A note on tax competition, attachment to home, and underprovision of public goods

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*Address: 401 W Fulton St, 478C DeVos Center, Grand Rapids, MI 49504, USA, telephone: 1-616-331-7234, e-mail: *ogural@gvsu.edu*. The author is grateful to Jan Brueckner for advice and suggestions, and to Marco Polamartschuk, seminar participants at the University of Illinois at Urbana-Champaign, and anonymous referees for helpful comments. After the first version of this paper was completed, the author became aware of the work by Leite-Monteiro and Sato [8] that also considers heterogeneity of capital regarding mobility costs. Their paper, however, does not discuss the efficiency in the provision of public goods.

Abstract

This paper analyzes efficiency in the provision of public goods when there is tax competition, but investors have attachment to home, i.e., a biased preference for investing in the region where they live. Investors are assumed to be heterogeneous in the costs to invest outside the home region. As a result, in comparison with the no attachment case, the capital outflow response to an increase in the tax rate is reduced because only investors facing small mobility costs will move capital out. In a symmetric equilibrium, tax rates are increased and the extent of the underprovision of public goods caused by tax competition is lessened.

Keywords: Tax competition; Investment location; Home bias; Attachment to home.

JEL Classification Numbers: H71, H73.

1 Introduction

The tax competition literature analyzes the distortions created by the reliance of public finance on a mobile tax base. In the case of capital taxation, jurisdictions' fear of loss of capital investment induces inefficiently low tax rates, resulting in underprovision of public goods relative to the social optimum (see Wilson [14] for a survey of the literature).

However, the usual assumption of perfect capital mobility can be contested by empirical evidence that indicates the persistence of significant home bias in investment decisions, despite the increasing openness of the economy. This home bias was first demonstrated by Feldstein and Horioka [3], who showed that investment rates were highly correlated with domestic saving rates across a sample of OECD countries.[1] In terms of subnational regions, Helliwell and McKitrick [6] did not find the same correlation across Canadian provinces, but Figueiredo et al. [4] noted a significant advantage of the home region (the "prior locality of economic activity") in the location choice of new industrial investments in Portugal. Regarding the causes of such home bias, most of the theoretical explanations focus on frictions in asset markets like transaction and information costs (see Obstfeld and Rogoff [10], Gordon and Bovenberg [2], and Coakley et al. [1]).

The objective of the present paper is to analyze tax competition in the presence of home bias in capital investment, with the population of investors assumed to be heterogeneous in the degree of home bias. Heterogeneity in home attachment was first considered in the fiscal competition literature by Mansoorian and Myers [9], in a model of population migration control, where they assumed that individuals differ in their preferences for residing in a given region. This bias, called "attachment to home", was justified by a non-pecuniary benefit derived from living in the home region.[2] Their paper shows that, with attached individuals, governments would have less incentive to make interregional transfers to control population

[1] More recent evidence confirmed the persistence of the bias across countries (see Coakley et al. [1]). There is also evidence of home bias in international portfolio diversification, first noticed by French and Poterba [5].

[2] The authors suggested that the consideration of attachment to home addresses the case of culturally diverse regions, such as the European Economic Community or Canada.

migration. In the present paper, home attachment in investment decisions is assumed to come from higher costs related to obtaining information and managing resources when investing outside the home region. It is plausible that such costs are different for each investor because people differ in the ability to invest. Hence, some investors are more attached to home than others. As a result, the capital outflow response to an increase in the tax rate is reduced compared to the no attachment case. Intuitively, only the less attached investors move capital out when the net-of-tax returns on capital become higher abroad. Further capital flight would require an increasingly larger difference in returns between regions because the remaining capital stock is owned by more attached individuals. The choice of tax rates is affected. The analysis shows that, in a symmetric equilibrium, governments choose higher tax rates than in the absence of home bias, lessening the extent of the underprovision of public goods caused by tax competition.

Regarding the effects of capital mobility costs on tax rates, Persson and Tabellini [11] obtain similar results in a simplified setting, but their paper analyzes the political determination of fiscal redistribution rather than the efficiency issue. Moreover, the authors did not justify one of the key assumptions of their model (that mobility costs are increasing in the amount of capital exported).[3]

This paper is organized as follows. The next section presents the setup of the model. The choice of tax rates in a symmetric equilibrium is analyzed in Section 3. Section 4 presents remarks on a more general approach. Section 5 concludes.

2 The model

In this section, attachment to home in investment decisions is formally considered in a standard tax competition model.[4]

[3]Other related papers are Westerhout [12], which studies the case where capital mobility is restrained by information asymmetry between domestic and foreign investors, and Lee [7], which considers mobility costs that arise after capital is first installed.

[4]The setup follows Wilson's [13] paper. However, only the case with symmetric regions is considered. See footnote (11) for the case with asymmetric regions.

There are two jurisdictions $i = 1, 2$, with measure one of population in each region. Two types of goods are available in this economy: a numeraire private good (denoted by c) and a public good (denoted by g). Individual's preferences over goods are represented by a utility function $u(g, c)$, where $g \geq 0$ and $c \geq 0$ represent the consumption of the public and the private goods respectively, and the usual functional properties are assumed. In order to simplify the analysis (without affecting the results), assume a quasilinear utility function:

$$u(g, c) = v(g) + c, \tag{1}$$

with $v'(g) > 0$, $\lim_{g \to 0^+} v'(g) = +\infty$, and $v''(g) < 0$.

In order to consume, individuals obtain income by supplying their endowments of labor and capital, which are inputs to the economy production. Each individual has one unit of labor and one unit of capital. Labor is supplied in the region where the individual lives in exchange for a wage w_i. Capital can be invested in any region, yielding net-of-tax returns ρ_j, where $j \in \{1, 2\}$ indicates the investment location. Note that ρ may differ between regions, since it depends on the gross returns on capital and the tax rate in each region (the equilibrium condition for ρ is discussed later). Individuals, however, are more inclined to invest in the home region, a tendency called "attachment to home". This attachment is assumed to come from a pecuniary cost of obtaining information and managing resources abroad, which affects the consumption of the private good. As explained in the Introduction, the population of investors is heterogeneous in the degree of attachment. Individuals in jurisdiction i are indexed by n_i, an index that is uniformly distributed over $[0, 1]$. Thus, the budget constraint of the individual of type n_i can be written as

$$c_{n_i} = \begin{cases} w_i + \rho_i & \text{if capital is invested in region } i \\ w_i + \rho_{-i} - \gamma a(n_i) & \text{if capital is invested in the other region } (-i), \end{cases} \tag{2}$$

with the last term, $\gamma a(n_i)$, representing the cost of investing outside the home region due to

attachment to home. While the parameter $\gamma \geq 0$ is just a scalar measure of the home bias,[5] the function $a(n_i)$ is defined as $a : [0,1] \to \Re_+$, twice differentiable on $(0,1)$, with $a'(n_i) < 0$ and $a(1) = 0$. As a result, a larger $a(n_i)$ means that the individual n_i has to pay a higher cost to invest abroad. The assumption $a'(n_i) < 0$ represents the heterogeneity of the population of investors. In addition, $a(1) = 0$ is needed along with positive returns on capital to guarantee that some capital move when net-of-tax returns differ between regions.

Production in this economy is carried out by competitive firms according to a usual constant-returns function $F(K_i, L_i)$, with K_i and L_i denoting the capital and the labor inputs respectively. The per worker version of the production function is $f(k_i)$, where $k_i \geq 0$ is the amount of capital per worker in region i, with $f(0) = 0$, $f'(k_i) > 0$, $\lim_{k_i \to 0^+} f'(k_i) = +\infty$, and $f''(k_i) < 0$.

Firms pay a tax per unit of capital,[6] denoted t_i, which is collected by the jurisdiction's government and used in the provision of the public good. This tax is taken into account in the maximization of firms' profit, with profits being given by $f(k_i) - (\rho_i + t_i)k_i - w_i$. Thus, the optimality condition is

$$f'(k_i) = \rho_i + t_i. \tag{3}$$

Moreover, the zero profit condition implies

$$w_i = f(k_i) - (\rho_i + t_i)k_i. \tag{4}$$

Turning to the provision of the public good, the government of each jurisdiction uses the output of the firms to produce the public good and then distributes it uniformly across residents. To simplify the analysis, it is assumed that one unit of output can be transformed into one unit of the public good, so that scale effects are ignored. Therefore, the budget

[5] If $\gamma = 0$, there is no cost of investing abroad. This case will be considered for the sake of comparison.

[6] As in the standard tax competition model, there is no other type of tax. Wilson [14] surveys models where options are available.

constraint of the government in region i is

$$g_i = t_i k_i, \tag{5}$$

where g_i is the per capita provision of the public good.

In choosing the tax rate and the optimal provision of the public good, each government maximizes a welfare function, denoted simply by W_i, which is assumed to be the sum of the residents' utilities. Hence, the government in region i solves

$$\begin{array}{c} \underset{t_i \geq 0, g_i \geq 0}{Max} W_i = \int_0^1 u(g_i, c_{n_i}) dn_i \\ s.t.\ (5)\ and\ (2). \end{array} \tag{6}$$

To characterize the equilibrium tax rates, suppose without loss of generality that $\rho_2 \geq \rho_1$.[7] With perfect mobility, capital would move from region 1 to 2 until changes in the productivity in each region offset differences in returns. However, with attachment to home, an inequality between net-of-tax returns may remain in equilibrium. The reason is that, from the budget constraint (2), an individual residing in region 1 invests in region 2 only if her type is such that

$$\rho_2 - \gamma a(n_1) \geq \rho_1. \tag{7}$$

As capital moves from region 1 to 2, condition (7) will eventually hold with equality. Clearly, less attached individuals move capital out first. Since $a'(n_1) < 0$, these are the individuals with type $n_1 \in [\hat{n}_1, 1]$, where $\hat{n}_1$ denotes the indifferent individual such that

$$\rho_2 - \gamma a(\hat{n}_1) = \rho_1. \tag{8}$$

Since n_1 is distributed uniformly on $[0, 1]$ and each individual has one unit of capital, $\hat{n}_1$

[7] The assumptions that $\lim_{k_i \to 0^+} f'(k_i) = +\infty$ and $\lim_{g \to 0^+} v'(g) = +\infty$ guarantee that ρ_1 and ρ_2 are strictly positive in equilibrium.

gives exactly the amount of capital per worker in region 1: $k_1 = \hat{n}_1$.[8] Hence, using (3) and the market clearing condition $k_2 = 2 - k_1$, (8) can be rewritten as

$$f'(2 - k_1) - t_2 - \gamma a(k_1) = f'(k_1) - t_1. \tag{9}$$

Condition (9) must hold in equilibrium because it guarantees that no individual wishes to relocate capital. Implicitly, this condition gives the amount of capital per worker in the exporter region (k_1) as a function of the tax rates in the two regions (t_1, t_2). Note that, in a symmetric equilibrium, $\hat{n}_1 = k_1 = 1$, so that (8) and (9) imply $\rho_1 = \rho_2$ and $t_1 = t_2$.

In order to analyze the optimal choices of the government in region 1, start with the implicit differentiation of the equilibrium condition (9) with respect to k_1 and t_1, which yields the capital flow generated by a change in region 1's tax rate:

$$\frac{\partial k_1}{\partial t_1} = \frac{1}{f''(k_1) + f''(2 - k_1) + \gamma a'(k_1)} < 0. \tag{10}$$

Aware of (10), region 1's government solves problem (6), which is rewritten as

$$\underset{t_1 \geq 0}{Max}\ W_1 = v(t_1 k_1) + w_1 + k_1 \rho_1 + \int_{k_1}^{1} [\rho_2 - \gamma a(n_1)] dn_1. \tag{11}$$

To obtain the first-order condition (F.O.C.) for the solution of this problem, note that, from (4),

$$\frac{\partial w_1}{\partial t_1} = -f''(k_1) \frac{\partial k_1}{\partial t_1} < 0, \tag{12}$$

and, from (3) and (10),

$$\frac{\partial \rho_2}{\partial t_1} = -f''(2 - k_1) \frac{\partial k_1}{\partial t_1} < 0. \tag{13}$$

[8] Because $\lim_{k_1 \to 0^+} f'(k_1) = +\infty$, there will be some capital invested in region 1, i.e., $\hat{n}_1 > 0$. In addition, because $\rho_2 \geq \rho_1$ and $a(1) = 0$, capital may be exported to region 2, i.e., $\hat{n}_1 \leq 1$. Then, continuity and strict monotonicity of $a(n_1)$ guarantee the existence of a unique indifferent individual.

The F.O.C. for the problem in (11) is

$$v'(t_1k_1)\left[k_1+t_1\frac{\partial k_1}{\partial t_1}\right]-k_1f''(k_1)\frac{\partial k_1}{\partial t_1}+k_1\left[f''(k_1)\frac{\partial k_1}{\partial t_1}-1\right]$$

$$+\left[\rho_1-\rho_2+\gamma a(k_1)\right]\frac{\partial k_1}{\partial t_1}+(1-k_1)\frac{\partial \rho_2}{\partial t_1}=0. \tag{14}$$

Noting that the indifference condition (9) implies $\rho_1-\rho_2+\gamma a(k_1)=0$, (14) can be rewritten as the standard optimality condition for the provision of a public good, with the marginal rate of substitution between the public and the private goods (MRS) being equal to the effective marginal cost of the public good:

$$MRS_1=\frac{k_1-(1-k_1)\frac{\partial \rho_2}{\partial t_1}}{k_1+t_1\frac{\partial k_1}{\partial t_1}}, \tag{15}$$

where $MRS_i=\frac{\partial W_i/\partial g_i}{\partial W_i/\partial c_i}=v'(t_ik_i)$, $c_i=\int_0^1 c_{n_i}dn_i$, $\frac{\partial \rho_2}{\partial t_1}$ is given by (13), and $\frac{\partial k_1}{\partial t_1}$ is given by (10). Since k_1 depends on (t_1,t_2), (15) implicitly represents the reaction function of the government in region 1 to t_2.

3 Choice of tax rates

In a symmetric equilibrium, the optimality conditions for the two regions are symmetric. Noting that $k_1=1$ and $t_1=t_2\equiv t$ in such equilibrium, (15) implies

$$MRS_i=v'(t)=\frac{1}{1+t\frac{\partial k_i}{\partial t_i}}\ \forall i, \tag{16}$$

where $\frac{\partial k_i}{\partial t_i}$ is the analogue of (10):

$$\frac{\partial k_i}{\partial t_i}=\frac{1}{2f''(1)+\gamma a'(1^-)}<0. \tag{17}$$

Note that $a'(1^-)$ denotes the derivative of $a(n_i)$ evaluated to the left of $n_i = 1$ (recall that n_i is restricted to the interval $[0, 1]$). Nonetheless, (17) holds for both an increase or a decrease in t_i because $a'(1^-)$ is the same for both regions. Assuming that the tax revenue increases with the tax rate, i.e., $\frac{\partial t_i k_i}{\partial t_i} = 1 + t\frac{\partial k_i}{\partial t_i} > 0$, condition (16) implies $MRS_i > 1$. This means that there is underprovision of the public good relative to the social optimum because the efficient outcome requires that the MRS_i equals the unitary marginal rate of transformation between the two types of goods.[9] Note that attachment affects the choice of t through the tax elasticity of the demand for capital, $t\frac{\partial k_i}{\partial t_i}$, which decreases (in absolute value) in the parameter γ at any given t. As a result, the optimal t increases with attachment.[10] This claim is verified through comparative static analysis using (16), which yields

$$\frac{dt}{d\gamma} = \frac{[1 - v'(t)]\, a'(1^-)}{v'(t) + v''(t)\,[2f''(1) + \gamma a'(1^-) + t]} > 0. \tag{18}$$

Since a greater t implies a higher provision of the public good, the results of this section can be summarized by the following proposition:

Proposition. *In the symmetric equilibrium, there is underprovision of the public good, but the extent of the underprovision is lessened relative to the no attachment case.* [11]

[9] The underprovision result, which is typical of tax competition models, is due to the so-called *fiscal externality*, which refers to the reallocation of the tax base to the other region when the tax rate increases. The effect of this externality is represented by the second term in the denominator of the MRS_i expression.

[10] Notice that, as $\gamma \to +\infty$, capital becomes immobile. As a result, $MRS_i \to 1$, i.e., the efficient outcome is obtained.

[11] With asymmetric regions, there is underprovision in the capital-exporting region, while under or over-provision may occur in the importing region (these results are similar to what is found in the standard tax competition model). However, regarding whether the provision of the public good increases or decreases in each region, the results are ambiguous. The ambiguity arises from the additional effects coming from the existence of capital trade in equilibrium. Notice that the capital-importing region gains from taxing foreign capital, but mobility costs would probably reduce the amount of capital imported compared to the perfect mobility case, thus possibly inducing a smaller tax rate. As the reaction, the choice of the other region could also be a lower tax rate. The formal analysis is available upon request.

4 Remarks on generalizations

Imperfect capital mobility can be model in a more general approach by a capital stock function like $k_i = \phi(t_i - t_{-i}; \gamma)$, where γ is the attachment parameter as before, with $\frac{\partial \phi(t_i - t_{-i};\gamma)}{\partial t_i} < 0$ and $\phi(0;\gamma)$ being independent of γ. In a symmetric equilibrium, the optimality condition would be $MRS_i = 1/(1 + t\frac{\partial \phi(0;\gamma)}{\partial t_i})$. From this condition, it is clear that if the capital outflow response to changes in the tax rate is reduced by higher mobility costs, i.e., $\left|\frac{\partial \phi(0;\gamma)}{\partial t_i \partial \gamma}\right| < 0$, then the equilibrium tax rates (and the provision of the public good) increase in γ.[12]

Although the model presented in the previous sections is a special case of the general approach just described, it has the advantage that the signs of the derivatives of the capital stock function are derived, rather than set by assumption, from the properties of the attachment cost function $a(n_i)$ (based on the heterogeneity of the investors) and the indifference condition (equation (9) in the model).

5 Conclusion

This paper analyzes efficiency in the provision of public goods when there is tax competition, but investors have attachment to home, i.e., a biased preference for investing in the region where they live. The population of investors is assumed to be heterogeneous, with each individual incurring a different cost of investing outside the home region. As a result, in comparison with the no attachment case, the capital outflow response to an increase in the tax rate is reduced because only investors facing small mobility costs will move capital out. The analysis shows that, in a symmetric equilibrium, governments choose higher tax rates than in the absence of home bias, lessening the extent of the underprovision of public goods caused by tax competition.

[12] The generalization, suggested by a referee, makes clear how attachment to home must affect the responsiveness of a region's investment level to tax rate differentials. Note that, in order to have the provision of the public good to converge to the efficient outcome, it is also necessary that $|\partial \phi(0;\gamma)/\partial t_i| \to 0$ as $\gamma \to +\infty$.

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