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Tax Incentives and the City

"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

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. Moreover, is this sort of competition among cities not just a zero-sum game? In this paper we maintain 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

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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. Then again, 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 and at least one recent paper conclude that taxes are, in some instances, statistically significant determinants of state and local economic growth.[1] 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 argues that increases in employment do not necessarily translate into increases in welfare.[2] In the present study we ask a different question, but we argue, too, 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 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.[3] Pagano and Bowman argue that even fiscally healthy cities may offer tax breaks and subsidies for symbolic reasons to maintain a city's image.[4] 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

1. For recent surveys, see Bartik (1991); Wasylenko (1997); for paper, see Mark, McGuire, and Papke (2000).
2. Courant (1994).
3. Wolman (1996).
4. Pagano and Bowman (1995).

maximize an objective function other than social welfare. Thus tax breaks may be needed to pull tax levels closer to the efficient level.[5]

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, we add one new assumption: New capital investment is assumed to generate a form of agglomeration economies, which we call concentration externalities.[6] 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 the subsequent section and describe in the penultimate 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.

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 and continuing with several papers in the mid-1980s, finds that tax competition results in inefficiently low taxes and public services.[7] Oates 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.[8] 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

5. Oates (1996).
6. See Oates and Schwab (1991).
7. See Oates (1972); Zodrow and Mieszkowski (1986): Wilson (1986); Wildasin (1989). These papers and many others referenced herein are summarized in Wilson (1999).
8. Oates (1972).

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.

Authors using formal models of tax competition reached similar conclusions. Two of the earliest and most influential papers are by Zodrow and Mieszkowski and by Wilson.[9] 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 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 shows, this inefficiency could be corrected by a central government subsidy to local governments that internalizes the externality.[10]

In another instance of competition leading to inefficiently low taxes, McGuire examines a case of mobile residents in which the residents-consumers have preferences for redistribution.[11] 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

9. Zodrow and Mieszkowski (1986); Wilson (1986).
10. Wildasin (1989).
11. McGuire (1991).

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 and continuing with papers by Oates and Schwab, reaches very different conclusions.[12] Under these models, tax competition among local governments results in an efficient allocation of resources with mobile residents and firms facing nondistortionary benefit taxes.

Oates and Schwab 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.[13] 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-Mieszkowski-Wilson, if jurisdictions can rely only on capital taxes, then the equilibrium is inefficient, and an underprovision of public goods results.[14]

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.[15] Brennan and Buchanan argue that in this case, interjurisdic-

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12. Tiebout (1956); Oates and Schwab (1988, 1991).

13. Oates and Schwab (1991).

14. Zodrow and Mieszkowski (1986); Wilson (1986). In 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.

15. Niskanen (1977).

tional competition prevents officials from excessively taxing constituents and firms.[16] 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.[17] 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.

A Model of Tax Competition with Agglomeration Economies

The models of Zodrow-Mieszkowski-Wilson assume that communities are restricted to one tax instrument, a tax on mobile capital.[18] This assumption has some basis in fact as local governments in the United States rely 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 underprovision of public goods—the tax imposed on capital is too low from an efficiency perspective. Oates and Schwab assume that communities have access to a head tax on residents, thus allowing for more degrees of freedom in setting the tax on capital.[19] Competition for mobile capital under their assumptions results in an efficient allocation of resources with benefit taxes being imposed on capital as well as 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

16. Brennan and Buchanan (1980).

17. Black 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.

18. Zodrow and Mieszkowski (1986); Wilson (1986).

19. Oates and Schwab (1991).

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.[20] 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. 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 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, consumers pay a head tax 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 communities in the Oates and Schwab world because they are not in their best interest. 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 business. 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, Henderson and others, and Henderson.[21] Many of these authors stress information spillovers as a source of interfirm externalities, and their focus is almost exclusively on manufacturing.

20. Hamilton (1975).
21. Rauch (1993); Henderson and others (1995); Henderson (2001).

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 Oates and Schwab's model 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

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

where K is private capital, L is labor, and X is a publicly provided input distributed to firms in proportion to their capital stocks.[22] 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.[23] Assuming that the function F is homogeneous of degree one, equation 1 can be rewritten as

$$(2) \qquad\qquad q = f(k, x)k^{\delta},$$

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.[24] Thus a representative firm maximizes profits subject to the production function in equation 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 private capital and labor such that their marginal returns equal their respective per unit costs. Assuming a per unit tax on capital of t,

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

23. Ciccone and Hall (1996).

24. As 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.

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and an interest rate of *r*, this implies the following condition for the optimal choice of private capital for the firm:[25]

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

where subscripts represent partial derivatives.

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

$$(4) \qquad w = f(k,x)k^\delta - kf_k k^\delta - xf_x k^\delta.$$

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

$$\max_{c,g,k,x,t,z} u(c,g)$$

$$\text{s.t.} \quad y + w = c + z$$

$$(5) \qquad w = f(k,x)k^\delta - kf_k k^\delta - xf_k k^\delta$$

$$r = f_k k^\delta + \frac{x}{k} f_x k^\delta - t$$

$$z + kt = p_g g + p_x x,$$

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 nonwage 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:

$$(6) \qquad \frac{u_g}{u_c} = p_g$$

$$(7) \qquad f_x k^\delta = p_x$$

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

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

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

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 equation 5, the optimal tax rate $\hat{t}$ is

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

As in Oates and Schwab, 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.[26]

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 $\hat{t}$, that is, when it is a benefit tax, equation 3 becomes

$$(11) \qquad f_k k^\delta = r.$$

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.

26. Oates and Schwab (1991, p. 130–31).

Figure 1. [TITLE?]
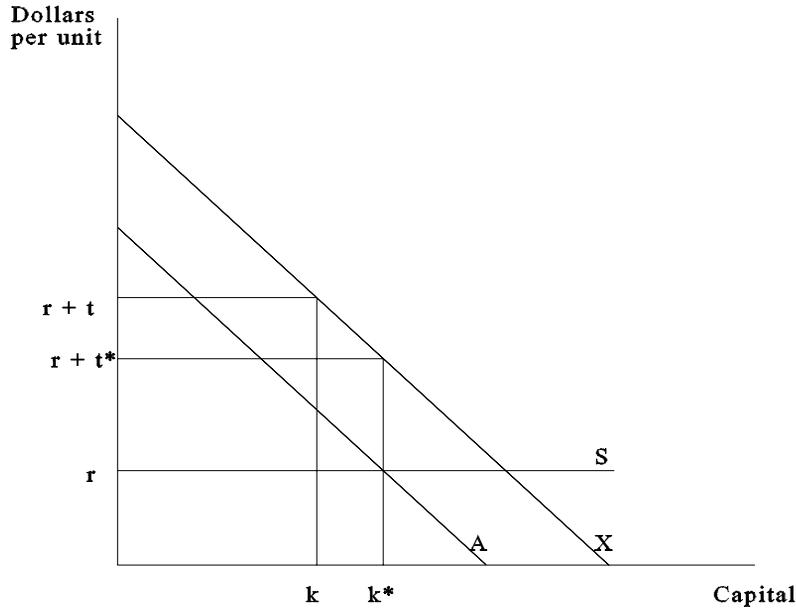
In figure 1, we compare the optimal solution with the one that would occur if firms did not receive a tax incentive. Line *A* represents the local government's demand for capital when agglomeration economies are taken into account. It is the left hand side of equation 8 or $f_k k^\delta + f(k,x)\delta k^{\delta-1}$. Line *X* represents the firm's demand for capital. If we rewrite equation 3 slightly we see 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.[27]

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

27 . If *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.

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'.

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

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

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 equation 13.

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

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 $f(k,x)\delta k^{\delta-1}$, the subsidy to firms attributable to the concentration externality, and therefore $z = p_g g + f(k,x)\delta k$.

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 firm or several identical firms, assuming 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 agglom-eration 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 and others 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, there-fore, is more likely to offer and benefit from tax breaks.[28] Industrial mix can also be an important factor in determining the potential growth of a region.[29] Existing business services firms are likely to benefit more than existing man-ufacturing firms from the spillovers of human capital and knowledge associated with a newly locating corporate headquarters firm. Thus it may be optimal for a city with a base of business services firms to offer a tax incen-tive to a relocating headquarters firm, whereas it may not be in the best interests of a city with a base of traditional manufacturing firms to do so. Therefore, we might find different cities offering different levels of tax incen-tives 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:

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

This expression is positive for positive values of k, so the larger δ is, 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,

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28. Glaeser and others (1992).
29. See Garcia-Milà and McGuire (1993, 1998).

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

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

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

Assume that 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 immobile and fixed for each community and for each sector within the community.[30] Assuming that functions F_1 and F_2 are homogeneous of degree 1, equations 15 and 16 can be rewritten as:

$$(17) \qquad q_1 = f_1(h, x_1)h^{\delta}$$

$$(18) \qquad q_2 = f_2(k, x_2)h^{\delta}.$$

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

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:

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

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

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

$$(21) \qquad w_1 = f_1(h, x_1) h^\delta - h f_{1h} h^\delta - x_1 f_{1x_1} h^\delta$$

$$(22) \qquad w_2 = p_2 f_2(k, x_2) h^\delta - p_2 k f_{2k} h^\delta - p_2 x_2 f_{2x_2} h^\delta.$$

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

$$\max_{c_1^1, c_1^2, c_2^1, c_2^2, g, h, k, x_1, x_2 t_1, t_2, z_1, z_2} 1_1 u_1(c_1^1, c_1^2, g) + 1_2 u_2(c_2^1, c_2^2, g)$$

$$\text{s.t.} \quad y + w_1 = c_1^1 + p_2 c_1^2 + z_1$$

$$y + w_2 = c_2^1 + p_2 c_2^2 + z_2$$

$$w_1 = f_1(h, x_1) h^\delta - h f_{1h} h^\delta - x_1 f_{1x_1} h^\delta$$

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$$w_2 = p_2 f_2(k, x_2) h^\delta - p_2 k f_{2k} h^\delta - p_2 x_2 f_{2x_2} h^\delta$$

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

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

$$1_1 z_1 + 1_2 z_2 + 1_1 h t_1 + 1_2 k t_2 = p_g g + 1_1 p_{x_1} x_1 + 1_2 p_{x_2} x_2$$

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; 1_1 and 1_2 are the share of workers of the jurisdiction in sectors 1 and 2 respectively, such that $1_1 + 1_2 = 1$.

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

(24) $$t_1 = \frac{x_1}{h} f_{1x_1} h^\delta - \delta h^{\delta-1} f_1(h, x_1) - \frac{1_2}{1_1} p_2 \delta h^{\delta-1} f_2(k, x_2)$$

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

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 equals the marginal benefit of the public input to the firm minus the marginal concentration benefit to both sectors of additional capital in sector 1.[31]

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 cities, it is difficult even to speculate about

31. Note 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.

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 relocations or existing externality-generating firms increase their investment in capital. Strictly speaking, we would expect to see tax breaks offered under both scenarios. However, 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.

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 eighty-five 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.[32] Third, the number of jobs—a tradi-

32. Duranton 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.

tional 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 the new location rather than creating jobs for local residents.[33]

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.

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."[34] 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.[35]

In the end, 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 that 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.[36]

Moreover, 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

33. In 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.

34. "More Boeing for the Buck." In *Denver Post*, April 29, 2001, pp. K-01.

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

36. See James Wallace, reporter for *The Seattle Post Intelligencer*. Interview by Steve Edwards, *Eight Forty-Eight,* WBEZ Chicago Public Radio, May 10, 2001.

any evidence that residents and existing firms in Chicago will benefit? Local, state, and national politicians touted the so-called 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."[37] 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."[38] 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.[39]

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.

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 pro-

37. *All Things Considered*. On National Public Radio, May 10, 2001. Boeing would be the only Dow Jones Industrial Average company with its headquarters in Chicago and one of only two Dow Jones companies (McDonald's Corporation is the other) in the metropolitan area.

38. "Chicago Snags Boeing." In *Chicago Tribune*, May 11, 2001, p. 1.

39. In their study of Tennessee's successful efforts to attract the Saturn plant after a fierce competition with several other states, Bartik and others (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.

viding 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, such as 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. At the same time, a given locality may offer tax breaks to some firms and not to others, depending on their size, 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 headquarters differ remarkably in terms of location, specialization, and amenities. In addition, they offered quite different tax breaks and incentives to attract the firm. Also, at the same time that Chicago was wooing Boeing, it was neglecting efforts to retain a Brach's manufacturing plant. Not only are Boeing and Brach's very different types of firms, but the former offers the potential for knowledge spillovers through incoming headquarters activity, while the latter, with 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 to explain the reasons for and benefits of tax breaks. Our work could provide a new prism through which to assess tax breaks and some guidance for future empirical studies.

Comments

Edward Glaeser: Why did Chicago offer Boeing $50 million in tax abate-
ments to locate in that city? Are tax deals like this welfare-enhancing or
socially damaging? Garcia-Mila and McGuire's "Tax Incentives in the City"
presents a new approach to this question taking into account the possibility
that there are significant agglomeration economies. This is a fine paper with
a new idea. In this comment, instead of responding directly to the paper, I will
give an overview of locational tax incentives and suggest how I think that
empirical work should proceed in this area.

What are tax incentives conceptually? There are two rival definitions of tax
incentives. First, they can be seen as tax rates that are chosen on a firm-by-firm
basis. As such, the interesting thing about tax incentives is their heterogene-
ity among firms. Needless to say, they also represent a great increase in the
discretionary nature of taxation. Second, the tax breaks may also represent a
reduction in the total tax rate. Indeed, Garcia-Mila and McGuire define tax
incentives as "a tax rate lower than the marginal benefit of the public goods
and services provided to the firm." Garcia-Mila and McGuire's model focuses
on the level of taxes in a single jurisdiction. It provides both a justification for
why tax incentives should be below the cost of public goods and services and
a possible framework for understanding interfirm heterogeneity in tax rates.

When a company like Boeing—the topic of Garcia-Mila and McGuire's
case study—receives a $50 million dollar tax package, this is both an increase
in the degree of heterogeneity of tax rates and a decrease in the main level of
taxes. However, I think that the most striking thing about the Boeing exam-
ple is its firm-specific nature, and it is this aspect of tax incentives I will focus
on here. Moreover, it is hard to know whether Boeing is actually covering the
costs of the public services it consumes. I am not sure if tax incentives ever

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exist using the author's definition. As such, I think the heterogeneity of tax rates, and the fact that these tax rates are handled on a firm-by-firm basis, is much more important than the effect of these tax incentives on the overall tax rate. The rest of this note will focus on two linked but fundamentally different questions: why do tax incentives occur (the positive question) and what are the welfare effects of tax incentives (the normative question).

Why do cities offer tax incentives? In this section, I review five theories about why tax incentives occur. Some of these theories (such as the agglomeration view) suggest a benign side of tax incentives, and other theories (such as influence and corruption) suggest that tax incentives are pernicious. However, almost all of these theories are fundamentally positive and leave the normative question—should tax incentives be banned—unanswered. The first two theories start with the view that governments maximize the consumer welfare of their current residents. Theories three and four are based on the assumption that local governments maximize total tax revenues. Theory five assumes that corrupt officials maximize their own well-being and pay little attention to the needs or demands of their community.

—Positive Theory 1: Consumer and Producer Surplus. The simplest theory of tax incentives is that these represent bids by communities to attract firms that will generate either consumer or producer surplus for the current residents of the community. According to this theory, when the firm moves in, it will be involved in local markets for inputs (mainly labor) and perhaps also local markets for outputs. In both these cases, conventional welfare and analysis suggests that there will be welfare triangles gained by the city. Even if the firm acts as a local monopolist or monopsonist, there will be inframarginal workers or consumers who strictly benefit from the firm's presence. Upward sloping labor demand curves mean that some workers will be strictly better off by the presence of the firm. Downward sloping consumer demand curves mean that some customers are made better off by the new producer.

According to this theory, when cities bid for firms, their bids reflect the different levels of welfare gain they expect their residents to get from the presence of the firm. As such, this bidding presence is essentially benign (since after all, Pareto optimality requires that the firm takes this surplus into account when making its location decision). This force seems to matter mostly for firms that are hiring large numbers of workers, or firms that are supplying to the local market. One positive explanation for the subsidization of local sports teams is that these teams generate consumer surplus they are not directly able to capture.

What are the implications of this theory? In general, the size of the subsidy that the government will pay should be equal to the level of consumer and producer surplus that will be generated. This implies that when labor supply is elastic (that is, workers and jobs are homogeneous), there will be little local surplus. When labor supply to this firm is more inelastic, then workers will get rents from this new source of labor demand and the city should be willing to offer tax incentives to the firm. Obviously, if (as is the case of Boeing) there will be few local employees from the move, then this theory predicts that Chicago should not be willing to pay for the firm's location.

The same simple price theoretic arguments apply when thinking about consumer products. If demand is highly elastic, and the price is close to willingness-to-pay for all of the consumers, then this product generates little consumer surplus. However, more inelastic demand yields higher surpluses. Naturally, cities with bigger local demand for the firm's product will generally be willing to offer most in terms of tax incentives. A further important factor in this case is returns-to-scale technology on the part of the firm. If the product has large fixed costs and the firm prices at close to marginal cost, then the consumers will get almost all of the surplus. This may be the case for some sports teams that have large fixed costs and in either the cases of stadiums or television coverage, marginal costs are small. Of course, Boeing does not supply any local products.

A final implication of this theory is that the level of tax incentives may be higher than the net present value of the taxes (minus cost of public services) that the firm will pay to the city. As the tax incentive is meant to pay for the surplus that the firm will bring to the city, then this tax incentive should represent a net transfer to the firm.

—Positive Theory 2: Agglomeration Economies. This theory represents the contribution of Garcia-Mila and McGuire to the literature. Their work argues that if there are agglomeration economies, then cities will bid to capture firms which generate these agglomeration economies. They have modeled this case in some detail so it makes little sense for me to review it here. Instead, I will stress two aspects of the model that limit its ability to generate testable implications. These comments should not be seen as a slight on their work, but rather an attempt to stress just the full extent to which this theory can be useful.

My first point is that the primary empirical implications of this model will come from the agglomeration production function. Firms that offer higher spillovers will get bigger tax incentives. Cities that stand to benefit most from

these spillovers will pay most for these firms and offer higher incentives. This type of cross-city, cross-industry variation will stand to be the primary testable implication of this model. Since we aren't so sure about the factors that lead to greater spillovers, probably the most sensible modeling approach would be to put together a very flexible function that includes both firm and location characteristics as determinants of the level of spillovers.

Garcia-Mila and McGuire assume that agglomeration economies are a function of "*k*"—the capital to labor ratio of the jurisdiction. This is certainly one plausible assumption, but the agglomeration economy literature has generally focused on skill levels rather than capital or labor ratios as the source of agglomeration economies. Rauch documents that wages and rents both rise in skilled cities.[1] Glaser and others show that skilled cities grow more quickly than unskilled cities.[2] As such, it is at least as reasonable to assume that the magnitude of spillovers generated by a new firm is a function of the number of skilled workers it brings to the city. This different specification of agglomeration economies would yield the prediction that tax incentives will be larger toward firms that have more skilled workers.

Another stylized fact from the urban growth literature is that cities with lots of firms grow faster than cities with a few large firms. This work suggests that externalities are more likely to be associated with small start-ups than with large established companies. If this is true, then it becomes much harder to rationalize tax incentives for big firms as sensible responses to agglomeration economies. Indeed, if agglomeration economies are a function of the number of small firms, then Chicago's subsidy for Boeing can be best understood if the Boeing employees are likely to start their own start-ups after they leave Boeing.

A third fact from the agglomeration literature relates to the connection between cities and firms—Glaeser and others find that growth is associated with urban diversity and interpret this as evidence for the important of cross-industry intellectual spillovers.[3] If this is correct, then cities would be expected to offer tax incentives for firms that greatly broaden the scope of the activities in that particular city. If new ideas are formed by combining old ideas, then bringing in new industries that add diversity will have particular value. This theory predicts that firms which add industrial diversity to the city are particularly likely to receive tax incentives.

1. Rauch (1993).
2. Glaeser and others (1995).
3. Glaeser and others (1992).

A second sensible extension of the theory would be to consider more dynamic concerns—in particular the location of other firms. Agglomeration-based tax incentives become more and more attractive when they induce other firms to come to the city. In that case, the optimal tax incentive includes both the direct effect of the first firm plus the indirect effects that work through the location of other firms. This is one way to understand the massive subsidies paid to railroads in the nineteenth century. Railroads were thought to be attractive because they would induce other firms to locate in the town.

This type of argument suggests that spillover-based tax incentives are likely to be used when other firms, ready to follow the first mover, are in large supply. For example, two locations might engage in a dynamic battle to attract a particular firm. The location that wins the firm will prove extremely attractive to a large number of other firms, which will then consider relocating there. In that case, the two locations should be willing to pay a great deal to attract the first firm. This can be thought of as a case where the elasticity of future migration to the city with respect to the location of the firm is extremely high.

A final implication of this theory is, as Garcia-Mila and McGuire prove, that tax incentives will be sufficiently high so that tax payments net of public services costs will be negative. As such, this aspect of the theory predicts the same thing as the consumer surplus theory.

—Positive Theory 3: Ex post Appropriation. A third theory of tax incentives is that these large up-front payments exist to compensate firms for future tax payments. According to this view, once firms move to a particular location, they will be easy for the local government to exploit. The firm's fixed resources create an immobility that means that it is easy prey for a taxing authority. Forward-looking firms recognize this fact and demand up-front tax breaks to compensate for *ex post* appropriation.

This type of theory also has some clear implications for the firms that will be given particularly generous tax breaks. In particular, more immobile firms will be more likely to receive up-front payments than less mobile firms. Furthermore, firms that have highly inelastic demand for land and local labor will be the most attractive prey for *ex post* appropriation. As such, they will be most likely to receive large up-front payments. Generally, the firms that will end up paying the most *ex post* will receive the largest tax breaks *ex ante*.

This theory also predicts that tax incentives will never be so high that the total net present value of future tax payments minus the tax break are less than the total net present value of providing the firm with public services. As such, this is a theory that can explain the tax incentives that we see in practice,

including the Boeing deal. However, this theory cannot explain tax incentives as they are defined by Garcia-Mila and McGuire.

—Positive Theory 4: "Tax" Discrimination. A fourth related theory is tax discrimination. According to this theory, there are firms with different levels of demand for different locations. As such, local governments face a supply of potential resident firms. Just as monopoly providers of any goods ideally charge different prices for the product to consumers with different reservation values, this theory predicts that locations will charge different tax rates to different firms depending on how much they want to locate in the city. If the city is to extract maximum revenues (while attracting as many firms as possible), it needs to tax inframarginal firms more and marginal firms less.

This theory predicts that the recipients of tax incentives will be those firms that are on the locational margin. Thus firms that really need to be in Chicago will receive no tax incentives. Firms like Boeing, which are on the margin, will not receive these breaks. In principle, empirical work could test this hypothesis by calculating the extent to which some firms are differentially drawn to any given location on the basis of that location's assets (including its labor force). Firms that are strongly attracted to the location should receive lower tax incentives.

Like the previous theory, this theory cannot predict tax incentives as defined by Garcia-Mila and McGuire. In this case, tax incentives will never be so high that the net present value of taxes minus the cost of public services is negative. At the most extreme, tax incentives will mean that for the firm on the margin, the flow of tax revenues minus public costs will equal zero.

—Positive Theory 5: Corruption and Influence. The fifth theory of why tax incentives occur is corruption and influence. According to this theory, these incentives do not represent maximization of tax revenue or maximization of the welfare of current residents of the city. Instead, tax incentives reflect the ability of the firm to bribe or coerce the leaders of the government. The nineteenth century tax incentives for railroads were often motivated by this force as railroads regularly bribed politicians to get generous tax treatment.[4] In the nineteenth century, explicit bribes were often the norm. In the twentieth century, contributions to election campaigns or skillful use of the revolving door are presumably more common.

This theory predicts that the level of tax incentives is determined by the ability of the firm to get away with this bribery. Situations where detection is difficult will be more likely to lead to tax incentives. This predicts that tax

4. See Glaeser (2000) for details.

incentives will be linked to the appearance of spillovers or large consumer sur-
plus. Tax incentives will be more likely to be granted to firms that are
politically influential. Furthermore, when it is difficult to monitor public offi-
cials, we will expect to see higher levels of tax incentives. This theory predicts
that tax incentives should be more common in countries with weaker rule of
law, and that tax incentives should have been more common in the nineteenth
century when detection was difficult.

Naturally, this theory predicts little about the overall tax level. Tax incen-
tives may be so generous that the overall net tax revenue may even be negative.
On the other hand, tax incentives may be much less, depending on what the
firm and politicians can get away with.

Should cities offer tax incentives? There are two separate normative ques-
tions related to tax incentives. First, do these incentives distort the location
decisions of firms. Second, do these tax incentives lead to tax burdens that are
too low and correspondingly low levels of public services. A question that is
related to the second question is whether these incentives lead to an undesir-
able level of transfer to mobile firms.

—Normative Question 1: Will tax incentives lead firms to make the wrong
location decisions? From an urban economics perspective, this is perhaps the
central normative question. Does the behavior of local government lead to spa-
tial distortions where tax incentives distort the decisions of firms? Some of the
positive theories of tax incentives predict that these incentives create spatial
distortions. Other theories predict that tax incentives are necessary corrections
to existing distortions.

What does efficient location actually mean? In principle, it means that
firms choose locations which maximize total social surplus. The benefits of a
firm moving to a particular location should include the profits the firm earns
from the location, any external effects, and the consumer and producer surplus
created by the locational choice. The costs include the cost of providing pub-
lic services. For the purposes of this question, I will avoid discussion of
so-called fiscal externalities that lead to transfers of funds from one location
to another. These fiscal externalities can, of course, always be undone at the
central government level and will be addressed in the subsequent section.

The way I have framed the question makes it clear that if either agglom-
eration economies or these consumer surplus type issues exist, then tax
incentives are almost surely necessary to get the efficient location of firms.
The misallocation of firms will depend on the extent to which agglomeration
effects differ across space. In principle, if firms generate agglomeration

economies, but these are constant, then there is no need for tax incentives. However, this will generally be unusual. More likely, tax incentives will lead to efficient, not inefficient, location of firms if there are heterogeneous agglomeration effects across space.

If there are no agglomeration effects and no spatial impacts of consumer or producer surplus effects, and if tax incentives address tax issues, then there is also no malign effect of tax incentives. For example, if locations maximize tax revenues and are not allowed to offer tax incentives, then locations will act like local monopolies. Taxes will be too high, and too few firms will come to the location. Just as price discrimination creates an efficient level of consumption of a monopolist's product, tax discrimination creates a more efficient allocation of firms across space. Likewise, in the *ex post* appropriate case, tax incentives are needed to undo the distortions that are created by governmental expropriation. In these cases, tax incentives would help to eliminate distortions that would otherwise be created by local taxing.

The only theory that suggests that tax incentives would create spatial distortions is the corruption and influence theory. If this theory is correct, firms will move to locations that offer the most generous packages, and the magnitude of these packages will be based exclusively on the venality of the local government. Obviously, choosing a location on the basis of which area is most susceptible to bribery will probably not lead to efficient outcomes. As such, this theory predicts that tax incentives will probably lead firms to locate in the wrong places.

Overall, this analysis suggests that almost all of the theories predict that location decisions will be better with tax incentives than without these incentives. Local taxes often distort locations (unless they are perfectly tied to the cost of local services). Agglomeration economies mean that private firms' decision-making will not internalize important spillovers. The existence of tax incentives can, in principle, remedy these problems and banning these incentives will make things worse. The only exception occurs if tax incentives are based primarily on corruption and influence.

—Normative Question 2: Will tax incentives lead mobile firms to get too many rents and will this lead to underprovision of other public goods? The bulk of the public finance literature on tax competition has focused more on the "race to the bottom" of tax levels than on any other impact. The models that argue that tax competition does bad things suggest that locations will cater to mobile residents and deprive their less mobile residents of needed pub-

lic services.[5] As such, the reduction in income associated with tax incentives will produce underprovision of socially productive public goods.

Alternatively, followers of Tiebout stress that local tax competition disciplines the leviathan aspects of local government.[6] According to this literature, local government expenditures naturally tend toward inefficiency and waste. Tax competition eliminates this waste.

I think tax competition can be considered an income transfer where funds are transferred from the local government to mobile firms. This is clearly a boon for the shareholders of these firms. The question is what the losses are from depriving the localities of income. If local governments act as oligopolies rather than as separate competing entities, they could charge higher taxes and this would increase their funds. Would this be better?

There is no question that, in principle, this can be worse. The mobility of firms certainly stops some localities from redistributing to the poor. However, the mobility of the rich also stems the ability of localities to redistribute. More to the point, I think that mobility generally means that local redistribution is almost always a bad idea. Tax incentives may certainly limit the ability to engage in local redistribution, but probably that local redistribution should never have gone on in the first place.

More generally, will reducing the income available to local governments cause a loss in social welfare? This answer can certainly not be answered in the abstract. Economists need to estimate what happens when localities are deprived of the marginal dollar. Does this loss lead to eliminating very valuable services or are fairly marginal services cut off? In principle, anything local competition does can be offset by transfers from the central government. My suspicion is that optimal policy always involves allowing localities to complete with tax incentives (unless we are sure that those transfers are motivated by corruption). Then if localities are thought to make highly efficient use of the marginal dollar, money can be transferred to those localities.

Of course, tax incentives will have redistributional effects, even beyond their negative impact on local redistribution. Taxes will lead to a transfer in rents from less mobile firms to more mobile firms. It's not clear why this type of redistribution between one type of shareholder to another is a particularly pressing subject for government action. However, if this type of redistribution is thought to be highly undesirable, it can always be cut off by

5. See, for example, Wilson (1986); Zodrow and Mieszkowsky (1986).
6. See, for example, Brennan and Buchanan (1980).

central government action. I cannot help thinking that the best way to handle the redistributional impacts of redistribution is not to eliminate competition, but to have a separate redistribution policy.

Conclusion. Tax incentives seem to be a permanent part of the urban economic landscape. However, economists do not yet know why these incentives occur and whether they are desirable. These two questions are intrinsically linked. Hopefully, Garcia-Mila and McGuire's paper will lead to further investigation of these questions. In ten years, I hope we will be able to conclusively reject some of the theories discussed above and that we will be closer to knowing what is really going on with these incentives.

My discussion suggests that tax incentives will almost surely improve the efficiency of the locational decisions of firms. The only case where this is not true occurs when tax incentives are driven by corruption and influence. Tax incentives may lead to a redistribution from local governments to mobile firms. However, the efficient response to this redistribution should be a central government redistribution policy, not eliminating local government competition.

Todd Sinai: The issue of tax competition between cities, states, and even countries is pervasive and appears in many contexts. From U.S. states trying to attract manufacturing, to cities subsidizing sports stadiums, to countries trying to attract foreign investment, all levels of government attempt to influence economic decisions by providing tax incentives. Indeed, there is plenty of evidence that tax incentives affect firms' choices, whether the incentives are intentional or not. To name just a few examples, work by Hines as well as work by Hines and Desai find that taxes affect the location of firm investment[1] Goolsbee and Cummins, Hassett, and Hubbard address whether tax incentives affect firm investment and the prices of capital goods.[2]

But the fact that tax incentives influence firms does not mean they are a justifiable policy. Herein lies the contribution of this fine paper by Teresa Garcia-Mila and Therèse McGuire. The authors provide an example of how cities providing tax breaks to firms can be justifiable *ex ante*. They do not claim that any particular tax break is justified *ex post*, but instead, outline conditions under which tax incentives may increase economic efficiency. They then turn to the very interesting case of Boeing Corporation's relocation

1. Hines (1996); Hines and Desai (2001).
2. Goolsbee (1998); Cummins, Hassett, and Hubbard (1994).

of its headquarters to Chicago to see if their theory could apply to that par-
ticular instance.

Chicago's courtship of Boeing is especially fascinating because it does
not seem to conform to the usual stories about why cities give tax breaks. One
common argument is that politicians buy jobs with taxpayer dollars by giving
subsidies to firms to situate themselves locally. However, that was not the case
with Boeing, which brought nearly all its 500 headquarters' employees with
it from Seattle. Chicago Mayor Richard Daley argued that the $50 million in
subsidies to Boeing was good advertising for the city as other companies
might then view Chicago as a good place to establish their businesses.   How-
ever, that explanation seems particularly unlikely since the same companies
would also be aware of the lucrative tax deal that was awarded to Boeing.

Garcia-Mila and McGuire propose an alternative hypothesis: The reloca-
tion by Boeing may create a positive externality for Chicago. The authors label
the externality "benefits from agglomeration," but it really could be anything
productivity-enhancing: from greater civic pride to honest-to-goodness knowl-
edge spillovers. Since externalities constitute a market failure, government
intervention is called for. The typical pricing solution is a Pigouvian tax (sub-
sidy) and that, in essence, is what this paper shows should happen. If Boeing
would provide spillovers for other firms and workers in Chicago but not real-
ize all those benefits themselves, they should be induced to locate in Chicago
via a subsidy.

This is an attractive notion and one that has received very little attention in
the literature. Of course, it may not be the only reason cities provide tax incen-
tives, but that's not the point. Rather, it may explain some tax breaks when
other theories break down.

The paper proceeds on two fronts: One is to augment a model of tax com-
petition to allow for agglomeration effects. The second is to relate the model
to the Boeing case. I like both these parts independently. The model conveys
an insight in an intuitive way, probably can explain many tax incentives, and
certainly provides guidance to policymakers on how to target their subsidies.
The Boeing case is a fascinating example of how these tax deals evolve. How-
ever, I would like to see each part developed on its own. In particular, I'm not
sure the model describes the Boeing case as well as the authors would have
us believe. On the one hand, I believe the argument in the model is correct, but
Boeing may not be the best illustration of it. On the other hand, there are fea-
tures of the Boeing case that would be interesting to try to explain, but which
cannot be addressed using the framework in the paper.

In the basic model, every firm is identical and has operations in every (identical) market. Labor is immobile, but productivity increases in the capital-to-labor ratio not only for a firm's own workers but for other firms' workers as well, increasing wages. The spillovers in productivity reflect agglomeration benefits. Since firms choose the capital-to-labor ratio in each market and are not compensated by their peers for the benefits of the spillovers they provide, the natural solution for a social planner is to subsidize firm investment.

Garcia-Mila and McGuire augment this approach by considering two extensions. First, what if cities differ in their benefits from agglomeration? Then cities with larger spillovers would provide greater subsidies to firms. Second, what if there are two sectors: one that produces spillovers and one that does not? Then, naturally, investment in the former sector would be subsidized relative to the latter.

Overall, I think this model makes a fundamental point in an elegant, clear, and efficient manner: that with concentration, externalities investment incentives are justifiable. But there are fascinating features of tax incentives, and especially of the Boeing case, that are not predicted by the model in this paper, and I think they are worth pondering in future work:

Spillovers Are Due to High-Value Labor. In this model, a greater investment of private capital in a city is expected to generate positive externalities. Since labor is immobile, the pool of workers does not change. How does the additional capital create greater productivity? A typical example of investment in private capital is when a company purchases better machines for its workers so their productivity increases. But the externalities in the Garcia-Mila and McGuire model derive from when a company buys their workers machines, and all the other workers in the economy have greater productivity as well. How does that happen? Does the capital investment reflect the firm investing in worker training and that knowledge diffusing through the economy? Is it simply that morale in a city, and thus workers' effort, is higher when a big company erects a showcase building? Understanding the channel through which the capital investment leads to spillovers will have important implications for city government. Since mayors get to choose which investments to subsidize, recognizing which ones generate the greatest externalities is crucial for accurate social planning in this model.

In addition, in the example in the paper, Boeing invested little capital in Chicago. Instead, it simply moved its headquarters staff to an existing building there. That had little effect on the capital and labor ratio and, if anything, may have lowered it. But it is consistent with what may be a more intuitive

model of spillovers: knowledge diffusion due to highly skilled labor entering the market.

The model in the paper does not allow for this channel for spillovers since labor is not mobile. If it were, however, it seems that the predictions would be different. Rather than subsidizing firms, cities may prefer to subsidize high-skill labor. A subsidy to capital may only lead to labor migration without any overall increase in wages.

Tax Breaks Affect Firm Location. It seems that investment subsidies investment for firms that are already located in a city rarely are trumpeted on the front pages of local newspapers. Instead, stories about tax giveaways to entice corporations to come to town—or not to leave—get all the ink. Boeing is no exception. The corporation received a tax incentive to locate in Chicago, not to increase their capital investment on the margin. The discrete decision of whether to locate in a city or not seems to be as important, if not more important, than how much to invest.

As the authors note, the base model in the paper does not consider location decisions. Rather, it uses tax subsidies to increase the amount of investment spillover-creating firms undertake in their current locations (which is everywhere, since all cities are identical). Since firms don't locate everywhere in reality, firm location would be an interesting, and relevant, avenue to explore. If there is a minimum efficient investment for firms, then the optimal tax rate reduction may rise and then decline in the size of the investment. Some firms may simply be too large for some cities and would increase the capital-to-labor ratio more than would be optimal, so cities would not compensate them for the extra investment. If there are moving costs, subsidies may need an up front lump-sum component in order to induce firms to relocate. That would raise the average cost of attracting investment, reducing the amount a mayor would want to try to entice to her town. If moving costs were sufficiently high, one might try to attract a firm that provided fewer spillovers but had lower moving costs. In the extreme, it may be preferable to distribute the $50 million among local firms that provide spillovers since they have no moving costs. Perhaps paying firms not to leave your city is more efficient than paying firms to move to it?

Jurisdictional Competition Plays a Role. Boeing entertained offers from several cities and the competition between them seemed to be an important aspect of the process. Would Chicago have offered $50 million if Dallas had not bid? There is no jurisdictional competition in the Garcia-Mila and McGuire model, except implicitly in the extension where cities are allowed

to have different agglomeration benefits. But this competition can have real welfare implications. For example, in this paper, cities offer firms the package of tax incentives that lead them to invest the social welfare-maximizing amount of capital. However, with perfect competition between cities, it seems Chicago should be willing to offer Boeing tax incentives up to the point where Chicago was indifferent if the firm invested in their town or not. In such a world, the spillover-producing firm would capture all the economic surplus. Even with a distribution of spillover benefits among cities, the best "match" city would have to pay enough to beat out the city that was the second best match, which could still leave it on the wrong side of the amount of investment in the capital investment case and with little increase in welfare in the location case.

This could also be an argument for why high fixed-amenity cities will continue to grow: They do not need to pay as much cash to attract firms. If this advantage is not fully capitalized into land rents, such cities could retain more of the surplus from attracting spillover-producing firms.

Few Firms Receive Subsidies. In the base model in the paper, every company is eligible for a subsidy. In the extension of the model, the authors argue that a matching process between cities and companies, where spillovers flow downstream and some companies provide more effective spillovers in certain cities, implies that cities would be willing to pay more for firms that are particularly good matches. Still, every company that produced spillovers would, and should, be eligible for some subsidy, somewhere.

However, Chicago offered only Boeing $50 million. It did not make Raytheon, for example, an offer to move (that we know about). Why just Boeing? Why does Chicago not have a standing offer to General Motors or General Electric? It seems unlikely that Boeing is the only firm that could provide a nonzero level of spillovers for Chicago.

Optimal Outcomes Do Not Arise Endogenously. In the Boeing example, Chicago appears to have believed that Boeing was more socially efficient there than in Seattle. But Boeing was not necessarily going to move its headquarters to Chicago on its own volition. It needed an incentive to do so.

The base model in the paper predicts the opposite. Firms in that model would naturally agglomerate where there were other spillover-producing firms. (They would underinvest, but they would locate in the right place.) In the extension, Boeing would not have moved since it is a provider of spillovers and does not receive any agglomeration benefits from other firms. The downstream firms, on the other hand, should have moved to Seattle and clustered around Boeing in order to receive some spillovers. (Still, Boeing would have

been providing too little capital since it did not receive any benefit from the positive externality it provided.)

This line of reasoning provides an alternative rationale for the kind of subsidies Boeing received. Boeing may have been a "loss leader" for Chicago, not intended to make existing firms more productive, but to act as a magnet for additional firms. There, the agglomeration benefits come from proximity—firms that work together want to cluster near each other—rather than knowledge spillovers. This pattern is similar to the one that has followed some auto plants: once the plant is established, suppliers build facilities nearby even though they do not receive subsidies themselves

While these features of the Boeing example may be best addressed in future work with a two-city model, two types of firms, and an endogenous firm location, the inability of the existing model to explain them does not diminish its real value: it provides a defensible justification for the presence of tax subsidies for firms.

The model also has the virtue of providing some empirically testable implications. For one, the size of the tax break should be increasing in the level of agglomeration of the city since the value of the spillovers would be greatest there. Since the spillovers are nonrival, a little spillover over a large base of firms is just as valuable as a big spillover over a small base. (The alternative hypothesis proposed in the previous section would have the opposite effect.) Big cities should thus give larger breaks than small cities. Finally, good "matches" between cities and firms (however defined) should lead to larger spillovers.

I think such empirical analysis would be quite valuable. In the spirit of illustrating that it can be done, I constructed a measure of agglomeration by state, which is the employment share of the largest industry. I then regressed the state's share of tax revenues due to the corporate tax on the agglomeration measure. A graph of the corporate tax share of revenues versus agglomeration is plotted as figure 1, with the regression line drawn as well. The crude results here are at least consistent with the authors' story, namely that in more agglomerated places the corporate tax is less burdensome. (A reduced corporate tax rate, in the authors' model, is a subsidy.)

To be sure, there are a number of econometric problems with this crude regression—for example, it does not control for variation in the tax base across states— but it is intended to be merely suggestive and a call for future work. Given the illuminating insight in the Garcia-Mila and McGuire paper, it would be very interesting to see if their view held true generally, beyond Boeing.

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