

TAX INCENTIVES AND THE CITY

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Abstract

It is difficult to justify tax incentives within the existing economics literature on tax competition. We develop a model in which communities are interested in attracting firms not only for their own capital but also for the “concentration externalities,” a form of agglomeration economies, their location bestows on existing firms. We find that it is efficient in this case for communities to offer tax incentives, defined as a tax rate below the benefit tax level, to firms. We present the recent relocation of the Boeing Corporation's headquarters from Seattle to Chicago as a case study.

“The General Assembly has determined that the relocation of the international headquarters of large, multinational corporations from outside of Illinois to a location within Illinois creates a substantial public benefit and will foster economic growth and development within the State.”

State of Illinois Public Act 92-0207, May 2001

I. Introduction

On May 10, 2001 the Boeing Corporation announced its selection of Chicago as the new home for its corporate headquarters. The City of Chicago and the State of Illinois had teamed up to offer Boeing a generous package of tax incentives and other subsidies. The high-profile competition for Boeing was reminiscent of many others before in which city and state governments had opened their purses to lure or retain businesses. Why would Chicago be willing to offer tax breaks to attract Boeing? After all, there are plenty of other deserving businesses already located in Chicago or potentially interested in locating in Chicago. And is not this sort of competition among cities just a zero-sum game? In this paper we argue that in some cases – arguably in the Boeing case – tax competition in the form of firm-specific tax breaks to lure or retain businesses can be welfare improving for the city and a positive-sum game.

Within the existing theoretical tax competition literature it is difficult to justify tax incentives. As we interpret the literature, tax competition either results in benefit taxes being imposed on mobile capital or in inefficiently low taxes on mobile capital. Neither strand of the theoretical literature would seem to support tax incentives. We expand upon this argument below.

In addition, there appears to be very little empirical evidence to support the notion that tax incentives are effective, let alone efficient. We are unaware of any direct systematic evidence on

the effect of firm-specific tax incentives. On the other hand, there is a large empirical literature that asks whether differences in general tax burdens are a significant factor in explaining differences in various measures of aggregate economic activity, including firm locations. The evidence is inconclusive, although some recent surveys (see Bartik, 1991 and Wasylenko, 1997) and at least one recent paper (Mark, McGuire, and Papke, 2000) conclude that taxes are, in some instances, statistically significant determinants of state and local economic growth. Whether it is appropriate to infer from these studies of the effect of overall tax burdens that firm-specific tax breaks are effective is debatable.

Most empirical studies of the effect of taxes on aggregate economic activity measure economic growth as an increase in employment or investment. Courant (1994) argues that increases in employment do not necessarily translate into increases in welfare. In the present study we ask a different question, but we too argue that cities might be interested in attracting firms for reasons other than jobs. From this perspective, the focus of the existing empirical literature may reveal little about the desirability of tax incentives.

Still, tax breaks in the form of property tax abatements, sales and income tax breaks, and other subsidies from state and local governments to attract or retain firms are pervasive. Why? The answer may simply be politics. No mayor or governor who seeks electoral success will risk being seen as the one responsible for losing the big automobile plant or high-technology firm. In Wolman's (1996) survey of the recent literature on the politics of local economic activity, he suggests that protection of tax base is a primary reason for economic development activities. Pagano and Bowman (1995) argue that even fiscally healthy cities may offer tax breaks and subsidies for symbolic reasons to maintain a city's image. Another possibility is that the theory

may need to be modified to accommodate more realistic assumptions. Within the existing theoretical economics literature, one can find arguments that real world taxes may be higher than the efficient level because, for example, governments maximize an objective function other than social welfare. Thus, tax breaks may be needed to pull tax levels closer to the efficient level (see Oates, 1996).

Within a simple model of tax competition we ask whether tax incentives, defined as a tax rate lower than the marginal benefit of the public goods and services provided to firms, can be justified. Starting from a base case in which communities impose benefit taxes on firms in equilibrium (see Oates and Schwab, 1991), we add one new assumption: New capital investment is assumed to generate a form of agglomeration economies, which we call concentration externalities. In this case, in contrast to the usual reason given for tax competition and tax breaks (protection of tax base), we argue that tax breaks may be justified because they can be welfare improving.

The remainder of the paper is structured as follows. In the next section we provide a review and our interpretation of a limited selection from the theoretical tax competition literature. We present our theoretical model in section III and describe in the subsequent section the Boeing case, which seems to fit well with our theory. We provide conclusions and possible directions for future research in the final section.

II. Can tax incentives be justified under existing models of tax competition?

The theoretical treatment of tax competition has two rather distinct strands. Each is concerned with the question of whether tax competition results in efficient outcomes, but the two come to opposite conclusions. Our interest in these theories is to explore whether firm-specific

tax incentives (or tax breaks) can be justified. In our interpretation, for different reasons, neither model argues for tax breaks to lure firms to communities.

One strand of the literature, dating back at least to Oates (1972) and continuing with several papers in the mid-1980s (Zodrow and Mieszowski, 1986, Wilson, 1986 and Wildasin, 1989), finds that tax competition results in inefficiently low taxes and public services.¹ Oates (1972) argues that tax competition designed to attract firms that seek to maximize profits by freely choosing among localities will lead local officials to reduce taxes on capital. When deciding the level of public goods to be financed by taxes, communities will take into account the cost of losing potential firms. This will result in an under-provision of public goods and services, especially if communities do not offer services of direct benefit to the firms. If all jurisdictions follow the same pattern, none gain a competitive advantage, but they all will have lower revenues and will provide lower levels of public goods than if they were not competing.

Similar conclusions were reached by authors using formal models of tax competition. Two of the earliest and most influential papers are Zodrow and Mieszowski (1986) and Wilson (1986). These authors analyze tax competition within a framework where the provision of a consumption public good is financed by a local tax on capital. No other forms of taxation are available in an unrestricted form. There is a fixed total amount of capital in society, which is perfectly mobile across jurisdictions, and for which jurisdictions compete. Jurisdictions are all alike and small so that their decisions do not influence the going interest rate. In equilibrium, a community will choose a level of public good provision at which the marginal benefit equals the marginal cost. Because the community finances the unit increase in the public good with an

¹These papers and many others referenced herein are summarized in Wilson (1999).

increase in the tax on capital, capital will flow out of the jurisdiction at hand into other jurisdictions in response to the tax increase. Thus, the marginal cost of a unit increase in the public good includes not only the resource cost, but also the loss in tax revenues associated with the loss of capital. The latter is a local loss but not a social cost because other jurisdictions realize a fiscal benefit from the inflow of capital. The cost of local public goods is therefore overestimated by the jurisdiction, which will choose an inefficiently low level of public good and capital tax rate. As Wildasin (1989) shows, this inefficiency could be corrected by a central government subsidy to local governments that internalizes the externality.

In another instance of competition leading to inefficiently low taxes, McGuire (1991) examines a case of mobile residents in which the residents/consumers have preferences for redistribution. To accomplish the redistribution, local governments rely on ability-to-pay taxes. The residents/consumers are heterogeneous in terms of income (or wealth) and mobility. In this setting a local jurisdiction has an incentive to offer tax breaks to relatively mobile and wealthy people to try to induce them to move in. In equilibrium, all jurisdictions would offer tax breaks to the relatively mobile and wealthy and thus there would be no movement of wealthy people across jurisdictions. The result is an inefficiently low level of public good provision (in this case, redistribution).

To summarize and interpret this strand of the literature, in a world where tax competition results in inefficiently low taxes on mobile factors, tax breaks that offer even lower tax rates to specific firms are in the wrong direction and enhance the distortions generated by competition.

Another strand of the literature, dating back to Tiebout (1956) and continuing with papers by Oates and Schwab (1988, 1991), reaches very different conclusions. Under these models, tax

competition among local governments results in an efficient allocation of resources with mobile residents and firms facing non-distortionary benefit taxes.

Oates and Schwab (1991) analyze the allocation of capital across jurisdictions in a model where local governments provide public inputs to firms as well as public consumption goods for residents. What distinguishes Oates and Schwab's model from the Zodrow-Mieszkowski-Wilson models is that regions have access to other forms of taxation in addition to taxes on mobile capital. Under these assumptions, tax competition yields efficient outcomes: Local taxes become benefit taxes and the allocation of capital across jurisdictions is socially efficient. The tax on capital equals the value of the increased production attributable to a marginal increase in the public input, while a head tax on workers pays for the consumption good. As in Zodrow and Mieszkowski (1986) and Wilson (1986), if jurisdictions can rely only on capital taxes, then the equilibrium is inefficient, and an under-provision of public goods results.²

Although the Oates-Schwab conclusions about the desirability of tax competition are very different from those reached by Zodrow-Mieszkowski-Wilson, the implications for tax incentives are similar. The Oates-Schwab model results in taxes on mobile capital that are benefit taxes, thus tax breaks to firms would move the economy away from the efficient point and would reduce the utility of consumers.

For very different reasons, tax competition is also beneficial in a world where the local government is not a benevolent social planner that aims to maximize the welfare of its constituents, but rather wishes to maximize the public budget (Niskanen, 1977). Brennan and

²In a related paper the authors examine the case where local authorities set environmental regulations (Oates and Schwab, 1988). Again, under certain assumptions, they find that competition results in efficient outcomes.

Buchanan (1980) argue that in this case interjurisdictional competition prevents officials from excessively taxing constituents and firms. Across-the-board tax reductions, rather than selective tax breaks, would appear to be the appropriate policy response under this model.

None of these theories seems to support the idea that tax breaks are beneficial and can be a key factor in improving the economies of the localities that offer them.³ Tax breaks either move the economy away from the efficient allocation, or worsen an already inefficient outcome. Our departure from the existing literature considers the possibility that new capital investment brings benefits to the community in addition to the increase in production and wages associated with the new capital. These benefits are concentration externalities, a form of agglomeration economies associated with increased capital investment. In our model a reduction in capital taxes below the level of a benefit tax will induce firms to make optimal decisions and will result in an efficient allocation of both public and private resources.

III. A model of tax competition with agglomeration economies

The models of Zodrow and Mieszkowski (1986) and Wilson (1986) assume that communities are restricted to one tax instrument, a tax on mobile capital. This assumption has some basis in fact as local governments in the U.S. rely fairly heavily on property taxes. The tax on capital must finance all of the locally provided public goods. In their models, competition for mobile capital leads to an under-provision of public goods – the tax imposed on capital is too low from an efficiency perspective. Oates and Schwab (1991) assume that communities have access to a head tax on residents, thus allowing for more degrees of freedom in setting the tax on capital.

³Black and Hoyt (1989), under the assumption that public good provision is characterized by decreasing average cost, find that if taxes are set according to average cost, selective subsidies to firms may improve welfare.

Competition for mobile capital under their assumptions results in an efficient allocation of resources with benefit taxes being imposed on capital (and residents). These assumptions and results also have some basis in fact. Local governments do have access to multiple tax sources, and many of them have the potential, at least at the margin, to be designed as benefit taxes.

We choose to use the Oates and Schwab framework as our starting point for two reasons. First, while both the Zodrow-Mieszkowski-Wilson and the Oates-Schwab tax assumptions are inherently unrealistic, we are comfortable with Oates and Schwab's assumption that communities have access to at least some form of benefit taxes. Arguably, even the local property tax when coupled with local zoning laws can be viewed as a benefit tax (Hamilton, 1975). The second and more compelling reason for choosing the Oates and Schwab framework is that we are fundamentally interested in a different question. Both Zodrow-Mieszkowski-Wilson and Oates-Schwab explore whether tax competition leads to efficiency (and they come to different conclusions, as we have noted). We are interested in exploring whether it can ever be optimal to offer tax incentives. It thus seems natural to start with a framework in which tax competition leads to an efficient allocation of resources, and in which firms face benefit taxes in equilibrium. From this nice state of affairs we ask whether it can be in the interests of consumers to offer tax breaks to firms.

The basic Oates and Schwab (1991) model has several elements. Many jurisdictions compete for a mobile capital stock by offering low taxes on capital and providing a productive input to firms. The benefit of attracting firms and their capital is higher wages for the resident workers (consumers). This benefit must be weighed against the loss of tax revenues and the cost of providing the public input. Oates and Schwab find that the optimal tax charged by each

community is a benefit tax, in other words, the tax rate is equal to the marginal benefit of the public input to the firm. The tax on capital does not generate any fiscal surplus or deficit to apply against a second public good, which communities provide to consumers. Instead, a head tax is paid by consumers that just covers the costs of providing the consumption public good. The allocation of resources under this model is efficient.

Clearly, tax incentives, which we define as a tax rate lower than the marginal benefit of the public goods and services provided to firms, are not offered by, because they are not in the best interest of, communities in the Oates and Schwab world. One justification often given by cities that offer tax breaks to new firms is that the new firms will improve the business environment for existing and future firms. One form this could take is agglomeration economies wherein all firms experience productivity increases as the number or size of geographically concentrated firms increases. Such externalities and their impact on cities are explored by several authors including Rauch (1993), Henderson et al. (1995), and Henderson (2001). Many of these authors stress information spillovers as a source of interfirm externalities, and their focus is almost exclusively on manufacturing.

If the location of new firms generates agglomeration economies, effective tax incentives may improve the welfare of the winning community. To explore this idea we adapt the model of Oates and Schwab (1991) by adding what we call concentration externalities. Our idea is that a greater concentration of externality-producing firms (capital) results in increased productivity through, for example, an easier exchange of ideas, particularly among business services firms. Specifically, we write the production function for a particular jurisdiction as

$$Q = F(K, L, X) \left(\frac{K}{L} \right)^\delta \quad (1)$$

where K is private capital, L is labor, and X is a publicly provided input distributed to firms in proportion to their capital stocks.⁴ It is assumed that society has a fixed stock of capital, perfectly mobile among the jurisdictions, and that labor is immobile and fixed for each community. The term $(K/L)^\delta$ represents the augmentation to productivity associated with greater concentrations of private capital, our representation of agglomeration economies. This representation is related to the density measure explored by Ciccone and Hall (1996). Assuming that the function F is homogeneous of degree one, equation (1) can be rewritten as

$$q = f(k, x) k^\delta \quad (2)$$

where q is the output to labor ratio, k is the capital to labor ratio, and x is the public input to labor ratio.

We assume that firms in the jurisdiction are identical and that each individual firm takes the aggregate amount of private capital as given when making its choices of capital and labor.⁵ Thus, a representative firm maximizes profits subject to the production function in (2) taking k^δ as a constant. That is, the firm does not take into account that an increase in its capital has a productivity effect on all firms in the region, including its own. The firm will choose levels of

⁴ X is not a pure public good; it is subject to congestion to the same extent as a private good.

⁵As all firms are identical, per capita capital and public input are the same for each firm and for the regional aggregate. Therefore equation (2) can also be viewed as representing the production function of a firm, where k and x are the firm's inputs per unit of labor.

private capital and labor such that their marginal returns equal their respective per unit costs.

Assuming a per unit tax on capital of t , and an interest rate of r , this implies the following condition for the optimal choice of private capital for the firm:⁶

$$\left(f_k + \frac{x}{k} f_x \right) k^\delta - t = r \quad (3)$$

where subscripts represent partial derivatives.

The wage in each community is set competitively and according to:

$$w = f(k, x)k^\delta - k f_k k^\delta - x f_x k^\delta \quad (4)$$

Assume that, unlike the firm, the social planner (or mayor) recognizes that an increase in aggregate private capital makes all firms more productive. Essentially, there is a spillover benefit to all firms if any one firm increases its level of private capital or if a new firm enters the jurisdiction thereby expanding the existing level of private capital. The local government's objective is to maximize the welfare of its constituents, taking into account the competitive conditions for the capital and labor markets and the private and public budget constraints. The local government's problem is

⁶We assume that all jurisdictions are small and take the interest rate as a parameter.

$$\begin{aligned}
& \max_{c,g,k,x,t,z} u(c,g) \\
\text{s.t. } & y + w = c + z \\
& w = f(k,x)k^\delta - kf_k k^\delta - xf_x k^\delta \\
& r = f_k k^\delta + \frac{x}{k} f_x k^\delta - t \\
& z + kt = p_g g + p_x x
\end{aligned} \tag{5}$$

where c is a private consumption good and the numeraire, g is a publicly provided good that can be purchased at price p_g , p_x is the price per unit of the publicly provided input, and y is non-wage income. The local government can impose a head tax z on its residents. The first order conditions can be rearranged to yield the following conditions:

$$\frac{u_g}{u_c} = p_g \tag{6}$$

$$f_x k^\delta = p_x \tag{7}$$

$$f_k k^\delta + f(k,x)\delta k^{\delta-1} = r \tag{8}$$

$$t = \frac{x}{k} f_x k^\delta - f(k,x)\delta k^{\delta-1} \tag{9}$$

To induce the firm to choose the socially optimal level of capital according to equation (8), the tax rate faced by the firm in equation (3) must be set according to equation (9). The optimal tax rate on capital when agglomeration economies are taken into account, what we refer to as t^* , is

equal to the marginal benefit to the firm of the public input minus the marginal agglomeration benefit of additional capital. The latter term is the subsidy needed to induce each firm to choose the socially optimal amount of private capital.

If instead k^δ is taken as a constant, that is, if the local government overlooks the concentration externalities when it maximizes utility subject to the constraints in (5), the optimal tax rate \hat{t} is

$$\hat{t} = \frac{x}{k} f_x k^\delta \quad (10)$$

As in Oates and Schwab (1991), the optimal tax rate when agglomeration economies are ignored is a benefit tax equal to the marginal benefit to the firm of the public input.

Clearly, for any pair of x and k , t^* is less than \hat{t} . Thus, we obtain the result that when agglomeration economies are taken into account, the optimal tax rate is lower than the tax rate that results when agglomeration economies are present but not accounted for. A tax incentive, defined here as a tax rate less than the marginal benefit to the firm from the public input, is justified to induce firms to choose the optimal amount of private capital.

The optimal amount of private capital when agglomeration economies are recognized, k^* , is greater than the amount of private capital chosen by the firm when they are not, \hat{k} . To see this note that when the tax rate is equal to \hat{t} , i.e., when it is a benefit tax, equation (3) becomes

$$f_k k^\delta = r \quad (11)$$

Comparing this equation, which determines \hat{k} , to equation (8), which determines k^* , it is clear that \hat{k} will be less than k^* as long as $f_k k^\delta$ is decreasing in k (because the second term of equation (8) is

positive). This will be the case if as k increases the decline in the derivative of f with respect to k dominates the increase in the agglomeration effect, which seems a reasonable assumption.

In Figure 1 we compare the optimal solution with the one that would occur if firms did not receive a tax incentive. Line A represents the local government's demand for capital when agglomeration economies are taken into account. It is the left hand side of equation (8) or $f_k k^\delta + f(k,x) \delta k^{\delta-1}$. Line X represents the firm's demand for capital. If we rewrite equation (3) slightly we see that the firm's choice of capital is the amount that equates $f_k k^\delta + x/k f_x k^\delta$ to $r + t$. The functions represented by line A and line X differ only in the second terms. The second term of the equation defining line A reflects the increase in output due to agglomeration economies associated with an increase in k whereas the second term of the equation defining line X reflects the additional output due to the increase in the public input associated with an increase in k .⁷

The perfectly elastic supply of capital is represented by line S at the going interest rate r . The intersection of A with S determines the optimal amount of capital k^* as given by the solution to the maximization problem (5) when the agglomeration externality is taken into account. To induce the firm to choose k^* we must set the tax equal to t^* . If agglomeration economies are not recognized and the tax is set at a higher level, say t' , the firm will choose a sub-optimal level of capital k' .

⁷If X were below A, that is, if the agglomeration effect were stronger than the productivity benefit attributable to the public input, the optimal tax would be a negative tax, that is, a subsidy to capital. Our best guess, although it is not necessary to our results, is that the productivity benefit of the public input exceeds the agglomeration effect and that X is above A, as has been illustrated in the figure.

When the tax rate is set at the socially optimal level according to equation (9), the tax revenues raised do not cover the costs of providing the public input. To see this multiply the tax on capital times the number of units of capital to obtain tax revenues per capita T equal to

$$T = x f_x k^\delta - f(k, x) \delta k^\delta \quad (12)$$

Dividing by p_x to convert into units of x , and noting that by equation (7) p_x is equal to $f_x k^\delta$ in equilibrium, this reduces to

$$T = x - \frac{f(k, x) \delta}{f_x} \quad (13)$$

Thus, t^* does not raise enough revenue to finance the public input x . This is in contrast to the case where agglomeration economies are not recognized and the tax rate is set equal to \hat{t} (equation (10)). In this case the tax rate is a benefit tax and taxes on capital (just) cover the cost of providing the public input x .

When the tax rate is set optimally, in order to obtain enough public revenues to cover the cost of providing x , the local government will have to set the head tax, z , above the value that would correspond if it were a benefit tax (as a benefit tax $z = p_g g$). The additional amount will be equal to $f(k, x) \delta k^\delta$, the subsidy to firms attributable to the concentration externality, and therefore $z = p_g g + f(k, x) \delta k^\delta$.

That welfare is higher in the case when agglomeration economies are taken into account can be seen from the derivation of the equilibrium under the two cases. When the agglomeration effect is not taken into account the equilibrium is a restricted solution to the more general problem

that takes the externality into account and allows for a solution that internalizes its effects.

Although consumers pay a head tax above the benefit tax, their utility is maximized when firms are given a tax incentive to induce them to choose k^* , and therefore they benefit by being partly responsible for financing the provision of the public input. The tax break offered to firms benefits consumers as it induces firms to invest a higher, optimal level of capital in the jurisdiction.

This theory is developed from the perspective of one jurisdiction and one (or several identical) firm(s) assuming that there are numerous jurisdictions competing with one another for the firms, and it implies that tax incentives are offered across the board to all firms. If each jurisdiction benefits from agglomeration economies in a similar fashion, and if each firm presents similar agglomeration economies to each jurisdiction, it will be socially optimal for each jurisdiction to offer similar tax incentives to all firms. More realistically, jurisdictions and firms will differ in terms of the agglomeration economies received and offered. These differences may justify selective, as opposed to across-the-board, tax breaks. We explore these ideas next.

It is quite plausible that different cities present different potentials for agglomeration economies because of the number and character of already existing firms. Glaeser et al. (1992) find that knowledge spillovers might occur between rather than within industries, so a diversified economy is more likely to present agglomeration effects of the type described in our model, and therefore more likely to offer and benefit from tax breaks. Industrial mix can also be an important factor in determining the potential growth of a region (see Garcia-Milà and McGuire, 1993 and 1998). A city with a high concentration of financial and other business services firms may benefit more from the successful attraction of a corporate headquarters than a city with a different configuration of existing firms, for example, traditional manufacturing firms, because there may be

a greater potential for spillovers of human capital and knowledge from the headquarters firm to the business services firms. Thus, it may be optimal for the former city (with a base of business services firms) to offer a tax incentive to a relocating headquarters firm, whereas it may not be in the best interests of the latter city (with a base of traditional manufacturing firms) to do so. We thus might find different cities offering different levels of tax incentives to try to attract the same firm.

We formalize these ideas in our model by allowing the concentration externality to differ across cities through different values of δ . The second term of the right-hand side of equation (9) is the tax incentive. Taking the derivative of that term with respect to δ , yields:

$$f(k, x)\delta k^{\delta-1} \ln(k) + f(k, x)k^{\delta-1} \quad (14)$$

This expression is positive for positive values of k , so the larger is δ the larger will be the tax break. Cities that are more receptive to concentration externalities, represented here by larger δ , will find it in their interest to offer larger tax breaks.

Another interesting extension of our model is to allow firms to differ in terms of the concentration externalities they generate. Our idea is that the headquarters of a large, global company, or a product development center for a high technology firm, or the production plant of a very innovative firm might generate positive externalities for existing business services firms. Because the externality-generating firm presents challenging and innovative problems and contracts, and its employees are highly educated and experienced, the skills, knowledge and capabilities of the services-providing firms might improve by virtue of doing business with the externality-generating firm. On the other hand, traditional manufacturing plants may not generate

such externalities. Under these circumstances it would be optimal for local officials to offer selective tax incentives, according to their beliefs about the different agglomeration impacts of the different firms. Thus, not all city-firm pairings are likely to be fruitful, and we would expect local officials to act accordingly by offering tax incentives selectively to those newly locating or relocating firms with the potential to improve the productivity of existing firms.

We illustrate this possibility formally through an extension of our model. Consider that the economy of the city is formed by two sectors. Sectors differ by the type of capital they use, with one sector, say sector 1, using capital H that produces concentration spillovers, and the other sector 2 using a capital K that does not generate spillovers.

The production function for a particular jurisdiction in each sector can be represented by

$$Q_1 = F_1(H, L_1, X_1) \left(\frac{H}{L_1} \right)^\delta \quad (15)$$

$$Q_2 = F_2(K, L_2, X_2) \left(\frac{H}{L_1} \right)^\delta \quad (16)$$

Assume that in the aggregate society has a fixed stock of capital of type H and a fixed stock of capital of type K, both perfectly mobile across jurisdictions. Labor is assumed to be immobile and

fixed for each community and for each sector within the community.⁸ Assuming that functions F_1 and F_2 are homogeneous of degree 1, equations (15) and (16) can be rewritten as:

$$q_1 = f_1(h, x_1)h^\delta \quad (17)$$

$$q_2 = f_2(k, x_2)h^\delta \quad (18)$$

where q_1 and q_2 are the output per worker of each sector, h is capital per worker in sector 1, k is capital per worker in sector 2, and x_1 and x_2 are units of public input per worker provided to each sector. The output of sector 1 is taken as the numeraire, and p_2 is the relative price of q_2 in units of q_1 .

In each sector all firms are identical and take the total amount of private capital in use in the sector as given when making individual choices of capital and labor. Thus, a representative firm in sector 1 (sector 2) maximizes profits subject to the production function in equation (17) (equation (18)), taking h^δ as a constant.

Let t_1 (t_2) be the per unit tax on capital in sector 1 (sector 2), then the conditions for the private maximizing choice of private capital in each sector are given by the following conditions:

$$\left(f_{1h} + \frac{x_1}{h} f_{1x} \right) h^\delta - t_1 = r \quad (19)$$

$$p_2 \left(f_{2k} + \frac{x_2}{k} f_{2x} \right) h^\delta - t_2 = r \quad (20)$$

⁸Although this assumption is unrealistic, it greatly simplifies the analysis and allow us to obtain a closed-form solution comparable to the solution in the one-sector case.

The wage in each sector of a community is set competitively and according to:

$$w_1 = f_1(h, x_1)h^\delta - hf_{1h}h^\delta - x_1f_{1x_1}h^\delta \quad (21)$$

$$w_2 = p_2f_2(k, x_2)h^\delta - p_2kf_{2k}h^\delta - p_2x_2f_{2x_2}h^\delta \quad (22)$$

We assume, as before, that the social planner, unlike the firm, recognizes the concentration spillover effect of capital in sector 1 and maximizes the welfare of its constituents, taking into account the competitive conditions for the capital and labor markets of both sectors, and the private and public budget constraints. The local government problem is

$$\begin{aligned} & \max_{c_1^1, c_1^2, c_2^1, c_2^2, g, h, k, x_1, x_2, t_1, t_2, z_1, z_2} l_1u_1(c_1^1, c_1^2, g) + l_2u_2(c_2^1, c_2^2, g) \\ \text{s.t. } & y + w_1 = c_1^1 + p_2c_1^2 + z_1 \\ & y + w_2 = c_2^1 + p_2c_2^2 + z_2 \\ & w_1 = f_1(h, x_1)h^\delta - hf_{1h}h^\delta - x_1f_{1x_1}h^\delta \\ & w_2 = p_2f_2(k, x_2)h^\delta - p_2kf_{2k}h^\delta - p_2x_2f_{2x_2}h^\delta \quad (23) \\ & r = \left(f_{1h} + \frac{x_1}{h}f_{1x} \right) h^\delta - t_1 \\ & r = p_2 \left(f_{2k} + \frac{x_2}{k}f_{2x} \right) h^\delta - t_2 \\ & l_1z_1 + l_2z_2 + l_1ht_1 + l_2kt_2 = p_g g + l_1p_{x_1}x_1 + l_2p_{x_2}x_2 \end{aligned}$$

where c_i^j is consumption per worker in sector i of goods produced by sector j ; z_1 and z_2 are lump sum head taxes for each sector's workers; p_{x_1} and p_{x_2} are prices per unit of the publicly provided

inputs in the two sectors; l_1 and l_2 are the share of workers of the jurisdiction in sectors 1 and 2 respectively, such that $l_1 + l_2 = 1$.

Solving the maximization problem we obtain the optimal taxes for each type of capital:

$$t_1 = \frac{x_1}{h} f_{1x_1} h^\delta - \delta h^{\delta-1} f_1(h, x_1) - \frac{l_2}{l_1} p_2 \delta h^{\delta-1} f_2(k, x_2) \quad (24)$$

$$t_2 = p_2 \frac{x_2}{k} f_{2x_2} h^\delta \quad (25)$$

The tax on capital in the sector that does not generate concentration externalities (sector 2) is a benefit tax equal to the marginal benefit to the firm of the public input. But the capital tax in the sector that produces concentration externalities, sector 1, is below the benefit tax. Its tax is set equal to the marginal benefit to the firm of the public input minus the marginal concentration benefit to both sectors of additional capital in sector 1.⁹

We thus find that a city will find it optimal to offer selective tax breaks in equilibrium. Firms that generate concentration spillovers will face a lower tax rate than firms that do not. Before we can use the model to assess tax incentives in the real world we must come to grips with two of our simplifying assumptions. First, we assume that jurisdictions have access to taxes other than capital taxes so that, absent concentration externalities, firms would face benefit taxes in equilibrium. Given the myriad of taxes and varying tax structures imposed on firms by different

⁹Note that the last term in equation (24) is the externality benefit to sector 2 of additional amounts of capital of type h , expressed in terms of units of output of sector 1 per unit of labor of that same sector.

cities, it is difficult even to speculate about whether the resulting tax burdens approximate benefit taxes. On the other hand, if we believe that firms are essentially mobile and that cities have access to at least some forms of benefit taxation, then it is not implausible that the taxes imposed on firms are close to benefit taxes. This assumption is important to our analysis because we assume that benefit taxation is the benchmark from which selective tax breaks may be offered. Second, we model the concentration externality as total capital per unit of labor. Clearly, this variable increases if either the number of externality-generating firms increases through re-locations or existing externality-generating firms increase their investment in capital. Strictly speaking we would expect to see tax breaks offered under both scenarios. But, the phenomenon we want to explain is the granting of tax breaks to relocating firms. We can appeal, perhaps, to the idea that existing firms are less mobile and therefore less able to extract tax breaks from the city (even if they are as deserving as relocating firms according to our model). We also note that virtually all studies in the tax competition literature and many in the agglomeration economies literature make similar assumptions: new capital (new employment in some cases) is beneficial whether it results from a new or newly relocating firm or expansion on the part of existing firms. With these two simplifications in mind, we turn next to a case study of a firm that recently relocated its corporate headquarters.

IV. The courtship of Boeing

On March 21, 2001 the Boeing Corporation announced that it was moving its headquarters out of Seattle, its birthplace and home for 85 years, to one of three cities: Chicago, Dallas or Denver. Several factors made this high profile relocation unusual. First, the company was moving its headquarters rather than a manufacturing plant. Indeed, the bulk of its

manufacturing concerns would remain in Seattle. Second, and related, the traditional concerns of wages, utility costs, and other input costs did not seem paramount in the decision. The company argued that they were seeking a new location that could better accommodate a restructuring of the firm from one focused almost exclusively on the production of domestic and military aircraft to a global, diversified aerospace company. The company wanted to distance its headquarters from its traditional manufacturing in Seattle at the same time that it sought a more central location.¹⁰ Third, the number of jobs – a traditional focus of economic development officials – was small: Boeing estimated that it would relocate 400 to 500 employees, pared down from approximately 1,000 headquarters employees in Seattle. The company made no promises to hire locally and the focus was on bringing employees to Chicago rather than creating jobs for Chicago residents.¹¹

An entertaining competition among the three cities ensued with Boeing orchestrating stealth visits to each city. The idea was to experience first hand the fixed attributes of the three cities, and to compare them to Seattle's. All three cities offered central locations and hub airports. Denver offered nearby recreation and scenic beauty. Dallas offered the home state of President Bush and a low cost of living, while Chicago played up its cultural institutions and Lake Michigan location (much was made of the fact that Boeing CEO Phil Condit is a sailor and an opera fan).

¹⁰Duranton and Puga (2001) provide evidence that firms are increasingly separating their management operations (headquarters) from their manufacturing concerns and locating these different functions in different types of cities.

¹¹In mid-July Boeing hosted a three-day job fair in Chicago with the intention of hiring 100 local support staff employees. Approximately 7,000 people submitted resumes.

While insisting that incentives were not the major factor, Boeing sought favorable relocation deals from each city. Denver refused to play the incentives game and offered only minimal tax incentives. City Councilman Ed Thomas stressed the high quality of life in Denver saying “I don’t know if we even need to compete...on financial incentives.” (“More Boeing for the Buck,” *The Denver Post*, April 29, 2001.) Dallas offered property tax abatements of \$10 million plus millions more in infrastructure and relocation costs. The City of Chicago and the State of Illinois teamed up to offer upwards of \$50 million in property and income tax abatements and other incentives.¹²

As we all know, Chicago won the competition and on May 10, 2001 Boeing CEO Phil Condit announced the company’s decision to move its corporate headquarters to Chicago, to a building across the river from the Lyric Opera of Chicago, near both Metra and Amtrak train stations, and a ten-minute walk to the LaSalle Street financial district. We may never know the real reasons for Boeing’s decision or how important the tax incentive package was in their decision. Indeed, some commentators speculated that Chicago was the choice all along and that Boeing’s strategy of pitting three cities against one another was just an attempt to get the best deal from Chicago. (James Wallace, reporter for *The Seattle Post Intelligencer*, interviewed by Steve Edwards on WBEZ Chicago Public Radio *Eight Forty-Eight*, May 10, 2001.)

And a good deal was negotiated for Boeing. Why was Chicago so eager to land Boeing? Are the \$50 million in tax incentives justified? Is there any evidence that residents and existing

¹²The State of Illinois promised 15 years of corporate income tax credits worth approximately \$22 million plus reimbursement of relocation costs of \$4-5 million. The City of Chicago promised 20 years of property tax abatements worth approximately \$20 million. Other miscellaneous city and state grants totaled approximately \$8 million.

firms in Chicago will benefit? Local, state and national politicians touted the “signaling” effect of attracting a global headquarters to Chicago. U.S. Senator Dick Durbin was quoted on the day Boeing announced its move saying “This is an investment to bring the leading aerospace company in the world to Chicago, Illinois. That certainly says a lot about Chicago, and it also sends a signal to other companies that we’re open to do business.” (*All Things Considered*, National Public Radio, May 10, 2001.)¹³ Chicago Mayor Richard Daley stated that “Boeing’s decision reinforces what most of us already know: Chicago has a quality of life that is unmatched by any major city in the country. Chicago, like Boeing, is world class.” (“Chicago Snags Boeing,” *The Chicago Tribune*, May 11, 2001.) CEOs of other large companies supported the efforts to woo Boeing through their active participation in a blue ribbon committee formed in April by the governor of Illinois and the mayor of Chicago. Further, just as the red carpet was being laid for Boeing, the City dropped its efforts to prevent a long term Chicago manufacturing concern (Brach’s candies) from closing a large plant with 1,000 employees on the city’s west side. The Brach’s case is further evidence that jobs may not be the main concern of politicians, at least not in every instance. The wooing of Boeing and the simultaneous spurning of Brach’s are consistent with the notion that some firms, but not others, provide valuable spillovers to existing workers and firms in Chicago.¹⁴

¹³Boeing would be the only Dow Jones Industrial Average company with its headquarters in Chicago and one of only two Dow Jones companies (the other being the McDonald’s Corporation) in the metropolitan area.

¹⁴ In their study of Tennessee’s successful efforts to attract the Saturn plant after a fierce competition with several other states, Bartik et al. (1987) argue that the particular match between Tennessee (a low-wage state) and Saturn (a high-wage automobile plant) justified the tax incentives offered by Tennessee.

Why did Chicago offer Boeing a more lucrative tax incentives package than Dallas did? Perhaps Chicago, given its concentration of financial, advertising, and other business services firms, felt that its potential to reap concentration externalities from Boeing was greater.

V. Conclusions

Two major strands of the tax competition literature reach opposite conclusions about whether tax competition is efficiency enhancing. Under either model, firm-specific tax breaks are not justified. In the strand of the literature that formalizes Tiebout's original conjecture that competition among local governments would lead to efficient provision of public goods, the resulting taxes on mobile factors are benefit taxes. Communities hope to attract firms (mobile capital) in order to increase local wages or jobs. They do so by providing firms with a public input that is financed by benefit taxes on capital. In our model, it is desirable to attract firms for similar reasons (higher wages), but also because firms provide a type of public good to the community – when a firm locates in a community, the productivity of the existing firms increases, resulting in even higher wages. A community's optimal policy is to impose a tax on capital that is lower than a benefit tax in order to attract new capital and experience this positive externality. Tax breaks are a means of internalizing the positive externality of agglomeration economies.

Thus, in our theoretical model, tax breaks are economically justified. In the real world, if our model is to be believed, it would seem to be good policy for cities to offer selective tax breaks to firms that they have identified as providing the benefit of concentration externalities. Not all cities would necessarily offer the same incentives to a given firm, as the benefit of new capital would depend on the potential externalities that a specific firm could offer to each location. On the other hand, a given locality may offer tax breaks to some firms and not to others,

depending on the type of business they would bring, and, in general, whether the match with the location would enhance agglomeration economies.

If our theoretical model is capturing reality, or bits of it, then selective tax incentives can be justified in some instances. The question is whether our model can be used to assess actual tax incentive deals.

The case study of Boeing presents some interesting facts. The three cities that bid for Boeing's location differ quite a lot in terms of location, specialization, and amenities. Interestingly, they offered quite different deals in terms of tax breaks and incentives for the firm. Also, at the same time that Chicago was making a big effort to attract Boeing's headquarters, it was neglecting any policy action to retain a manufacturing plant of Brach's candies. Not only are Boeing and Brach's very different types of firms, but in the former the incoming headquarters activity brings the potential for knowledge spillovers, while the latter (traditional manufacturing activity) is likely to generate few concentration externalities. One could read this case as evidence that cities do not offer indiscriminate tax breaks to firms, but rather offer them when there is a potential benefit to the locality in addition to the jobs that the company brings in.

The lack of systematic data on and empirical studies of tax incentives leaves us with inconclusive evidence on the reasons for and benefits of tax breaks. We hope that our work provides a new prism through which to assess tax breaks and some guidance for future empirical work.

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Figure 1

