. Furthermore, $\eta_i < 0$ if $0 < \sigma < \frac{a(1-\mu_i)^a}{1-(1-a)(1-\mu_i)^a} \equiv \hat{\sigma}_i$. Although we might be able to consider the case of $\sigma \geq \hat{\sigma}$, we can disregard this case since it contradicts the second-order condition; as that condition requires $\sigma < \bar{\sigma}_i$, $\sigma \geq \hat{\sigma}_i$ does not hold since $\bar{\sigma}_i < \hat{\sigma}_i$.

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