Economics Letters 123 (2014) 104–107

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Tax competition in federations revisited

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HIGHLIGHTS

- This paper extends Keen and Kotsogiannis (2002, 2004).
- We introduce the concept of all-purpose public goods.
- Both the producers and consumers can benefit from all-purpose public goods.
- We explore the horizontal externality and the vertical externality.
- We find that tax competition may not lead to a lower or higher tax rate.

ARTICLE INFO

Article history:
Received 16 September 2013
Received in revised form
21 January 2014
Accepted 22 January 2014
Available online 31 January 2014

JEL classification:
D62
E62
H21
H41
H77

Keywords:
Vertical tax competition
Public goods provision
Vertical externality
Horizontal externality

ABSTRACT

We extend Keen and Kotsogiannis (2002, 2004) by considering all-purpose public goods that are beneficial to both producers and consumers. Horizontal externality (resp. vertical externality) exerted by tax competition will not necessarily lead to inefficient outcomes.

1. Introduction

Since the publication of Zodrow and Mieszkowski (1986), tax competition among jurisdictions has attracted attention from public economists. Whether tax competition can lead to a socially optimal tax rate is consistently an important issue. In the investigation of the issue of tax competition efficiency, compared with works on horizontal tax competition, there are few studies of vertical tax competition, typically represented by Hoyt (2001), Keen and Kotsogiannis (2002, 2004), Wigger and Wartha (2004), Wilson and Janeba (2005), and Eichner and Runkel (2012). In contrast to horizontal tax competition, vertical tax competition is the characteristic of multi-tier governments, and capital is the overlapping tax base of the jurisdictional and central governments. The overlapping tax base results in vertical externality between the multi-tier governments, and its size is largely influenced by the central government's tax policy. Thus, in the framework of vertical tax competition that is exemplified by Keen and Kotsogiannis (2002, 2004), we know that vertical externality (resp. horizontal externality) leads to an inefficiently higher (resp. lower) tax rate than the social optimum.

However, a crucial trait of the existing literature on vertical tax competition is that public goods provided by the multi-tier governments can only be used by citizens or firms. However, in reality, some types of public goods can be utilized by both citizens

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http://dx.doi.org/10.1016/j.econlet.2014.01.024
0165-1765/

and firms (e.g., information network, law enforcement, and municipal public infrastructure). These types of public goods cannot only be directly consumed by citizens but are also beneficial to production activities (e.g., enhancing productivity). We call them all-purpose public goods.[1] Unfortunately, discussion of this type of public goods has been largely ignored by the literature on vertical tax competition.[2]

This paper introduces all-purpose public goods into Keen and Kotsogiannis' (2002, 2004) analytical framework. We find that if only horizontal externality (resp. vertical externality) exists, tax competition will not necessarily lead to a lower (resp. higher) tax rate compared with the social optimum and may even lead to a socially optimal level. In addition, we show that the situations of tax competition efficiency discussed by Keen and Kotsogiannis (2002, 2004) are special cases of our generalized theoretical model.

2. The model

For simplicity, our theoretical model establishes a typical Keen–Kotsogiannis economy in which there is a central government and two identical jurisdictions. Each jurisdiction has one unit of immobile citizens owning e units of initial capital endowment. Capital, the shared tax base among central and jurisdictional governments, moves freely between jurisdictions and comes from the savings of citizens. Jurisdictional government i ($i = 1, 2$) imposes a tax t_i on each unit of capital located in jurisdiction i and levies the rent tax at a rate of θ on local citizens, where $\theta \in (0, 1)$. The central government only levies a tax T on each unit of capital in the economy. All of the tax revenues are used to provide public goods.

In contrast to Keen and Kotsogiannis (2002, 2004) who hold that public goods can only be utilized by citizens, we assume that public goods are all-purpose and are beneficial to both citizens and producers. Each jurisdiction's public goods provision serves both local citizens and producers, and the central government equalizes its tax revenue to provide public goods shared by both consumptive and productive activities in the economy.

Similar to the Hicksian public input, our all-purpose public goods are introduced to the production function by enhancing the production factors' marginal productivity. Following Pi and Zhou (2014), we have the production function as below:

$$Y_i = R_i^{\alpha} F^i(K_i), \quad i = 1, 2, \tag{1}$$

where Y_i and K_i are the output and capital employment of firms in jurisdiction i. F^i is strictly concave with respect to capital because labor is an immobile production factor. α is a parameter belonging to $(0, 1)$. R_i is composed of the jurisdictional government's all-purpose public goods g_i and the central government's all-purpose public goods G, representing their comprehensive effects on the production. Specifically,

$$R_i = R_i(g_i, G), \tag{2}$$

where R_i is strictly quasi-concave and linearly homogeneous with respect to g_i and G.

Furthermore, we have:

$$R_i^{\alpha} F_K^i(K_i) = \rho + t_i + T, \tag{3}$$

$$\pi_i = R_i^{\alpha}[F^i(K_i) - F_K^i(K_i)K_i], \tag{4}$$

where ρ is the real return to capital. π_i is the citizens' rent income in jurisdiction i. $F_K^i = \partial F^i / \partial K_i$.

Total saving S is stated as:

$$K_1 + K_2 = 2S(\rho). \tag{5}$$

Public expenditures are given by:

$$g_i = t_i K_i + \theta \pi_i, \tag{6}$$

$$G = \frac{1}{2} T(K_1 + K_2) = TS(\rho). \tag{7}$$

Next, we consider the consumption side of the economy. On the basis of Keen and Kotsogiannis (2002, 2004) and Wigger and Wartha (2004), the utility function in jurisdiction i is described by:

$$W_i(C_{i1}, C_{i2}, g_i, G) = U_i(C_{i1}) + C_{i2} + \Gamma(g_i, G), \tag{8}$$

where W_i, C_{i1}, and C_{i2} are the aggregate utility level, the first-period consumption and the second-period consumptions in jurisdiction i, respectively. Functions U_i and Γ are strictly concave.

Furthermore, Eq. (8) can be rewritten as:

$$W_i(t_i, T) = U_i(e - S) + (1 + \rho)S + (1 - \theta)\pi_i + \Gamma(g_i, G). \tag{9}$$

The production activities are described by Eqs. (1)–(7). The consumption behaviors are depicted by Eq. (9). The central and jurisdictional governments will simultaneously choose T and t_i to maximize the citizens' utility. In line with Keen and Kotsogiannis (2002, 2004), this paper only considers bottom-up vertical externality and the case of symmetric equilibrium.

By employing the comparative static approach, we have (see Appendix A):

$$\frac{dK_1}{dt_1} = \frac{dK_2}{dt_2} < (\geq) 0, \quad \text{if } -1 + \frac{R_g K \alpha R^{\alpha-1} F_K}{B} < (\geq) 0;$$

$$\frac{dK_2}{dt_1} = \frac{dK_1}{dt_2} < (\geq) 0, \quad \text{if } 1 - \frac{R_g K \alpha R^{\alpha-1} F_K}{B} < (\geq) 0;$$

$$\frac{d\rho}{dt_1} = \frac{d\rho}{dt_2} < (\geq) 0, \quad \text{if } -1 + \frac{R_g K \alpha R^{\alpha-1} F_K}{B} < (\geq) 0.$$

Here, $B = 1 - R_g \theta \alpha R^{\alpha-1}(F - KF_K) > 0$.

It is worth noting that the establishment of above results is based on the condition that $\frac{R_g \alpha}{R}\theta\pi < 1 - \max\{\alpha R^{\alpha-1} F_K R_G TS', \frac{-\alpha A F_K}{R F_{KK}}\}$, which is a sufficient condition to guarantee the stability of the equation system describing production activities.[3] Such a condition indicates that the impact exerted by the increased local public goods provision on the jurisdictional government's tax revenue should be small enough. If we set $\alpha = 0$, then our model will be reduced to Keen and Kotsogiannis (2002, 2004) and the above condition will be definitely satisfied.

Because all-purpose public goods possess the productivity-enhancing characteristic, our findings are different from those in Keen and Kotsogiannis (2002, 2004). For example, a rise of local tax rate t_i initially decreases the local capital employment (i.e., $\frac{dK_i}{dt_i} < 0$ is determined by the term -1), but it also increases the public goods provision, raising the marginal productivity of capital and attracting more capital to jurisdiction i (i.e., $\frac{dK_i}{dt_i} > 0$ is determined by the term $\frac{R_g K \alpha R^{\alpha-1} F_K}{B}$). Hence, the final impact of a rise of t_i is ambiguous (i.e., $\frac{dK_i}{dt_i} < (\geq) 0$). If our public goods are not productivity-enhancing (i.e., $\alpha = 0$ and $\frac{R_g K \alpha R^{\alpha-1} F_K}{B} = 0$), then we will have

[1] Another way to describe all-purpose public goods is that a fixed proportion of them is merely employed by producers and the rest is only used by citizens. The investigation of such a situation is the same as that discussed by us.

[2] Similar ideas have been noticed by Dahlby and Wilson (2003) and Anwar (2006), but their analyses do not focus on tax competition.

[3] The derivation of such a condition is technical and complex. It is on request if needed.