Local Economic Development as a Prisoners' Dilemma:
The Role of Business Climate

Stephen Ellis
University of Oklahoma and Rutgers University

&

Cynthia Rogers*
University of Oklahoma
crogers1@ou.edu

Abstract:
We analyze the location incentives ‘arms race’ using a simple game theoretic model. Localities are compelled to offer incentives despite their drawbacks: if no other locality offers incentives, a locality can win big by offering incentives because it can influence the firm’s location decision at a minimal cost; if others are competing, a locality must offer incentives to avoid big losses. Failing to compete for a firm sends a negative signal about a locality's business climate. Business climate considerations force localities not only to compete but also to give away the entire value of attracting the firm.

JEL Classification: R58, H73, R11

Keywords: Interjurisdictional competition, business climate, industrial recruitment, regional development policy, prisoners' dilemma

*ACKNOWLEDGEMENT: The authors would like to thank the participants of the Economics Department Seminar at the University of Oklahoma. All correspondence should be sent to

Cynthia Rogers
729 Elm Avenue
Norman, OK 73019
Phone: (405) 325-5843
Fax: (405) 325-5842
crogers1@ou.edu
Offering incentives to influence the location decisions of businesses is a popular economic development strategy. Virtually every state, for example, offers both financial assistance and tax incentives to attract new firms and retain existing firms (Site Selection, 1998). There is, however, increasing criticism of this practice in the popular media as well as in academic and government circles. The arguments against offering incentives come in a variety of forms. Some point to the fact that incentives are not very effective at influencing firm behavior - surveys show that they affect location decisions at the margin and only after basic factors of production are considered (Kieschnick, 1981). Others stress the practical difficulties of trying to offer rational incentives, i.e. incentives that have a positive payoff to the locality. A recent Time magazine article claims, for example, that politicians are willing to make even bad deals with companies in order to create politically popular job announcements (Barlett and Steele, 1998). Political distortions, lack of information, and information asymmetries make it difficult to construct rational incentives packages (Rubin, 1988; Reed, 1996; Mahtesian, 1995; Leroy, 1995). Even incentives advocates concede that localities often make poor deals (Toft, 1996; Toft, 1995-96). Burstein and Rolnick (1995, 1996) argue that incentives have more subtle costs: because resources are spent on targeting particular businesses, local governments provide too few public goods. Other researchers argue that localities could do better by cooperating rather than competing (Hands and Mann 1987; Coates, 1993). Most agree that offering incentives leads to something like an arms race - once the practice begins, it is difficult to control and no one ‘wins’ (Grady, 1987; Jenn and Nourzad, 1996).

The interjurisdictional competition for firms has led to questionable outcomes. Why do localities continue to compete? Political incentives, miscalculation of costs and benefits, and the like are, no doubt, part of the answer. In this paper, however, we emphasize a factor that has generally been
neglected in the academic literature - the role of business climate. Many economic development officials emphasize that offering incentives is a way to send a pro-business signal. In reference to winning the Mercedes-Benz plant in Alabama (at a cost of more than $168,000 per job), Rob DeRocker of Development Counsellors states, "It's an attention grabber. You can't measure it - how can you measure the public-relations value of Mercedes-Benz? - but you can't discount it either" (Demott, 1994). Economic development practitioners are obviously concerned with demonstrating a business-friendly atmosphere. Establishing a positive business climate is a top priority for state and local officials. Without the right sort of atmosphere, they fear, firms will shun their localities and economic growth will suffer as a result (Venable, 1995; Venable 1996; Dabson, et al, 1996).

The perceptions of practitioners about the importance of business climate are not unfounded. In a review of recent empirical evidence, Wasylenko (1991) argues that "it is increasingly difficult to argue that business climate, however broadly defined, does not influence interregional firm locations" (pp. 27-28). Offering incentives is supposed to provide a powerful pro-business message. Subsidies to firms provide the right sort of signal because they show a willingness to promote growth and help businesses. "Governor Jim Folsum argues that, at least for his state, the Mercedes deal was [a] steal, if for nothing other than its symbolism—that is, to break through old stereotypes and announce to the corporate world that Alabama is open for business" (Mahtesian, 1995). According to Governor Jim Hunt, "North Carolina has one of the strongest economies and one of the best business climates because of … our aggressive efforts to create and keep good jobs for our people" (Lyne, 1998, p. 48). Corporate officials see incentives as a business climate signal as well. As Mahtesian (1995) notes, “Kentucky’s ad scramble for industry has left little doubt in business circles as to its hospitality to industry and commerce” (see also Venable and Coffee, 1993; Venable 1996). Development practitioners are
concerned with sending a pro-business signal so they can't ignore incentives. Some proponents claim that offering incentives is a necessary condition for having a good business climate. Toft (1996) claims, for example, that “[i]ncentives are a cost of doing business.” Essentially, localities look bad if they don’t offer sufficiently attractive deals to firms. According to Gary Carlton, Director of Business and Industry Development for North Carolina, “You’ve got to have incentives to get your foot in the door” (Carlton, 1996; see also Venable, 1995, p. 728). The political pressure to preserve and create jobs pushes policy makers to "play the game" (Wolkoff, 1992; Wolman, 1988; Walker, 1989; Spindler and Forrester, 1993). Political leaders are afraid to do nothing (Duncan 1992). If each locality offers incentives, however, then they must compete for firms. Each locality’s desire to show that it has a superior business climate fuels the ‘arms race’ mentality.

From a locality's perspective, the competition for firms is rational. Localities want to increase local employment levels and defend against losing the firms, both of which depend (to some extent) on their ability to send a pro-business signal. Opponents of the incentives competition, however, are also correct in emphasizing the practical difficulties in making good deals and in arguing that even with good deals, the escalating competition could be counter-productive for society as a whole. Economic development practitioners are not blind to these arguments. As Stephen Goldsmith, Mayor of Indianapolis, puts it, "You can't say no, but you can't afford to say yes." (Schwartz et. al., 1992, p. 40). Unfortunately, localities are essentially in a prisoner's dilemma: however much they might desire to do so, they can't afford to stop competing.

Examining the competition among localities for a firm as a simple non-cooperative game, we demonstrate that the practice of offering incentives to firms in a competitive environment has paradoxical results. Our model verifies the familiar result that, even in the best case scenario of precise cost-benefit
analysis and social welfare maximization, the general practice of offering incentives is bad for all localities (Hands and Mann 1987; Coates, 1993). We build on previous research by explicitly incorporating a locality's business climate signal as the cost of not competing in the bidding competition. In our model, localities compete for a firm. If a locality fails to attract a firm then it sends a negative signal about its willingness or ability to help business. This fact ensures that each locality will offer incentives, and so that competing does not increase a locality’s chance of getting a firm. Furthermore, if a locality succeeds in attracting a firm, the nature of competition forces them to give the firm, in the form of incentives, all of the benefit of the firm being in the locality. Giving away the entire store is the unique equilibrium. Consequently, localities do not gain by competing for firms but they can lose by not competing. Localities are thus compelled to compete, not because they stand to gain anything, but because they can't afford to send a negative signal about their business climates.

II. The Local Economic Development Game

In this section we model the competition for firms as a game. Our model is admittedly simple. We assume identical localities compete for a single firm in a single period. We also assume away all the practical problems that are associated with offering incentives to a firm, e.g., lack of public accountability for local officials, uncertainty about the costs and benefits of having a particular firm in the locality, and information asymmetry between a locality and a firm or between localities. In our perfect planning world localities are assumed to be able to make the best possible deals for themselves. The idea is to show that even under these propitious circumstances, offering incentives would still have perverse consequences.
There are two important features that distinguish our model from previous research that uses game theory to analyze interjurisdictional competition. First, we assume that only certain localities will be in the game - those that the firm actually considers. This is actually part of our perfect planning assumption. Everyone knows which localities the firm is considering so there are no information asymmetries for the firm to exploit. Which localities does the firm consider? The evidence suggests that incentives only influence decisions if more than one location satisfies the basic investment criteria (Kieschnick, 1981; Toft, 1996). Companies decide on certain localities first and then shop for incentives: “Lynn Markley, a spokeswoman for Frito-Lay, says the company selects a general region where it wants to locate a new plant. It then prepares a sort of shopping list of requirements for the facility and contacts states about incentives” (Barlett and Steele, 1998, p. 41). The localities in the game are therefore assumed to be equivalent with regard to basic location factors, at least with respect to the needs of the particular firm. In addition, we restrict the localities in the game to those that would benefit the most from attracting the firm (Brooks, 1989). The firm wants to get the highest subsidy it can. A capacity to provide such a subsidy is one of the things it looks for in a locality (Toft, 1996; Venable, 1995, p. 728). Given that localities are rational, the maximum amount they can offer a firm is the value of attracting the firm to the locality.

The second distinguishing feature of our model is how we incorporate the role of business climate. We explicitly model the cost incurred if a locality fails to attract a particular firm that it could attract.¹ The cost results from sending a negative business signal- as we discussed before, these are reputation

¹ We assume that a locality doesn't look any worse for failing to attract a firm that it had no hope of attracting.
effects that result from not appearing to be "open for business." These costs will be reflected in future economic development efforts.

To begin, we assume that there is a particular firm and a set of localities where it might want to locate. The localities 1, … , I that the firm considers are the players in this game. For the sake of simplicity, we model the players as identical.\(^2\) We assume that each locality knows what it will gain if it attracts the firm and what it will lose if it fails to do so. We also assume that there is no information asymmetry between localities: each locality knows the identities of the other players, its legitimate competitors. Localities try to entice the firm by offering incentives. Incentives can come in many forms, but for the sake of simplicity we assume that localities offer cash subsidies. The cash subsidy can be seen as the monetary value of the combined incentive package that a locality offers. The players are otherwise identical so the firm moves to the locality that offers the highest subsidy. We assume that the citizens of their localities hold local officials accountable. As a result, subsidy offers cannot exceed the benefit to a locality of attracting the firm. Let \(x\) be the discounted present value to a locality of attracting the firm. Let \(S_i = [0, x]\) be locality \(i\)'s strategy set: the set of possible subsidies that locality \(i\) can offer the firm. Then \(s_i\) is a particular subsidy offer (strategy) from the set \(S_i\). Let \(s = (s_1, \ldots, s_I)\) be a strategy profile that lists a strategy for each locality, where \(s \in \prod_i S_i = S\).

How any particular locality fares in the competition for a firm depends on the subsidies offered by each of the players. Suppose a locality is not among the high bidders. It doesn’t pay the cost of the subsidy, but it doesn’t get the benefit of having the firm either. Localities that fail to attract a firm also look bad compared to a locality that does. By not offering enough to win the firm, the locality sends a

\(^2\) Our result does not rely on this assumption. Each locality can, for example, face different costs for failing to win the firm as long as those costs have the form outlined below.
negative signal to its citizens, other firms, etc., about its business climate. The strength of that negative signal depends on how the locality’s subsidy offer compares to the highest bid(s). The greater the difference, the stronger the signal. Suppose a locality has the sole high bid. It gets $x$, the benefit of having the firm. It also has to pay out $s_i$, the subsidy offered. The net benefit of being the sole high bidder is, therefore, $x - s_i > 0$. Suppose a locality shares the high bid with another locality. We’ll assume that the firm chooses one of the high bidders at random, so each high bidder has an equal chance at the net benefit of having the firm. If a player that offers the highest subsidy doesn’t win the firm then there might be some small doubt about its business climate, which would show up as a cost, $c(0)$. The expected value of sharing the high bid with another locality, therefore, equals the chance of getting the firm multiplied by the value of getting the firm plus the chance of not getting the firm multiplied by the cost of doubt: $.5(x - s_i) + .5c(0)$.

To put all of this formally, let $H = \{s_j \mid s_j \geq s_k \text{ for } k = 1, \ldots, I\}$ be the set of high bids, and $h$ equal the number of elements in $H$, i.e., the number of high bids. The cost of sending a negative signal about the locality’s business climate, $c(\cdot)$, is a function of the difference between a high bid and a locality’s bid, $(s_j - s_i)$. The farther a locality is from the high bid, the larger the cost of doubt. Define $c(\cdot)$, then, as a strictly increasing function from the set $\{0, 1, \ldots, x\}$ into $\mathbb{R}$, the set of real numbers, such that $c(0) > 0$. The probability that a player with a high bid wins the firm equals $1/h$. The payoff to a bid depends on the bids of all of the players. Define the payoff for player $i$ as a function $p_i(\cdot)$ from the set of strategy profiles, $S$, into $\mathbb{R}$ such that

---

3 Even though there is perfect information for players and the firm that is being courted, non-players (those who do not enter the bidding) as well as other firms may not have access to the full information about the firm and about all possible localities.
if \( s_i \in H \) then \( p_i(s) = \frac{1}{h}(x - s_i) - (1 - \frac{1}{h})c(0) \), and

if \( s_i \not \in H \) then \( p_i(s) = -c(s_j - s_i) \) for \( s_j \in H \).

In other words, if player \( i \) offers a high bid (i.e., \( s_i \in H \)) then its payoff equals the probability of getting the firm multiplied by the net benefit of getting the firm minus the cost of doubt associated with offering the high bid and not getting the firm. If player \( i \) does not have a high bid (i.e., \( s_i \not \in H \)) then its payoff is negative and equals the cost of doubt about its business climate, which, depends, in turn, on how low its bid is relative to the high bid(s).

What subsidies will localities offer? We start with a simple two-locality case. Note that it is always better for each locality to offer a small subsidy of \( \varepsilon \) rather than 0. To see this, suppose you are player one and your opponent bids 0. (You could be either locality, so the argument works for both players.) If you offer 0 you get a 50% chance at \( x \) and a 50% chance at \(-c(0)\), but if you offer \( \varepsilon \) you get \( x - \varepsilon > \frac{1}{2}(x - c(0)) \). Now suppose your opponent also bids \( \varepsilon \). If you offer 0 you lose the firm and get \(-c(\varepsilon)\), but if you offer \( \varepsilon \) you get a 50% chance at \( x - \varepsilon \) and a 50% chance at \(-c(0)\). As long as \( x \) is greater than or equal to \( \varepsilon \), you would want to bid \( \varepsilon \) since \( c(\varepsilon) > c(0) \) by assumption. Suppose your opponent bids more than \( \varepsilon \). You lose the firm if you offer 0 or \( \varepsilon \), but you send a stronger negative signal with an offer of 0 rather than \( \varepsilon \).

Since we can rule out 0 bids, it is always better for each locality to offer a subsidy of more than \( \varepsilon \) rather than \( \varepsilon \). Again, suppose your opponent bids \( \varepsilon \). If you offer \( \varepsilon \) you get a 50% chance at \( x - \varepsilon \) and a 50% chance at \(-c(0)\), but if you offer more, say \( \varepsilon + \varepsilon' \), you get \( x - (\varepsilon + \varepsilon') > \frac{1}{2}(x - \varepsilon - c(0)) \).

Suppose your opponent bids \( (\varepsilon + \varepsilon') \). If you offer \( \varepsilon \) you lose the firm, but if you offer \( (\varepsilon + \varepsilon') \) you get a
50% chance at $x - (\epsilon + \epsilon')$. Suppose your opponent bids more than $(\epsilon + \epsilon')$. You lose the firm if you offer $\epsilon$ or $(\epsilon + \epsilon')$, but you send a stronger negative signal with an offer of $\epsilon$ rather than $(\epsilon + \epsilon')$.

The pattern suggested here continues until the only bid left is $x$: it is always better to bid a little more than your opponent if you can. If $c(0)$, the cost of not winning even though you share the high bid, is positive ($c(0) > 0$) then bidding $x$ along with your opponent provides a negative expected payoff equal to $-1/2c(0)$.

The upshot is that each locality has an incentive to bid as high as it can. To even be in the running for a firm, the locality must provide the firm with a subsidy equal to all of the benefit of having the firm locate there in the first place. Each locality would do better if they would all refuse to offer subsidies and let the firm choose at random. That isn’t a feasible outcome, however, since there is a huge benefit to cheating in such a system: even a very small subsidy wins the firm.

The two-locality results generalize substantially to the multi-locality case. Again, for each player, it is always better to offer a little rather than nothing; if subsidies of 0 are eliminated then it is always a better to offer a little more than a little; if little is eliminated then it is always better to offer a bit more than a little more; etc. As before, each locality has an incentive to outbid the others (see Appendix A). The result is a race to ‘give away the store.’ At equilibrium, each locality bids $x$, the whole benefit of having the firm.

III. Implications for Ending the Competition

Is there any way to rein in incentive giveaways? A unilateral moratorium on incentives is not feasible. Any locality that tried it would be at a competitive disadvantage - they couldn’t attract much business. Other localities would have no incentive to follow suit. For example, when North Carolina
was banned from offering incentives during the Maready Case, not only did competing states continued to offer incentives, they used the ban to their advantage by misrepresenting North Carolina's willingness and ability to assist firms (Howard and Harris, 1996). This example highlights the essence of the prisoner’s dilemma: everyone cooperating is better for each of the parties but the cooperative solution is impossible to attain voluntarily since there is much to be gained from cheating. “Such unilateral action has not worked in the past and offers limited future prospects” (Toft, 1995-1996).

A voluntary multilateral moratorium on incentives is a popular proposal. Politicians, economists, academics, and planners have called for such a moratorium. The resolution by 100 Midwestern economists issued on September 20, 1995, for example, called for an end to state-sponsored selective business incentive programs such as direct grants and targeted tax abatements (Toft, 1996). There is no reason, however, to be optimistic about this approach. Multilateral agreements have been tried in the past with no success (Stern, 1996; Reed, 1996; Reich, 1996). The non-competition compact between New York, New Jersey, and Connecticut, for example, lasted just four days (Reich, 1996). Basically, there is no reason for a locality to abide by a voluntary moratorium on incentives. As we saw before, a locality has much to gain by offering incentives. In particular, the officials of a locality want everyone else to stop offering incentives so they can offer smaller subsidies and realize greater gains. They have an incentive to sign compacts but not to abide by them.

There is a glimmer of hope for ending the bidding war. Under certain conditions, localities might be able to develop a stable cooperative scheme. The idea is for communities to divide a series of firms among themselves by taking turns offering small subsidies. A locality might have to wait for its turn to court a firm, but when its turn arrives, the locality will realize most of the benefit of acquiring the firm. This strategy can be incentive compatible. Localities will restrain themselves for future benefits if the
expected benefits are substantial enough, certain enough, and not too far off. The conditions for this sort of cooperation are quite rare, however. The set of localities must be stable. A locality outside of the compact won’t abide by its constraints, forcing the other localities to offer incentives to match. There must be a continuous supply of firms, arriving on the scene sufficiently often. If there are no more firms or if potential firms arrive too far in the future then a locality will not have an incentive to leave the field to another locality. Localities must also take a long run view. They have to value the future highly or they will have an incentive to cheat and go for the immediate gain. This condition is problematic for politicians who stand to gain from short-term success and may not get credit for success in the future (after their term ends). These conditions are likely to be met, if ever, only among a small number of localities with regard to a highly specialized sector of the economy. These results follow from an analysis of an indefinitely repeated version of the game described above (see Appendix B).

The prisoners’ dilemma aspect of the interjurisdictional competition for firms highlights the need for federal intervention. Recently, there has been an increased call for federal level solutions. The necessity of federally imposed solutions has even reached the popular literature (Bartlett and Steele, 1998b). On possible such solution is a government-enforced moratorium. As we saw before, a moratorium works only if everyone actually stops offering incentives. As a practical matter, this implies federal action. Melvin Burstein and Arthur Rolnick from the Federal Reserve Bank of Minneapolis have suggested such a moratorium (1996).

An alternative to the moratorium is to impose a federal excise tax on incentives. If set at a rate of 100 percent, businesses would no longer have an incentive to go shopping for deals, since any incentives received would be confiscated. If set at a rate of anything less than this firms would still want to participate in the competitive bidding process. The federal government has the Constitutional
authority to impose such a tax, but like the moratorium, it would be face strong political opposition from local economic developers. Moratoriums or other limitations on economic development incentives are especially unlikely in this era of new federalism since such legislation would directly reduce a state’s ability to promote economic development within its borders.

A more palatable federal option is to provide incentives for localities to shun the practice without restricting states' rights. For example, federal funding targeted at economic development initiatives could be made available contingent on a state's agreeing not to participate in the incentives arms race. In particular, low-cost loans from the Department of Housing and Development could be restricted to firms that aren't receiving additional state and local incentives, or to those that aren't the target of bidding war.

An alternative to tax and regulation policy is to attack the problem through the legislative branch of the federal government, namely, show that the practice of offering incentives is unconstitutional. There have been advances in this direction, but the jury is still out on whether this option will be fruitful (see for instance, Frickey, 1996; Hellerstein, 1996; Kramer, 1996).

The political obstacles to federal solutions are formidable. State and local economic development professionals will continue to resist policies that will limit their ability to send highly visible signals about their community's business climate. Consultants who help package and market incentives will join the resistance. Adding the firms who ultimately capture economic rents from the competition to the group, we can understand why federal solutions are not forthcoming. There are no easy solutions even if everyone recognizes the inherit problem with offering incentives to attract firms. From a practical standpoint we can expect the bidding competition to continue.
IV. Conclusion

Our analysis demonstrates the paradox of offering incentives from a locality’s perspective. There are good reasons why a locality would not want to offer incentives. Still, the desire to send a positive signal about its business makes it almost impossible for a locality to resist the urge to offer incentives. Once localities start to compete for firms, however, a bidding war is inevitable. Consequently, communities give away all of the benefits of attracting new firms. It is clear that localities would be better off if the unbridled competition for businesses could be ended. Unfortunately, coordination between places to that end is impossible absent external constraint because each locality would benefit by trying to attract firms if all other localities stopped trying.

Given the inevitability of the competition between places, at least in the immediate future, some analysis about how to make good deals is vital. Practitioners have very little room for error when offering incentives. Even when they do well, the best outcome for a locality may be to break even. Measures such as claw back provisions that attempt to ensure full disclosure, strict accountability, and improved cost-benefit analysis are essential to minimize errors (Ledebur and Woodward, 1990). Consequently, the focus in the literature on improving the practice of offering incentives is not inconsistent with the goal of restraining interjurisdictional competition. It is needed to minimize the risk of giving away more than what a locality stands to gain by attracting a firm.
Appendix A

This appendix provides some technical results for the I-player game, along with a brief explanation of what they might mean to someone trying to understand the practice of offering incentives to firms.

Result 1: \( s^* = (x, \ldots, x) \) is a Nash equilibrium.

**Proof:** Without loss of generality, consider payoffs to player one. It suffices to show that

\[
p_1(x, x, \ldots, x) > p_1(x - y, x, \ldots, x)
\]

for all \( y \in (0, x] \).

\[
p_1(x, x, \ldots, x) = (1/I)(x - x) - ((I - 1)/I)c(0)
\]

\[
p_1(x, x, \ldots, x) - p_1(x - y, x, \ldots, x) = c(y) - ((I - 1)/I)c(0)
\]

\( c(\cdot) \) is strictly increasing so \( c(y) > c(0) \)

\( c(0) \geq 0 \) and \((I-1)/I < 1\) so \( c(0) > ((I - 1)/I)c(0) \)

*therefore* \( c(y) - ((I - 1)/I)c(0) > 0 \)

A Nash equilibrium is a strategy profile where each player does the best she can given what every other player does. The outcome of a game with rational players will be a Nash equilibrium unless some player has false beliefs about what some other player will do. The first result highlights the defensive nature of the competition for firms. Each player's best strategy is to offer everything to the firm when any of the other players do likewise.

Result 2: \( s^*(x, \ldots, x) \) is the sole Nash equilibrium.
Note: a strategy $s_i^*$ dominates another strategy $s_i'$ for player $i$ if and only if $i$ does better playing $s_i^*$, rather than $s_i'$, no matter what anyone else does (for any $s_i^\sim$, $p_i(s_i^*, s_i^\sim) > p_i(s_i', s_i^\sim)$ where $s_i^\sim$ is the strategy profile $s$ without $s_i$). A rational player never plays a dominated strategy because she always does better by playing the dominant strategy. The proof proceeds by iterated elimination of dominated strategies: for each player $i$, strategies $s_i \in [0, x)$ are successively eliminated.

**Proof:** Without loss of generality, consider payoffs to player one. It suffices to show that for any $k \in [0, k)$, if $k = 0$ or the $s_i \in [0, k)$ are already eliminated, then $k \in S_1$ is dominated by $k + \alpha \in S_1$ for all $\alpha \in (0, (I - 1)/I)(x - k + c(0))$.

There are two cases:

1. $p_1(k + \alpha, k, \ldots, k) > p_1(k, k, \ldots, k)$
   
   $p_1(k + \alpha, k, \ldots, k) = x - (k + \alpha)$
   
   $p_1(k, k, \ldots, k) = (1/I)(x - k) - ((I - 1)/I)c(0)$
   
   $p_1(k + \alpha, k, \ldots, k) - p_1(k, k, \ldots, k) = x - k - \alpha - (1/I)(x - k) + ((I - 1)/I)c(0)$
   
   $= ((I - 1)/I)(x - k + c(0)) - \alpha$
   
   $\alpha < ((I-1)/I)(x - k + c(0))$

   **therefore** $((I - 1)/I)(x - k + c(0)) - \alpha > 0$

2. $p_1(k + \alpha, \ldots, k + \beta, \ldots) > p_1(k, \ldots, k + \beta, \ldots)$

   where $\beta > 0$, $k + \beta \in \{s \mid s_i > s_j \text{ for } i, j = 2, \ldots, I\} = H^{I}$

   and $h^{I}$ is the number of high bids in $H^{I}$.

   There are three subcases:

   (i) $\alpha > \beta$

   $p_1(k + \alpha, \ldots, k + \beta, \ldots) = -c(k + \beta - (k + \alpha))$
\[ p_1(k, \ldots, k + \beta, \ldots) = -c(k + \beta - k) \]
\[ p_1(k + \alpha, \ldots, k + \beta, \ldots) - p_1(k, \ldots, k + \beta, \ldots) = c(\beta) - c(\beta - \alpha) \]
\[ c(\cdot) \text{ is strictly increasing and } \beta > \beta - \alpha \text{ so } c(\beta) > c(\beta - \alpha) \]

*therefore* \( c(\beta) - c(\beta - \alpha) > 0 \)

(ii) \( \alpha > \beta \)

\[ p_1(k + \alpha, \ldots, k + \beta, \ldots) = x - (k + \alpha) \]
\[ p_1(k, \ldots, k + \beta, \ldots) = -c(k + \beta - k) \]
\[ p_1(k + \alpha, \ldots, k + \beta, \ldots) - p_1(k, \ldots, k + \beta, \ldots) = x - (k + \alpha) + c(\beta) \]
\[ k + \alpha \in S_1 \text{ so } k + \alpha \leq x \text{ and so } x - (k + \alpha) \geq 0 \]
\[ c(\beta) > c(0) \geq 0 \text{ so } x - (k + \alpha) + c(\beta) > 0 \]

(iii) \( \alpha = \beta \) (Note: in this case \( h = h^{-1} + 1 > 1 \))

\[ p_1(k + \alpha, \ldots, k + \beta, \ldots) = (1/h)(x - (k + \alpha)) - ((h - 1)/h)c(0) \]
\[ p_1(k, \ldots, k + \beta, \ldots) = -c(k + \beta - k) \]
\[ p_1(k + \alpha, \ldots, k + \beta, \ldots) - p_1(k, \ldots, k + \beta, \ldots) = (1/h)(x - (k + \alpha)) + c(\beta) - ((h - 1)/h)c(0) \]
\[ k + \alpha \in [0, x] \text{ so } x - (k + \alpha) \geq 0 \text{ and so } (1/h)(x - (k + \alpha)) \geq 0 \]
\[ c(\cdot) \text{ is strictly increasing and } \beta > 0 \text{ so } c(\beta) > ((h - 1)/h)c(0) \]

*therefore* \( (1/h)(x - (k + \alpha)) + c(\beta) - ((h - 1)/h)c(0) > 0 \)

Result 2 underwrites our main thesis. It shows that if localities compete for firms then the *only* incentive offer that makes sense is *everything*. The upshot is that when localities care about development, the best they can do is pretty poor: they must give away all of the benefit of attracting the firm in the first place.
Result 3: If \( c(0) > 0 \) then \( p_i(s^*) < 0 \) for \( i = 1, \ldots, I \).

Proof: Without loss of generality, consider the payoff to player one.

\[
p_i(x, \ldots, x) = \frac{1}{I}(x - x) - \frac{(I - 1)}{I}c(0) = - \frac{(I - 1)}{I}c(0)
\]

\( c(0) > 0 \) and \( \frac{(I - 1)}{I} > 0 \) so \( - \frac{(I - 1)}{I}c(0) < 0 \)

The third result is stronger than the second. If there are positive costs associated with not winning a firm even when the locality matches the best offer, then each locality has a negative expected payoff.

Competition for firms not only fails to help localities; it can actually hurt them.
Appendix B

Playing the same game over an indefinite number of times can make certain series of actions optimal even though none of those actions would be optimal with respect to the unrepeated game. In other words, repeated play can lead to new equilibrium actions. Modeling economic development as a repeated game might be appropriate in some situations.

Formally, an indefinitely repeated game consists of a series of stage games. The stage games we are interested in are each just like the game outlined above: the players are $1, \ldots, I$; the sets of actions for each player at each stage are the strategy sets $S_i$; and the payoffs at each stage are determined by the payoff functions $p_i(\cdot)$. Let $s(t) = (s_1(t), \ldots, s_I(t))$ be the action profile for the $t$ period of the game, where $t = 1, 2, 3, \ldots$. The history of play up to $t$ is given by $\lambda(t) = (s(0), s(1), \ldots, s(t))$, where $\lambda(t)$ is a particular history of play from the set of all possible histories, $\lambda(t) \in \Lambda(t) = \times_i S$. A strategy for player $i$ in the full game, $\sigma_i$, is a sequence of functions from histories into actions, $\sigma_i: \Lambda(t) \rightarrow S_i$. $\sigma_i \in \Sigma_i$, the set of all such possible strategies. A strategy profile of the full game is $\sigma$ which is an element of the set of all strategy profiles, $\sigma = (\sigma_1, \ldots, \sigma_I) \in \Sigma = \Sigma_1 \times \ldots \times \Sigma_I$. The payoff to player $i$ of strategy profile $\sigma$ is

$$\sum_{t=0}^{\infty} (\omega \delta)^t p_i(\sigma(\lambda(t)))$$

where $\omega \in (0, 1]$ is the chance that the game will continue to the next stage and $\delta \in (0, 1]$ is the discount factor. This payoff is, roughly, the discounted sum of the expected values of the stage payoffs given the actions implied by the strategy profile.

Let $\sigma^*_i$ be the strategy of bidding 0 at each stage until the first player bids more and bidding $x$ after that. $\sigma^* = (\sigma^*_1, \ldots, \sigma^*_I)$. This strategy profile is symmetric (every player plays the same strategy) and provides pareto-efficient payoffs (no locality can increase its payoff without decreasing the payoff of
another locality). The players are cooperating when they play $\sigma^*$: they refrain from bidding in order to avoid having to offer incentives. According to the folk theorem of repeated games, $\sigma^*$ is a Nash equilibrium (optimal for each player if the other players go along) if and only if $\omega \delta$ is large enough.\(^4\)

(Without loss of generality, we will be treating player 1 as a representative player.) How large does $\omega \delta$ have to be in order to support $\sigma^*$ as a Nash equilibrium? Suppose player one were to defect from $\sigma^*$: she would bid 1 at the first stage game before the gain from defecting could be discounted. Let $\sigma^D_1$ be a strategy where she does just that. Player one plays $\sigma^D_1$ when everyone else plays their part of $\sigma^*$ only if $\pi_1(\sigma^D_1, \sigma^{*-1}) \geq \pi_1(\sigma^*)$ where $\sigma^{*-1}$ is the strategy profile of all players except player one. Player one won’t defect if $\omega \delta$ is large enough as shown below.

\[
\pi_1(\sigma^*) = \sum (\omega \delta)^t \left[ ((1/I)x - ((I - 1)/I)c(0)) = (1/(1 - \omega \delta))[(1/I)x - ((I - 1)/I)c(0)]\right.
\]

\[
\pi_1(\sigma^D_1, \sigma^{*-1}) = x - 1 + \sum (\omega \delta)^t \left[ -((1 - 1)/I)c(0) = x - 1 - (\omega \delta/(1 - \omega \delta))[(1 - 1)/I)c(0)]\right.
\]

\[
(1/(1 - \omega \delta))[(1/I)x - ((I - 1)/I)c(0)] \geq x - 1 - (\omega \delta/(1 - \omega \delta))[(1 - 1)/I)c(0)] \implies \omega \delta \geq 1 - (x/[I(x - 1) + c(0)(I - 1)])
\]

Let $\omega \delta = 1 - (x/[I(x - 1) + c(0)(I - 1)])$. $\omega \delta$, therefore, is the smallest level of $\omega \delta$ that supports cooperation among localities. How does $\omega \delta$ change as $I$, $x$, and $c(0)$ change?

(B1) $\partial \omega \delta / \partial I = (\partial / \partial I)[1 - (x/[I(x - 1) + c(0)(I - 1)])] = (x^2 + c(0) - x)/(I(x - 1) + c(0)(I - 1))^2 > 0$ so $\omega \delta$ increases as $I$ increases.

(B2) $\partial \omega \delta / \partial c(0) = (\partial / \partial c(0))[1 - (x/[I(x - 1) + c(0)(I - 1)])] = (x(I - 1))/(I(x - 1) + c(0)(I - 1))^2 > 0$ so $\omega \delta$ increases as $c(0)$ increases.

(B3) $\partial \omega \delta / \partial x = (\partial / \partial x)[1 - (x/[I(x - 1) + c(0)(I - 1)])] = (I + c(0) - c(0)I)/(I(x - 1) + c(0)(I - 1))^2$.

$I + c(0) - c(0)I > 0$ if and only if $c(0) < (I/(I - 1))$

---

\(^4\) See page 150-160 of Fudenberg and Tirole, 1991 for an explanation of the folk theorem.
so $\omega \delta$ increases as $x$ increases where $c(0) < (I/(I - 1))$, and 

$\omega \delta$ decreases as $x$ increases where $c(0) > (I/(I - 1))$. 
References


Burstein, M. L. and A.J. Rolnick, 1996, Congress should end the economic war for sports and other businesses, Fedgazette, January.


Carlton, G., 1996, A conversation with Gary Carlton, available:


Duncan, H., 1992, Interstate tax competition: the good, the bad, and the ugly, State Tax Notes, 266, August 24.

Fickey, P.P., 1996, The congressional process and the constitutionality of federal legislation to end the economic war among the states, The Region.


Hellerstein, W., 1996, Commerce clause restraints on state tax incentives, The Region, June.


Ledebur, L., and D. Woodward, Adding a stick to the carrot: location incentives with clawbacks, recissions, and recalibrations, Economic Development Quarterly, 4(3) 221-237.

Leroy, G., 1995, No more candy store: states move to end corporate welfare as we know it, Dollars and Sense magazine, May/June.


Mahtesian, C., 1995, Romancing the smokestack, Governing magazine.

Reich, R. B., 1996, Bidding against the future, The Region.
Reed, L., 1996, Time to end the economic war between the states, Regulation, Number 2. Also
published at http://www.mackinaw.org/topics/econdevo/econdevo.htm, a web site of the Mackinac
Center for Public Policy (Michigan).

Rubin, H.J., 1988, Shoot anything that flies: claim anything that falls: conversations with economic
development practitioners, Economic Development Quarterly, 2, 236-51

Newsweek, February 17, 40-41.


Quarterly 29, 28.

Stern, 1996, Like all wars, this one requires political leadership, The Region, June.

Manufacturing Systems, 8 (1), Winter.

____, 1996, Doing battle over the incentives war: improve accountability but avoid federal
noncompete mandates, The Region, June.

Venable, T., 1995, Sunny sessions for business: incentives soar, taxes slashed, Site Selection, 726-800,
October.

____, 1996, Tax cuts, incentives blitz top 1996's sunny year for U.S. business climates, Site Selection,
822-862, October.

Venable T. and Coffee, 1993, Incentives boosted, budgets bashed in '93 legislative sessions, Site
Selection, 1086-1169, October.

