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Entry in Tax Competition and Intergovernmental Transfer

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Abstract

This paper proposes an efficient intergovernmental transfer system within fiscal competition settings under the endogenization of the number of regions that engage in fiscal competition. In our theoretical model, two externalities arise, namely: (1) fiscal externalities; and (2) externalities resulting from the endogenization of the number of regions. If a system is a full equalization system, inefficiencies in the public input supply and the number of competing regions are resolvable. This is because the two externalities can be internalized.

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1. Introduction

Tax competition is widely known as a "race to the bottom." After a pioneering study by Oates (1972) that argued that tax competition is harmful, Zodrow and Mieszkowski (1986) and Wilson (1986) developed relevant theoretical frameworks that revealed public policy inefficiency resulting from noncooperative and independent tax policy decisions in different regions.

Intergovernmental transfers are necessary inter-regional policy instruments for federal governments to improve the efficiency of public policy. Indeed, this transfer policy has been widely implemented in various countries including Australia, Canada, Germany, and Switzerland. Focusing on intergovernmental transfers, Köthenbürger (2002) and Bucovetsky and Smart (2006) provide a general characterization of the transfer system and show that intergovernmental transfer improves public policy inefficiencies. Many of their followers study the relationship between tax competition and intergovernmental transfers (Holm-Hadulla 2020; Kikuchi and Tamai 2019; Kotsogiannis 2010; Liesegang and Runkel 2018; Wrede 2014). Several empirical studies have investigated the impact of intergovernmental transfers on tax rates (Dahlby and Warren 2003; Egger *et al.* 2010; Smart 2007). The underlying assumption of the conclusion in these theoretical studies is that the number of regions is given exogenously. In reality, there is a decision-making mechanism by which each region decides whether to engage in tax competition.

Considering regional disparities, the production environment in a region heavily influences business investment and firms' decisions regarding the locations of production bases. For example, it is difficult to move capital to regions that have not yet secured land for industrial use. Therefore, regional governments' improvement of production environments can be a vital factor in attracting mobile capital. The cost of improving the production environment is closely related to environmental, geographical, economic, and social factors; thus, regions which may have to incur enormous costs for improving the production environment may be unable to compete or may not even dare to engage in such competition.

In recent years, several studies have tackled issues surrounding participation in intergovernmental competition (Bucovetsky 2005; Fenge *et al*. 2009; Jayet and Paty 2006; Justman *et al.* 2005; Matsumoto 2010; Zhang 2011). They have found that when considering the issue of participation in intergovernmental competition, the number of regions participating in the competition is determined endogenously. In particular, Matsumoto (2010) endogenized the number of regions by introducing regional development costs into the tax competition model. In these previous studies, regional development or the supply of public inputs are required for each region to participate in competition. Furthermore, they have shown that in addition to public policy inefficiency, there was an inefficiency in the number of participating regions.

Therefore, it is important to consider inefficiency related both to the number of participating regions and to public policy when creating transfer policies. However, the issue of competition participation has not been considered when verifying the effect of intergovernmental transfer. Therefore, after endogenizing the number of regions participating in tax competition, this study examines the intergovernmental transfers implemented by various countries.

The basic structure of the theoretical framework is similar to that of Matsumoto (2010). Two externalities arise in our theoretical framework. First, the fiscal externality occurs because each region does not consider changes in the amount of capital in other regions caused by increases in tax rates. Second, the other externality, called *externality resulting from endogenization of the number of regions*, arises because each region does not consider the decrease in the amount of capital in already-participating regions caused by tax competition participation.

Our theoretical findings indicate that the supply of public inputs and the number of regions participating in tax competition will reach an efficient level if intergovernmental transfer

completely corrects interregional disparities. Generally, multiple policy instruments are required to achieve multiple policy goals. However, this study shows that two externalities can be internalized using one policy because both externalities are caused by capital mobility between regions. This study adds new knowledge to the theory of tax competition by clarifying its nature. The number of regions is endogenized, presenting specific policies through which the efficient equilibrium is realized.

2. The model

In this section, we construct the basic theoretical model. Further, we derive equilibrium solutions and efficient resource allocation conditions for the supply of public inputs and the number of regions engaging in tax competition, respectively. Our basic setting is based on that of Matsumoto (2010). We consider an economy composed of a large number of regions. The index of regions is denoted by n, and the total number of regions is denoted by N. The regions are assumed to be distributed continuously across the interval $[0, N]$. We further assume that regional development costs, $C(n)$, differ for each region and that $C'(n) > 0$. This development cost not only indicates the difference in the cost of developing the production environment between regions, but it also represents environmental, geographical, economic, and social characteristics. Each region has immobile residents whose population is standardized to one. Residents possess factors that are immobile, L (e.g., land and labor), and a mobile factor, capital $\bar{K}$. Immobile factors L are constant in each region.

For a region to participate in tax competition to lure capital, it must develop its production environment through regional development. The residents of a region can choose whether to use immobile factors to develop the region. After making this choice, there will be competing regions (herein termed "active regions") and non-competing regions (herein termed "inactive regions") due to the difference in costs of regional development. In the active regions, perfectly competitive firms produce *numeraire* goods that can be used for private goods and public inputs G using the constant-returns production function $F(L, K, G)$. Here, we assume marginal products are positive and diminishing $F_{ii} < 0 < F_i$ and all factors are complements $F_{ij} > 0, i, j = L, K, G$. The residents of the active regions derive their income from immobile factors and capital. Each active region acts as a price taker assuming symmetry between active regions following regional development. At this time, the profit maximization condition for firms in the active regions can be expressed by

$$F_K(L, K, G) = r + \tau. \tag{1}$$

Here, r is the common price of capital, and τ is the unit tax rate on capital. Meanwhile, production does not occur in inactive regions because the production environment is not ready, and residents receive income from the capital by investing in active regions. Using the number of active regions n_e, the equilibrium condition equation for the capital market can be expressed as

$$n_e K = N\bar{K}. \tag{2}$$

The left-hand side of Equation (2) shows the capital demand for all active regions, while the right-hand side shows the total capital stock in the economy, that is, the capital supply.

Each region has its own regional government, which makes policy decisions to maximize the income of its residents under the intergovernmental transfer system. Public inputs are supplied in active regions, but the production does not occur in inactive regions; therefore, public inputs cannot be supplied. The regional government budget constraint in the active regions can be expressed as

$$\tau K + T_{ac} = G, \tag{3}$$

where T_{ac} represents the intergovernmental transfer to active regions. The left-hand side of

Equation (3) shows the capital tax revenue and payment for intergovernmental transfer, while the right-hand side shows the public input supply. Inactive regions allocate the received intergovernmental transfer as a (lump-sum) subsidy to their residents. This is because inactive regions cannot attract capital and do not supply public inputs.

Intergovernmental transfers are conducted such that

$$n_e T_{ac} + (N - n_e) T_{in} = 0 \tag{4}$$

is satisfied. Here, T_{in} captures the intergovernmental transfer to inactive regions. Intergovernmental transfers are presented following Köthenbürger (2002). Using the average capital tax $\bar{\tau} = [n_e \tau_{ac} K_{ac} + (N - n_e)\tau_{in} K_{in}]/N\overline{K}$, the value of the transfer to region n can be expressed as

$$T_n = \alpha\bar{\tau}(\overline{K} - K_n), n = ac, in. \tag{5}$$

Here, $0 \leq \alpha \leq 1$ is a parameter. Note that $T_{ac} = \alpha\bar{\tau}(\overline{K} - K)$ in the active region and $T_{in} = \alpha\bar{\tau}(\overline{K} - 0)$ in the inactive region. Where $\alpha = 0$, the results are consistent with those of Matsumoto (2010). For example, $\alpha = 1$ indicates that the entire difference is transferred from the active regions to the inactive regions. In other words, α indicates the extent to which intergovernmental transfers reduce interregional disparities. Each region takes the average tax rate $\bar{\tau}$ as well as the common price of capital as given: a small region's public policy will have a negligible impact on the average tax rate in the entire economy.

Fully differentiating and rearranging Equations (1), (3), and (5), the impact of changes in the capital tax rate on the amount of capital demand, and the level of public input supply can be expressed as

$$K'(\tau) = \frac{1 - KF_{KG}}{D}, \quad G'(\tau) = \frac{KF_{KK} + (\tau - \alpha\bar{\tau})}{D}, \tag{6}$$

where

$$D \equiv F_{KK} + (\tau - \alpha\bar{\tau})F_{KG}.$$

Here, a one-unit increase in a capital tax increases $(K + \tau K' + \partial T_{ac}/\partial\tau)$ units of local public inputs if we assume that the equilibrium point is located on the left side of a Laffer curve. That is, $G'(\tau) > 0$ is assumed. In this study's theoretical model, we consider the case where $K'(\tau)$ is both positive and negative. This is because capital tax increase reduces the effect of attracting capital, but the increase in the supply of public inputs enhances the effect of attracting capital.

In this study, we consider a two-stage game in which decisions are made as follows. In the first stage, residents decide whether they want to develop the region, that is, whether or not to engage in tax competition. The regional government sets the capital tax rate and the public input supply, taking the transfer scheme and the policies of other regions as given. Therefore, the number of active regions and public policies are determined simultaneously. In the second stage, perfectly competitive firms in the active regions determine capital demand.

The number of active regions is determined so that the income of the active regions $F(L, K, G) - (r + \tau)K + r\overline{K}$ matches the income of the inactive regions $r\overline{K} + T_{in}$. Therefore, the number of active regions is determined using Equations (3) and (5) under symmetric equilibrium where $\tau = \bar{\tau}$:

$$F - F_K K - [G - (1 - \alpha)\tau K] = C(n_e). \tag{7}$$

Here, the left-hand side of Equation (7) shows the benefits of participating in tax competition, while the right-hand side shows the costs of participating in tax competition.

The regional governments of the active regions set policies to maximize the incomes of their residents. The optimization problem facing regional governments can therefore be expressed as

$$\max_{\tau, G, K} F(L, K, G) - (r + \tau)K + r\overline{K} \text{ s.t. } (1), (3), \text{and } (5). \tag{8}$$

The regional public input supply rule can be derived using the first-order condition under symmetric equilibrium where $\tau = \bar{\tau}$:

$$F_G - 1 = -(1-\alpha)\tau \frac{K'(\tau)}{G'(\tau)}. \quad (9)$$

The right-hand side of Equation (9) represents the fiscal externality after adjustment by intergovernmental transfer.

Efficient resource allocation determines the public input supply and the number of active regions to maximize income for the economy as a whole. We assume symmetric allocations where K and G take the same value in all active regions. Using Equations (2), (3), and (4), the total income maximization problem can be expressed as

$$\max_{G,n_e} Y \equiv n_e \left[F\left(L, \frac{N\bar{K}}{n_e}, G\right) - G \right] - \int_0^{n_e} C(n)dn. \quad (10)$$

From the first-order condition, we derive

$$F_G = 1, \quad (11)$$

$$F - F_K K - G = C(n_e^*). \quad (12)$$

Equation (11) shows that public inputs are supplied such that the marginal productivity of public inputs matches the marginal rate of transformation. This equation is a condition for efficient public policy, and the efficient public input supply is denoted by G^*. Equation (12) is a condition for efficient regional development; the efficient number of active regions is determined by Equation (12), where n_e^* is the efficient number of active regions.

Equations (7) and (12) show the number of active regions under efficient resource allocation and the number of active regions in equilibrium, respectively. We consider the case where intergovernmental transfers were not conducted ($\alpha = 0$). Each region recognizes the benefits of participation in tax competition as $F - F_K K$, but the economy as a whole is $F - F_K K - G$. Comparing the above two benefits, $n_e \tau (dN\bar{K}/dn_e) = -G$ is the impact of a region's tax competition participation on the tax revenue of all active regions. That is, it is the externality resulting from the endogenization of the number of regions. The endogenous number of active regions leads to inefficiency.

3. Efficient intergovernmental transfer

This section analyzes the impact of intergovernmental transfers on the supply of public inputs and the number of active regions. The efficient resource allocation condition, Equation (9), and the equilibrium condition, Equation (11), are compared to determine whether public inputs are supplied efficiently. Meanwhile, Equation (7) and Equation (12) are compared to determine whether the number of active regions is efficient. The efficient public input supply, G^*, and efficient number of active regions, n_e^*, are achieved under full equalizations where $\alpha = 1$ and symmetric equilibrium where $\tau = \bar{\tau}$. Therefore, the following proposition holds:

Proposition 1. *If a system is a full equalization system, the public policy in each active region and regional development are efficient.*

We interpret Proposition 1 with respect to public policy. While active regions consider the change in K due to the increase in τ (increase in G), they do not consider the change in K in other regions. Fiscal externality arises because each active region does not consider the impact on other regions when making public policy decisions. From Equation (9), $-(1-\alpha)\tau[K'(\tau)/G'(\tau)]$ captures the fiscal externality after adjustment for intergovernmental transfer under symmetric equilibrium, where $\tau = \bar{\tau}$. In particular, $-\tau(K'(\tau)/G'(\tau))$ represents the fiscal externality. Under full equalizations where $\alpha = 1$ and symmetric equilibrium where $\tau = \bar{\tau}$, the marginal cost of public inputs matches the marginal rate of transformation from Equation (9) when compared to Equation (11). Therefore, the fiscal

externality is internalized. As an efficient public inputs supply, G^*, is achieved under perfect equalization, the public policy in each active region is efficient. This result of Proposition 1 is parallel to the results obtained by Köthenbürger (2002), who showed that full equalization internalizes fiscal externality when public goods are supplied by capital taxation.

We interpret Proposition 1 with respect to regional development. From Equation (7), each region considers the benefit of participating in tax competition, $F - F_K K - [G - (1-\alpha)\tau K]$, and the cost of participating in tax competition, $C(n_e)$. However, in Equation (12), the benefits for the overall economy are $F - F_K K - G$, although the costs are the same. In particular, $-G$ represents the decrease in tax revenue of all active regions resulting from participating in tax competition, that is, externality resulting from the endogenization of the number of regions. The benefits recognized by each region are $F - F_K K - [G - (1-\alpha)\tau K]$. Under full equalizations where $\alpha = 1$ and symmetric equilibrium where $\tau = \bar{\tau}$, the benefits perceived by each region match the benefits of the economy as a whole. Therefore, externality resulting from the endogenization of the number of regions is internalized. As an efficient number of active regions, n_e^*, is achieved under perfect transfer from active to inactive regions, regional development is efficient.

Under full equalizations where $\alpha = 1$, both fiscal externalities and externalities from the endogenization of the number of regions are internalized. Fiscal externalities arise because individual regions do not consider changes in the amount of capital in other regions produced by changes in the tax rate in that region. Externalities resulting from the endogenization of the number of regions occurs because individual regions do not consider the reduction in the capital in active regions because of engaging in tax competition. Capital mobility causes these externalities. Thus, intergovernmental transfers that provide equalization transfers in response to changes in the actual tax base can internalize the fiscal externalities and those caused by the endogenization of the number of regions.

4. Conclusion

This study aimed to clarify the relationship between intergovernmental transfer to reduce interregional economic disparities and regional participation in tax competition. Thus, we constructed a basic tax competition model and examined intergovernmental transfers. Results from the theoretical analysis show that the complete correction of interregional disparities through intergovernmental transfers can fully amend both the insufficient participation of regions with low development costs and the excessive participation of regions with high costs. Furthermore, our theoretical findings indicate that the complete correction of interregional disparities can fully resolve an inefficient public input supply.

In the tax competition model, in which the number of regions is endogenized, fiscal externalities and externalities resulting from the endogenization of the number of regions have a shared cause, namely capital mobility between regions. This study shows that equalization transfer acts directly on this factor and internalizes these externalities. In general, multiple policy instruments are needed to achieve multiple policy goals. This result contributes new knowledge to the tax competition theory because it shows that two externalities can be internalized using a single policy.

Finally, we discuss future prospects for this study. In the basic setup used in this study, for the sake of simplicity, we assumed that all regions engaging in tax competition are symmetric, and the decision-making by an economic agent (that is, the central government) is excluded from the analysis of how intergovernmental transfers should be implemented. Considering the asymmetry between active regions in this way, it becomes possible to discuss intergovernmental transfers between active regions. Additionally, by considering decision-

making by the central government, vertical tax competition and vertical transfers could also be examined.

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