Incentives to Attract Firms Induce Bad Selection

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Abstract

A locality that pays a firm establishing a new plant gives the firm an incentive to establish the plant early, thereby obtaining the payment early. The firm therefore has less incentive to delay its decision, and so may establish a plant with a lower chance of success.
1 Introduction

Several studies find that tax incentives offered firms to locate new establishments are ineffective in promoting employment or growth. To give one example (others are discussed in the literature review below) Lester and Lowe (2018) find that establishments that received an incentive had employment growth that was 3.7 percent slower than non-incentivized establishments. The analysis below offers an explanation for why local incentives may retard growth, by attracting low-quality projects. The argument is not the simple one that a locality may offer incentives only to projects that would otherwise be unprofitable. Nor does it rely on an argument that local officials are corrupt or subject to corporate influence. Rather, the argument below is that incentives which increase the profitability of establishing a new plant or facility induce a firm to invest early, to take advantage of the incentives, and thus to engage in little search for the best investment.

2 Literature

A review, conducted at the Upjohn Institute, of 30 different studies concludes that typical incentives tip between 2 percent and 25 percent of firms to favor the location giving the incentive. But that does not mean that incentives generate jobs or economic growth.

The employment effects of large plant openings in the United States are studied by Fox and Murray (2004) and Edmiston (2004). Both studies conclude that such openings largely fail to create indirect jobs in the local economy. A comparison of neighboring states with and without right-to-work laws finds that the pro-business right-to-work law is associated with a one-third increase in manufacturing activity (Holmes 1998). A study of location decisions in the United Kingdom finds a small effect of grants in attracting plants to specific geographic areas, and that firms are less responsive to government subsidies in areas with fewer existing plants in their industry (Devereux, Griffith, and Simpson 2007). The US Urban Empowerment Zone program was found to increase employment in zone neighborhoods (Busso, Gregory, and Kline 2013). State tax policies (state investment tax credits and state

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1 But reviews of the literature by Wasylenko (1999), Buss (2001), and Arauzo-Carod, Liviano-Solis and Manjon-Antolin (2010) note that the effect of incentives on firm location is ambiguous.
corporate tax rates) that reduce the cost of capital in a state increase capital formation in that state, and slightly increase the number of manufacturing establishments (Chirinko and Wilson 2008). A city with low corporate tax rates is more likely to attract a relocated headquarters (Strauss-Kahn and Vives 2009).

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Greenstone et al. (2010) study large plant openings in the United States, examining the effects on local productivity. They use data on “winning” counties (those attracting a plant) and “losing” counties (those left as runners-up in the choice process). They find that the opening of a large plant increases the productivity of incumbent plants in the winning county relative to that of plants in the losing county. Patrick (2016) compares outcomes in counties that won new plants to counties that sought the same plants but did not get them. She finds modest increases in new economic activity, that does not generate a fiscal surplus for winning counties. Patrick (2014) examines the job creation effects of state and local non-tax incentives for capital investment, concluding that increasing the ability of governments to aid private enterprise has a significant negative medium-term effect on rural county employment levels but otherwise has no effect on employment or growth.

A comparison of establishments receiving incentives to a control group finds that the incentives create few new jobs, but that incentives granted to smaller establishments generate more jobs than incentives given to very large
establishments, where incentives reduce employment (Lester and Lowe 2018). Similarly, Bartik (2018) finds that incentives produce stronger economic and employment returns when channeled toward smaller establishments.

Perhaps governments offer incentives not because they directly affect a firm’s decision, but because an incentive signals that the locality favors the industry (Dahm, Dur and Glazer 2014). Empirical support for the idea that policy can signal a jurisdiction’s type appears in Raff and Srinivasan (1998), who suppose that a firm that is initially uncertain about business conditions in a host country may infer that a government which offers tax incentives signals favorable business conditions. The data they report are consistent with such a signaling model.

3 Assumptions

A project once established, generates discounted profits that are either high ($H$) or low ($L$). In any period, the probability that the project under consideration generates high profits is $\pi$. The firm has private information about the quality of the project, so that the locality cannot make its incentive payment contingent on the quality of the project. Only one project can be established in the locality under consideration. A local government can offer an incentive payment $K$ at the time a new plant, if any, is established. The intertemporal discount rate is $\delta$. For simplicity, I consider two periods.

The present value of a project to a locality, discounted to the period in which the project is adopted, is some parameter, $\alpha$, times the profits of the project ($H$ or $L$) to the firm. Thus (abstracting from discounting) a locality prefers the adoption of a High project over adoption of a Low project.

4 Incentives discourage search

4.1 Local government does not pay the firm

Interesting results arise when the project available in period 1 has low profits ($L$). If the firm does not establish the project in period 1, then it can establish it in period 2.\(^2\) The firm’s expected profits, discounted to period 1, are

\(^2\)The model thus builds on the standard analysis of option value, which show the conditions inducing a decision maker who expects to get more information soon to postpone
\[ \delta(\pi H + (1 - \pi)L). \] The firm therefore adopts the project in period 1 if

\[ L > \frac{H\pi\delta}{1 - \delta(1 - \pi)}. \] (1)

4.2 Local government pays the firm

Now let the locality pay the firm \( K \) if it adopts a project in that locality. If the firm adopts project \( L \) in period 1, its expected profits are \( K + L \). If the firm delays its decision to period 2, its expected profits discounted to period 1 are

\[ \delta(K + \pi H + (1 - \pi)L). \] (2)

The firm will adopt an \( L \) project in period 1 if

\[ L > \frac{H\pi\delta + K(\delta - 1)}{1 - \delta(1 - \pi)}. \] (3)

Because \( \delta < 1 \), the right-hand side declines with \( K \). Thus, the larger the incentive the government offers, the more willing is the firm to adopt a low-profit project in period 1.

Let the benefit to the locality be some parameter, \( \alpha \), times the project’s profitability. Then if an \( L \) project is adopted in period 1 if that is the only one available, the locality’s expected benefits are \( \alpha((1 - \pi)L + \pi H) \). If the firm would only adopt a project in period 1 if it were an \( H \) one, the locality’s expected benefits are

\[ \alpha(\pi H + \delta(1 - \pi)((1 - \pi)L + \pi H)). \] (4)

So the locality prefers to avoid inducing immediate adoption of the project if

\[ H > \frac{L(1 - \delta(1 - \pi))}{\pi\delta}. \] (5)

Instead of discounting, a firm may fear that an incentive offered this year may not be offered next year, so it is best for the firm to take \( K \) now, rather than wait. A related result applies if in year \( t \) there is no incentive, but firms expect an incentive in year \( t + 1 \). Then a firm may reject an \( H \) project in year \( t \), wanting the incentive in year \( t + 1 \). 

4.3 How decision varies with probability project has high profits

Consider the effects of $\pi$, or the probability that a project has High profits. The effect is not obvious. An increase in $\pi$ means that if the project is adopted in period 1, regardless of its quality, then with higher probability is the project highly profitable. But it also means that if the possible project in period 1 has Low profits, then the greater the gain from delaying until period 2.

If a project is adopted in period 1, regardless of its quality, then the probability that it is a High type is $\pi$. If, instead, an $L$ project is not adopted in period 1, but a project is adopted in period 2, then the probability that the adopted project is an $H$ one is $\pi + (1 - \pi)\pi$. The difference is $\pi(1 - \pi)$, which is positive: the likelihood of adopting an $H$ project is of course higher when an $L$ project is not adopted in period 1. The derivative of this difference with respect to $\pi$ is $1 - 2\pi$, so that the benefit of delay increases with $\pi$ for $\pi < 1/2$, and is otherwise decreasing. Or put it this way: if most projects are highly profitable, then tax incentives do little to reduce the quality of projects adopted. In the opposite case they do.

4.4 Quality of plants

Consider how the average quality of a plant varies with the probability, $\pi$, that a plant under consideration has high profits. First, suppose there are no incentives. Then the probability that the plant that is adopted over the two periods has high quality is

$$\pi + (1 - \pi)\pi. \tag{6}$$

Now suppose that tax incentives are offered, and that in period 1 even a low-profit project will be adopted. The probability that the adopted project has high profits is simply $\pi$. The difference between these probabilities is $(1 - \pi)\pi$.
5 Extensions

5.1 Multiple cities

Suppose that of several candidate cities, one offers incentives and the others do not. Suppose further that in any year, the project quality is the same across all cities. That could occur, for example, because of input prices, or because of export prices. Thus, in year $t$ across any locality the project has either High profits or Low profits. Now, as in the above analysis, even if the profits are low in period 1, then a firm may find it profitable to adopt the project in period 1 in a locality that offers incentives, but will not adopt such a project then in a locality offering no incentives. In the following period, the profits from a new project will be either High or Low, and so with positive probability the firm will invest in a High profit project in period 2, though the locality offered no incentives. The results considering only one locality can thus apply to multiple ones.

5.2 Incentives that reduce costs or increase revenue

The analysis above spoke of a lump-sum grant, $K$, to a firm which establishes a facility. The interpretation is more general. We can think that the local government engages in some activity that reduces the firm’s costs or that increases its revenue. For example, infrastructure investments can reduce transportation costs and so increase demand for the firm’s output, make the locality more attractive to workers and so attract better workers at the same wage, and so on. Consider then two new variables which are analogous to $K$. Let $K_H$ be the present value of increased profits for an $H$ project, and $K_L$ the present value of increased profits for an $L$ project. Interpret $K$ as the present value of the increased profits arising from the infrastructure.

Now, if $K_H = K_L = K$, the analysis given above continues to apply. The increased profits induce the firm to invest earlier rather than later, and so reduce the firm’s incentive to delay investing until it finds a more profitable project.

An infrastructure investment, however, may favor one type of project over another. If $K_L > K_H$, then the firm has an even greater incentive to invest immediately in an $L$ project. If $K_H > K_L$, then the firm may delay a decision, in hopes of finding an $H$ project next period. A firm which faces an $L$ project in period 1 will choose not to invest in that period, but wait for
period 2 if

$$K_H > \frac{(L + K_L)(1 - \delta(1 - \pi)) - H\pi\delta}{\pi\delta}.$$  \hspace{1cm} (7)

Notice, then, that a lump-sum grant, $K$, always creates a bias favoring immediate investment by the firm. But an improvement in infrastructure which especially benefits highly profitable projects may not only make such a project more attractive, but also induce the firm to delay investment in search of such a project.

Also note that these effects can appear even when the improvement in infrastructure occurs before a firm contemplates investment, rather than only occurring once the firm decides to adopt a project. That is, an improvement in infrastructure in the year 2010 can induce a firm that contemplates a project in 2018 to invest in 2018 (even if it is an $L$ project) rather than to wait for 2019 in the hope of having an $H$ project.

### 5.3 Economies of agglomeration

The establishment of a project with low profits may induce future investments to have similar low quality. The idea that a firm benefits from locating near similar firms is a major argument in cluster theory (Porter 2000). Though some empirical work does not find such an effect (Buenstorf and Klepper 2009), a comprehensive study by Beaudry and Swann (2009) on 56 two-digit industries in the UK supports this argument: in about half of the industries, locating within agglomerations of workers in the same sector increases a firm’s growth. Such agglomeration effects mean that a locality that gets an $L$ project will later be more attractive to $L$ projects than to $H$ projects. So a locality that offers subsidies in some year may attract low-quality projects in that year, and also find that even after the subsidies are gone it is comparatively attractive to $L$ firms.

Furthermore, after a plant is established, what resembles economies of agglomeration for particular types of projects may appear if the politicians who brought the plant do not want it to fail—that would be embarrassing. So they may adopt policies that benefit the plant and similar plants, even if that hurts other plants or firms.
6 Tax incentives can reduce output and incomes

The problem with incentives to attract firms can go beyond attracting projects too early, and so getting inferior ones. Tax incentives which attract a new plant can reduce aggregate output in the locality. Consider a simple model, illustrated in Figure 1. For a start, let the total labor supply in a locality be fixed at $L$; labor is the only input in production. Initially, the locality has one firm, or one industry, with the marginal product curve $MP_U$ ($U$ stands for unsubsidized). Aggregate output is the area under the marginal product curve, or the area of trapezoid with vertices $OABL$. Now let an additional firm or industry enter the locality. We measure its use of labor from the right-hand axis (instead of the left-hand axis). The marginal product curve is $MP_S$ ($S$ indicated a Subsidized firm), or the line $CD$. This firm or industry receives a wage subsidy, perhaps in the form of a tax credit for each worker it employs. Demand for labor by this firm is then lies above the marginal product curve, shifted up by the subsidy per worker. The resultant demand is shown by $D_S$, or line $EF$. The equilibrium is at point $G$, with $L_E$ workers at the unsubsidized firm, and the remainder (indicated by the distance between $L$ and $L_E$) at the subsidized firm. Aggregate output is then the sum of the areas under the marginal product curves for the quantity of labor used by each firm. That output is the area of trapezoid $ODHL_E$ plus the area of trapezoid $LCHL_E$. This sum is less than the area $OABL$, which is output with no subsidized firm.

Of course, the reduced output need not always occur. If $MP_S$ is sufficiently large, then output can increase. And output can increase if wages increase, and so aggregate labor input increases, possibly resulting in larger output. Nevertheless, the point reminds that a subsidy to jobs reallocates labor to the subsidized firm. And if labor is not especially productive at that subsidized firm (as can happen because of the incentives a subsidy provides to adopt a project early), aggregate output will fall.

A locality may care not about aggregate output (perhaps because it does not care about the firms’ profits), but about incomes. The entry of a subsidized project will increase wages. But the subsidy itself will require raising taxes to pay for the subsidy, so the question addressed now is whether the increased labor income exceeds the amount paid in subsidies.

The effects are illustrated in Figure 2. The curve $MP_U$, as before, is the
marginal product in the initial situation. Curve $MP_S$ is the marginal product of the new project, which is subsidized. The job credits raise the subsidized project’s demand curve for labor to $D_S$, or to line $EF$, which lies above the subsidized project’s marginal product curve. Initially, with labor supply fixed at $L$, and demand given by $MP_U$, the wage is the marginal product at $L$, namely $w_0$. After the subsidized project enters, demand for labor increases, the equilibrium is at point $G$ (where $MP_U$ intersects $D_S$), and the wage increases from $w_0$ to $w_E$. Total wage income increases by $Lw_E - Lw_0$, or by the area $w_E J B w_0$. The subsidy payments equal the amount of labor used by the subsidized project times the amount of subsidy per worker. The subsidy per worker is simply the distance between $D_S$ and $MP_S$, so that the subsidy payments are given by the trapezoid with vertices $DFEC$. Here, the subsidy payments exceed the increased wage income, and so residents can be made worse off. The wage will increase more the steeper the marginal product curve for the unsubsidized project. So if the marginal product curve is steep, the increase in wage payments can exceed the cost of the subsidy. Otherwise, the subsidy cost will exceed the increase in labor income. Note that an increase in labor supply following an increase in the wage will attenuate the wage increase. So, recalling the results about aggregate output, a tension appears between increasing output and increasing labor income.

7 Conclusion

I do not claim that incentives to attract new plants always hurt the locality offering the incentives. The new facilities incentives attract can be a benefit. Perhaps most importantly, as Greenstone et al. (2010) show, agglomeration economies exist.

My story shows a difference between local and state or national incentives. For any one locality, a new facility may preclude the establishment of other facilities. At the state or national level, that need not happen.
Figure 1: Figure 1: Tax incentives reduce output
Figure 2: Figure 2: Effect of tax subsidy on wage income
References


8 Notation

$H$ Profit on high-quality project

$K$ Payment by government to firm

$K_H$ Benefit to an H project of infrastructure

$K_L$ Benefit to an L project of infrastructure

$L$ Profit on low-quality project

$\delta$ Intertemporal discount factor

$\pi$ Probability project is high-quality.