Urban Public Economics
Review
Revista de Economía Pública Urbana

Tax Competition and New Economic Geography

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By using models of monopolistic competition, new economic geography provides a different prediction on the outcome of tax competition than standard tax competition literature. Any region that is concerned by agglomeration may then benefit from a taxable agglomeration rent and gain from tighter economic integration. On the empirical side, there are very few papers that try to test the theoretical predictions of such a literature. Most papers provide evidence of the existence of a taxable agglomeration rent by analysing either the governments' behaviour when setting their local tax rate or the location choices of new plants.

La nueva geografía económica, usando modelos de competencia monopolística, ofrece una predicción acerca del juego de la competencia fiscal, distinta de la visión estándar que venía ofreciendo la literatura. Algunas regiones que pertenecen a un área de aglomeración pueden beneficiarse de las rentas gravables de aglomeración y ganar así con la integración económica. Desde el punto de vista empírico hay algunos trabajos que tratan de probar estas predicciones. La mayoría evidencian la existencia de una renta de aglomeración gravable, cuando los gobiernos locales establecen su tipo impositivo o cuando escogen la localización de nuevos establecimientos empresariales.

1. Introduction

Standard tax competition literature predicts that competition among governments over scarce capital will bid down taxes and public spending to suboptimal levels (see the survey by Wilson, 1999). Although the specific asset of assumptions modifies the extent of the fiscal externality, tax rates are always too low as long as governments maxi-

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mize the welfare of a representative citizen (Janeba and Schjelderup, 2002).

However, this literature fails to account for some aspects of modern economies such as increasing returns to scale and product diversity. By introducing agglomeration forces linked to the increasing returns to scale and the trade cost of goods, new economic geography has renewed the issue. The aim of this literature is to explain the formation of a large variety of economic agglomeration (or concentration) in geographical space (Fujita and Krugman, 2004).[1] Theoretical work in new economic geography relies heavily on Krugman (1991), which develops a general equilibrium framework where the geographical distribution of mobile factors is the result of opposing forces working in favour of concentration and dispersion respectively. Scale economies in manufacturing lead each firm to concentrate its production in a single location. As a result, the firm's preferred location will tend to be the larger of the two markets in order to minimize its trade costs. Moreover, workers/consumers will prefer to live in the region with more firms, as it offers better access to manufactured goods. Krugman identifies these two aspects as 'backward' and 'forward' linkages, respectively, which tend to favour the spatial agglomeration of activity into a manufacturing 'core' and an agricultural 'periphery'. Finally, lowering trade costs is shown to increase the tendency for the core–periphery pattern to emerge.

Together with trade barriers reductions, regions usually have access to taxes and public goods supply that can influence the location of economic activity. Following Krugman (1991), recent papers analyse competition between governments using tax policies to influence the location of manufacturing activity (Kind et al., 2000; Ludema and Wooton, 2000; Andersson and Forslid, 2003; Baldwin et al., 2003). In particular, they focus on the taxation of mobile factors in economies where agglomeration economies are present, firms face monopolistic competition, and trade is allowed. They conclude that agglomeration economies create rents for the mobile factor that can be taxed away by the government without inducing relocation, increasing the equilibrium tax rates. By fostering agglomeration, greater economic integration may then lead to a

[1] The clustering of economic activities may have a variety of composition: a cluster of small shops and restaurant in a neighbourhood, the formation of cities, the emergence of a variety of industrial districts, the existence of strong regional disparities within the same country...

decrease in the intensity of tax competition. In terms of welfare analysis, Baldwin and Krugman (2004) show that tax harmonisation always harm at least one nation while a tax-floor leads to a weak Pareto-improvement. In the case of asymmetric countries, Ottaviano and van Ypersele (2005) show that tax competition can be globally beneficial for high trade barriers and detrimental otherwise.

On the empirical side, to our knowledge, there are very few papers that try to test the theoretical predictions of such a literature in a local framework. Charlot and Paty (2005, 2007) investigate the effects of agglomeration economies on local tax setting. Furthermore, some empirical work analyse whether agglomeration forces may reduce firms' sensitivity to tax differentials across locations in Switzerland (Brülhart, Jametti and Shmidheiny, 2006), in Great Britain (Devereux, Griffith and Simpson, 2007) and in Spain (Solé-Ollé and Jofre-Monseny, 2007).

In this paper, we first present a brief survey of the main theoretical results found in the new economic geography literature that introduces taxation of mobile factors (section 2). We then review the main results obtained in the empirical literature that tests the theoretical predictions of this literature (section 3).

2. The theoretical results

As economic activities tend to concentrate in a small number of places (typically in urban area), some literature considers the effect of agglomeration forces on fiscal competition between jurisdictions. More specifically, the new economic geography literature uses the monopolistic competition framework, with internal increasing returns, to study agglomeration in general equilibrium models (Krugman 1991). The increasing returns to scale mean that industrial producers want to be close to consumers (or firms when there is vertical linkage) to satisfy a large demand, while consumers want to be close to producers to benefit from more varieties of goods without sustaining transport cost. Thus, there is a cumulative process of agglomeration whose intensity depends on the values of transport cost, on the magnitude of the preference for diversified goods and on the share of the monopolistic competition sector.

Following this large literature (see Baldwin et al., 2003, for a recent survey) recent papers have started to focus on the taxation of factors and their income when firms are in monopolistic competition and when trade costs on goods are present. They show that capital mobility is not the only factor affecting the impact of tax competition on tax rates. The

level of trade openness and the extent of agglomeration forces not only have effects on location but also on tax rates in equilibrium, when localities or countries engage in tax competition.

2.1. Agglomeration forces and tax competition

The main question addressed by Ludema and Wooton (2000) is whether economic integration, by strengthening agglomerative forces (such as a reduction in the trade cost), intensifies tax competition and results in lower equilibrium taxes. They study the impact of varying factors' mobility costs and trade costs and find that lowering either cost may result in higher taxes being chosen in standard tax competition literature. If there exists a core–periphery equilibrium, then integration makes labor less responsive to tax differentials. The reason is that, once workers are all concentrated in a core, any measure that increases agglomerative forces or increases worker mobility only gives them incentives to stay where they are. Integration makes labor more responsive to tax differentials only when agglomerative forces are too weak or labor is insufficiently mobile for the core–periphery pattern to emerge as an equilibrium. As a result, economic integration may reduce the intensity of tax competition regardless of whether labor becomes more or less responsive to tax differentials.

2.2. Agglomeration economies and taxable rent

In a pioneer paper, Andersson and Forslid (2003) build a model where taxation on factors is used by local government to produce a local public good. They show that the taxation of immobile workers stabilises the dispersed equilibrium, where increasing returns activities is evenly distributed across locations. On the other hand, the taxation of mobile workers destabilises the dispersed equilibrium. One of the major explanations is the production's technology of the public good which constitutes a new agglomeration force; regions with more mobile factors own resources to produce more public goods, attracting more mobile factors. This effect is reinforced when mobile factors are not taxed too heavily compared to immobile factors. When regions are asymmetric, in terms of their endowment of immobile factors, Ludema and Wooton (2000), Andersson and Forslid (2003), Baldwin and Krugman (2004) and also Borck and Pflüger (2006) show that agglomeration creates rents for the mobile factor that can be taxed, increasing the equilibrium tax rates. In this set up, the result, according to which the mobile factor may not respond to marginal changes in tax rates, differs from the standard theo-

retical predictions regarding tax competition. They show how an agglomerated region can tax more without losing its mobile activities. Firms accept to bear a higher tax rate in order to benefit from agglomeration economies and from local public goods.

As long as the tax gap is smaller than the agglomeration rent, industry will be agglomerated in one region. Since this agglomeration rent is a bell-shaped function of the level of trade integration, the tax gap is also bell-shaped (Baldwin and Krugman, 2004). At intermediate trade costs, agglomeration forces are very strong and the sensitivity to tax differentials is very low in the agglomerated region. Contrasting with the standard results in tax competition literature, closer integration will first result in a 'race to the top' and then lead to a 'race to the bottom'.

To illustrate these results, we present in Frame 1 a linear foot-loose capital model (Charlot and Paty, 2007) in which local governments play a Nash equilibrium in tax rates. The main agglomeration force at work is due to market access: firms close to a larger demand can exploit their increasing returns to scale further. Because of the agglomeration rent linked to the 'market access effect', the predicted relationship between tax rate and the size of local demand is positive: the larger the market access, the higher the tax rate.

Frame 1: Market access effect and tax setting (Charlot and Paty, 2007)

This model is a very simple two-region model, with a quasi-linear quadratic utility function. Following Ottaviano and van Ypersele (2005), they use a linear foot-loose capital (FC) model, initially developed by Ottaviano (2001) and clearly presented in Baldwin et al. (2003). In this framework, capital is mobile and its spatial distribution gives the spatial equilibrium. Capital can be invested in one region but owned by someone living in the other region.

There are two regions, two factors of production and two private sectors. They also consider two local governments. The traditional sector, A, is perfectly competitive, under constant returns to scale, and employs only labour. The good produced by this sector is freely tradable and, after normalisation of the marginal cost of production and considering this good as numéraire, price and wage are equal to unity.

The manufacturing sector, M, employs labour and capital, and is in monopolistic competition and under increasing returns to scale: there is a fixed cost,

incurred in terms of capital, in the production function. Since the wage is unity, the total cost of producing x units of a variety of the M good is $\pi J + a_m x$. Where J is the number of units of capital employed to produce one variety (a fixed cost), and a_m the variable cost in labour. J determines the number of firms and therefore the number N of varieties produced. π is the net remuneration of capital.

Transporting a manufacturing good from one region to another costs t units of the A good.

Consumers located in region j maximise the quasi-linear quadratic utility function:

$$U_j = \alpha \int_{i=0}^{n_1+n_2} c_i di - \frac{\beta-\delta}{2} \int_{i=0}^{n_1+n_2} c_i^2 di - \frac{\delta}{2}\left(\int_{i=0}^{n_1+n_2} c_i di\right)^2 + C_A + H(G_j)$$

where c_i is the consumption of variety i of the M good, C_A is the consumption of the A good and n_1 and n_2 are the number of varieties produced in region 1 and 2. α expresses the preference for the M goods, $\beta(>\delta)$ the preference for variety, and the δ substitutability between different varieties.

H(.) is a concave function of the local public spending G in region j. Capital is assumed to be mobile while workers are immobile. Mobile capital can thus be employed in one region while its owner is located in the other. The location of capital depends on the net return on capital in each region and determines the spatial equilibrium. $S_L = L_1/L$ is the share of total labour which is localised and employed in region 1. $s_K = K_1/K$ is the share of total capital owned by workers localised in region 1. We suppose that each local government taxes the return on the capital located in her region and plays Nash relative to the other government. This means that each government will set its own tax rate in order to maximise the indirect utility from public goods subject to its budget constraint.

Local governments produce G_j public goods. Let us note that since capital is not owned by inhabitants of the region where its return is taxed, there is a 'tax exportation' phenomenon: inhabitants of one region can benefit from local public good partly financed by owners of capital who live in the other region. There is no direct link between local income, even income from capital and local amount of public good produced.

The maximisation problem for the local level is: $\text{Max}_{tj}\, H(G_j)$ subject to $G_j = t_j n_j K_j$. They assume the following simple concave function: $H_j = G_j - 2G_j^2$.

In spatial equilibrium, local tax rates that maximise the public objective functions are equal to:

$$t_1^* = \frac{\tau(b+c)}{3K(2b+c)} + \left[\frac{3}{4}c\tau M + (2ba_m + b\tau - 2a)\left(\frac{1}{2}M - M_1\right)\right]$$

$$t_2^* = t_1^* - \frac{\tau(b+c)(2ba_m + b\tau - 2a)(M - 2M_1)}{3K(2b+c)}$$

When regions have the same size ($M_1 = M_2 = M/2$), local tax rates in Nash equilibrium are identical and increase with the size of total demand (M), with the transport cost and with goods' substitutability, c. As in Baldwin and Krugman (2004), when regions are identical, preference for diversity and integration process make tax competition harder: equilibrium tax rates decrease when they are high.

Since $2ba_m + b\tau - 2a < 0$ under the trade condition, when regions are different, the relative size of the local demand (M_i/M) increases this optimal tax rate and the higher the trade cost, the larger this effect. Because of the market access effect, the government in a larger region can tax more than in the smaller region. Charlot and Paty (2007) find the same results as Ottaviano and van Ypersele (2005): first, there is an agglomeration rent for large regions and second, horizontal interactions among local governments depend on the size of each locality. This fiscal interactions are huge when regions have got the same size. In their model, horizontal fiscal interactions are modulated by the market access effect when jurisdictions have not the same size.

To sum up, because of the agglomeration rent linked to the 'market access effect', the relationship between tax rate and the size of local demand is positive; the larger the market access, the higher the tax rate. This effect is increasing when trade cost of consumption goods is low and when preference for diversity is high.

2.3. Agglomeration and tax harmonisation

In the traditional analysis based on Nash tax competition, tax harmonisation defined as a shift from a non-cooperative outcome to a cooperative one, is likely to improve the welfare of all governments. In the new economic geography framework, Baldwin and Krugman (2004) explicitly consider the implications of agglomeration forces for different tax harmonisation schemes. In their model with asymmetric countries, simple tax harmonisation –defined as adoption of a common tax rate– always harms at least one nation. A rise in both nations rates to a single tax rate would raise the large country's welfare while the small nation would lose. Moreover, a policy which consists in adopting a rate that lies between the two initial rates turns out to harm both nations. Compared to the initial equilibrium, this harmonization scheme forces

the large country to lower its tax rate, when that nation would prefer to raise it. Moreover, given that this common tax rate do not lead to a shift in the core from the large country to the small one, firms prefer to stay agglomerated in the large country. The small nation remains without firms and would prefer to set its pre-harmonization tax rate (Baldwin et al., 2003). Finally, a tax-floor, set at the level of the small country's equilibrium tax rate, leads to weak Pareto improvement, with the high-tax nation gaining and the low-tax nation being left indifferent. This coordination scheme lessens the tax pressure in the big country without altering the situation for the small one.

Ottaviano and van Ypersele (2005), also study the impact of the trade cost decline on the welfare in a general equilibrium model in which two countries compete for monposptically competitive firms. Countries are assumed to have asymmetric sizes and trade is costly. As a result, the larger country provides a better overall market access. The free market outcome yields a home market effect, i.e. the larger country hosts a more than proportionate share of firms (Helpman and Krugman, 1985). They show that this outcome is inefficient because, unless trade costs are low enough, firms are too concentrated in the larger country. When trade costs are large enough to make it inefficient for all firms to cluster in a single country, tax competition for mobile firms may be beneficial with respect to the free market outcome since it can prevent from excessive spatial concentration of firms. However, tax competition may be detrimental when trade costs fall and clustering becomes efficient.

3. Some empirical results in a local context
There are very few empirical papers that aim to test the theoretical predictions of such a literature in a local framework. We present hereafter recent empirical studies that investigate the relationship between the market access effect and the local tax setting (Charlot and Paty, 2005, 2007) and the effect of agglomeration economies on the location choices of new plants (Brülhart, Jametti and Shmidheiny, 2006; Devereux, Griffith and Simpson, 2007; Solé-Ollé and Jofre-Monseny, 2007).

3.1. The impact of agglomeration economies on local governments' tax setting
The main purpose of Charlot and Paty (2005) is to assess the existence and the magnitude of tax interdependencies among the French local

tax setting by taking into account the agglomeration forces. In order to perform that test, they estimate a tax setting equation using a cross section data set in 2002 on business tax rate set by groups of municipalities. Their sample contains 354 urban groups of municipalities or urban jurisdictions (that is 5,117 municipalities) and 129 rural groups of municipalities or rural jurisdictions (that is 1,855 municipalities). This paper is in line with this growing empirical literature which generally confirms the positive relationship between competing regions' (or states') fiscal choices, that is the existence of horizontal externalities, and provide some strong empirical support for the hypothesis of vertical tax (or spending) interactions between the federal government and lower layers of government (see Goodspeed, 2000; Hayashi and Boadway, 2001; Brett and Pinske, 2000; Revelli, 2001, 2003; Esteller-Moré and Solé-Ollé, 2001; Aronsson et al., 2000; Andersson et al., 2004). However this paper is original in the way the effect of agglomeration economies on tax interactions are introduced by allowing a differentiation in tax setting behaviour according to the extent of urbanization of local government. They observe a positive relationship between tax rate and capital stock only for urban jurisdictions giving presumption of a taxable agglomeration rent, as highlighted by new economic geography models. They also observe significant mimic behaviour between the French localities when they choose their rate of local business tax. However, the mimic behaviour between jurisdictions is not shown to be more intense in denser areas, suggesting that tax competition is not harder as agglomeration increases.

Charlot and Paty (2007) focus on the role of agglomeration economies in the tax setting of local governments. They first describe a simple economic geography model (presented in frame 1) in which the main agglomeration force at work is the market access effect defined as the size of demand in one municipality. Empirically, market access effect may be captured by the income of all the other municipalities weighted by trade cost. They then estimate a local business tax-setting equation using spatial panel data for the period 1993–2003 and covering 834 French municipalities. The estimation results show significant mimic behaviour between French localities when they choose their rate of local business tax. They also confirm the existence of a positive and significant relationship between business tax rates and market access, which suggests there is a taxable agglomeration rent in the French municipalities.

3.2. The impact of agglomeration economies on the sensitivity to local taxes of firms' location choices

Recent empirical work has well established that the spatial distribution of plants is concentrated, both across sectors and within individual industries: see e.g. Devereux et al. (2004), Holmes and Stevens (2004), Combes and Overman (2004), Fujita et al. (2004), Duranton and Overman (2005). A number of empirical studies also conclude that agglomeration economies may explain the location decisions of firms (Devereux et al., 2004; Dumais et al., 2002; Harhoff, 1999). Moreover, many papers provide evidence of the impact of fiscal incentives on firms' location (see the surveys by Hines, 1999, and Devereux and Griffith, 2002). However, very few papers estimate the impact of agglomeration economies on the sensitivity to local taxes of firms location choices. We here present three empirical work that address this important issue.

Brülhart, Jametti and Schmidheiny (2006) provide an empirical verification of the hypothesis that agglomeration forces can offset differences in corporate taxes as a determinant of firm location. They base their estimation on panel data on firm startups across 213 Swiss municipalities for the period 1999-2002. Their dependent variable is a count of new firms per municipality and sector. Their main explanatory variables are local corporate taxes, sectoral agglomeration economies and the interaction of those two effects. Local corporate taxes are included via a tax index which is a revenue-weighted average of consolidated municipal and cantonal profit and capital taxes. Although, agglomeration economies are not directly observable, the authors argue that sectors subject to strong agglomeration economies are more spatially concentrated than sectors subject to weak agglomeration economies. They then compute spatial concentration indices as defined by Ellison and Glaeser (1997). This index controls for differences in firm numbers among sectors in computing the extent of geographic clustering. Their coefficient of interest is the effect of the interaction between the tax index and the spatial concentration indices. Their estimation is based on panel Poisson regression, which can be formally derived from a linear location choice model. Estimation results show that high corporate taxes do really act as a deterrent to firm births. However, this negative relationship between taxes and new firms' location is significantly weakened for the most spatially concentrated sectors. This result confirms the validity of the new economic geography prediction suggesting that agglomeration forces may reduce the sensitivity to local taxes of firms' location choices.

Devereux, Griffith and Simpson (2007) focus on how specific British government grants affect the location of new plants set up by foreign-owned multinationals using plant-level data at the level of the 64 counties and Scottish regions in Great Britain over the period 1986 to 1992. They estimate a discrete choice model of firm location where the choice of location is a function of characteristics of each region, plant and industrial sector. They also include in their final specification an interaction term of region-level fiscal incentives and industry-level spatial clustering. They find that firms in more agglomerated industries choose to locate new plants near to other plants within the same industry. As a consequence, specific grants have a small positive impact on location choices. Moreover, firms are less responsive to government subsidies in areas where there are fewer existing plants in their industry. These findings suggest that countervailing agglomeration externalities may reduce the sensitivity to local subsidies of new plants' location choices.

A paper by Jofre-Monseny and Solé-Ollé (2007) analyses empirically how differences in local taxes affect the intraregional location of new manufacturing plants by taking into account the presence of different types of agglomeration economies. Agglomeration economies denote any mechanism that causes economic activities to cluster. First, localization economies arise when the productivity of a firm depends on the amount of economic activity being carried out within the same industry. Second, urbanization economies are linked to the amount of economic activities being carried out within other industries. Third, the sectoral diversity of the local economy implies the existence of diversity effects. They look at the decisions of more than 10,000 establishments locating between 1996 and 2003 across more than 400 municipalities in a Spanish region, Catalonia. The maximum likelihood Poisson estimates of the location determinants of new and relocating establishments lead to the following results. Both local taxes –property tax and local business tax– as well as the variables of agglomeration economies (localization, urbanization economies and diversity effects) are shown to be relevant determinants of the location of new manufacturing establishments. However, the omission of the agglomeration economies' variables, i.e. ignoring the benefits firms obtain from the economic scale and composition of different locations, results in a severe underestimation of the negative effect of the business tax on the location of plants (the business tax effect switches sign and become positive). This may be explained by the fact that localities setting high tax rates are also hosting large amounts of

economic activities and remain preferred locations due to the existence of agglomeration economies.

4. Conclusion

By using models of monopolistic competition, new economic geography provides a different prediction on the outcome of tax competition than standard tax competition literature. In these models, production is undertaken by use of labor an capital in the presence of scale economies. The region where industry is agglomerated has an advantage. Since firms may benefit from these agglomeration economies, the host region can tax away part of this return without inducing relocation. Any region that is concerned by agglomeration may then benefit from a taxable agglomeration rent and gain from tighter economic integration.

On the empirical side, there are very few papers that try to test the theoretical predictions of such a literature. Most papers focus on the test of the existence of a taxable agglomeration rent by analysing either the governments' behaviour when setting their local tax rate or the location choices of new plants.

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