Playing the Incentive Game:

The Search for the Elusive Marginal Worker

December 3, 2000

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I Introduction

When a firm announces its intention to construct a factory in a yet undetermined location, a battle soon erupts. This skirmish takes place between competing states and/or municipalities, with each offering increased incentives as they vie to outbid their neighbors. This contest is commonly referred to as a "race to the bottom" (Glickman & Woodward, 1989), whereby states, in their haste to acquire the trophy of new investment reduce taxes and diminish the costs to the firm at the expense of future revenue to themselves. These business incentives, which are often firm specific, can vary from worker-training programs to subsidized site development to reduced tax rates on property (Chi, 1989) or they can also be rather large, with total incentive packages routinely in the hundreds of millions of dollars. The goal of my paper will be to estimate the impact of these incentives on employment in new auto plants.

In the modern auto industry, the opening of a new assembly plant causes great anticipation, both for the firm and the government. To the firm, there exists both the risk of capital loss and the lure of potential profits. But, there is also profits to be gained. If the firm can lessen costs, such as the expense of site procurement or reduce tax rates, this diminishes the probability of failure. In addition, if the state is willing to incur infrastructure development costs, this aids the efficiency of the plant. One example of this is the deal secured by General Motors for its Saturn plant in Spring Hill, Tennessee.

To entice the company, the state provided the Saturn Parkway, a five-mile roadway linking the Saturn plant with highway I-65 (Sherman, 1994). This was finished at a cost of $50 million and undoubtedly aided in the auto plant's transportation efficiency (Hoyman, 1997).

The state, on the other hand, sees the possibility of an increased tax base along with the likelihood of increased employment. Also, since the opening of a new factory creates an opportunity which officials in political office can use to their personal advantage, this further stimulates the excitement. However, this pressure can cause the state to increase its incentive package, often to unparalleled levels. When the Spring Hill assembly plant opened in December 1987, it received a total incentive package of $80 million (Hoyman, 1997). The recent opening of a BMW plant in Spartanburg, South Carolina brought with it a subsidy of $200 million (auto.com, 1998). Not to be outdone, Nissan garnished nearly $300 million for its facility being constructed in Jackson, Mississippi (justauto.com, 2000). These figures come at a cost to the state or community involved provoking the obvious question: Are the incentives given to firms worthwhile to the state or local government and its constituents?

States, along with municipalities, frequently use employment as a measuring stick by which to tout the benefits of landing the firm's factory. Increasing the employment of the local populous is largely viewed as beneficial because this increases the tax base of the locality and reduces unemployment. The problems of this measurement are the difficulties in its interpretation and derivation. Do the final tallies reflect workers hired strictly in the short-term, such as laborers for plant construction? Are agglomeration

effects accounted for? On a related note, are the satellite manufacturers that locate nearby and provide the needed parts included? For the auto industry, such satellites produce key ingredients such as dashboards and rubber grommets. These industries often locate in a peripheral location to an auto plant and add additional employment (Head, 1994). Local businesses also benefit from the activity surrounding the opening and functioning of a new automotive facility, further increasing employment benefits. Ignoring these economic benefits would be incorrect, but quantifying them can be difficult.

Some scholars, such as Glickman and Woodward (1989) and Chi (1989) believe that competing locations overspend on incentives; that is they provide more benefits to the firm than they receive from the firm. Specifically, Glickman and Woodward are of the opinion that the firms have an inherit advantage by knowing beforehand the desired locational outcome, and use this to leverage one state against another. This leads the disadvantaged state to the "winners curse" in which, to its chagrin, it pays more than the firm is worth.

Exemplifying this is the opening in 1978 of Volkswagen's assembly plant in Pennsylvania (Glickman & Woodward, 1989). Designed to produce the popular Rabbit sedan and coupe, VW received some $86 million to assist in purchasing the factory, which was then an abandoned Chrysler plant located in New Stanton. Pennsylvania originally outbid Ohio, the other state finalist, for the trophy of new investment and jobs. But, with the coming recession of the early 80's combined with the onrush of Japanese auto imports, Volkswagen was forced to curtail production. This reduced output to

60,000 cars in a plant designed for a capacity of 200,000. Coinciding with this was a drop in manufacturing employment at the factory that cut employment to approximately 2,500 workers. This was one-half of the anticipated employment that the plant was originally to provide. By Thanksgiving 1987, VW knew that the situation was untenable, and on July 14, 1988 production halted, leaving the surrounding community without jobs and without benefits for the subsidies provided.

Even in situations without cutbacks in production, incentives do not always sit well with the community. After Kentucky Governor Martha Collins went to great lengths to woo Toyota, accomplishing the task with a record $325 million in business incentives, the local community expressed outrage (Glickman & Woodward, 1989). Gathering at the capital, protesters denounced the incentive package. Toyota "played Martha Layne for a sucker" spoke the rally's organizer, adding that "they're taking our tax dollars to cut their operating costs." It would be hard not to sympathize, for the Kentucky legislature approved a package of $125 million. But, with a majority of the perks paid for through bonds, the cost to the citizens of the state will be much higher. This, combined with the fact that the initial incentive package was under the assumption of additional aid from the federal government, raised the total package to a record $325 million, which was $200 million more than was initially approved. Thus, it is not surprising that some resistance would arise.

Others see the landscape differently, recognizing the spillover benefits that other states and municipalities receive from development in an adjacent locality. Davies (2000), writing on the issue of foreign direct investment in the United States, notes the

difference between the optimal location for the state and the nationally optimal location. His conclusion is that states, by entering the competition, assist in reaching the desired national outcome, thus lessening the subsidy that the national government must provide to reach that same optimal rate. Additionally, the method whereby states compete also ensures that the firm will locate in an area that provides the maximum benefits to the firm. Thus, the "race to the bottom" may not be such an undesirable consequence, after all. Critical to this is that incentives increase employment by the firm. I estimate this effect for 13 U.S. auto plants. I find that the incentives do have a significant effect, however they are extremely small, ranging between three and eighteen workers for each additional million dollars in incentives. The following section describes my data. Section III contains my results. Section IV concludes.

II Data

My data on the individual plant openings which were measured encompassed a timeframe of twenty-one years, from November of 1982 (Honda's Marysville plant opening) to the future completion of Nissans' factory in Jackson, Mississippi (expected to open in 2003). Because of this time span, all dollar amounts were converted to real 1996 dollars using the BEA's GDP deflator (BEA, 2000). This study also remained national in scope, ignoring recent plant investments in Canada or Mexico by firms such as General Motors or Daimler-Chrysler. The purpose of doing so was to further diminish possible data irregularities concerning exchange rates, not to mention differing economic development policies instituted by the two nations.

Since the data was derived from a number of sources, this raises questions into the accuracy and compatibility of the individual data points. For instance, it is often unclear as to the accounting methods used in deriving the published figures. This seems most prevalent in data concerning overall plant investment by the firms. Additionally, the collection method used by the source of the data is also somewhat in question. This can be apparent in the total incentives received by the individual plants. For example, revenue bonds come at a cost to local constituents, but this is not always accurately portrayed by the aggregate incentive figures provided. This interest, accounted for over considerable repayment period, can alter costs significantly.

Further adding anxiety to the accuracy of the figures is the understanding that the automotive industry is not stagnant, for existing assembly plants change and modify their behavior over time. For example, some plants combine assembly procedures with engine or drivetrain casting. This can call into question the equivalency of the employment data in comparison to other plants which only do final assembly work, for plants that do final assembly work utilize more workers (Harbour Report, 1998). Additionally, some plants, such as Honda's Marysville site, have instituted expansions (Hoyman, 1997). This addition to the plant site usually coincides with additional company investment and further subsidies by states, bringing more questions to the table as to the incremental investment and subsidy data. In an attempt to deal with this, I restricted attention as much as possible to plants producing finished automobiles. This leaves me with thirteen plants.

As noted previously, the varied data sources raised issues of compatibility. This was accounted for by relying upon two primary sources, one of which was the University of Michigan's study of the international auto sector. Conducted by the University's Transportation Research Institute, it proved highly valuable as a stable force within the data. The UM data yielded more precise results, possibly due to more consistent collection methods. The second source is the Harbour Report, a manufacturing analysis of the U.S. auto sector brought forth by the private firm of Harbour and Associates. The remainder of the data was primarily collected from auto industry web sites, which, in turn, report information produced by sources such as Reuters, The Detroit News, or the firm's spokespeople themselves.

These sources supplied my employment, capacity and incentive (in millions of dollars) information. Capacity is intended to control for the size of the plant and output potential. Since some of the plants in my sample have yet to begin production, capacity was chosen over actual production figures to ensure compatibility. To control for cross-location wage variation, I included the real state wage in the year the plant opens as an independent variable. A union dummy variable, equal to one if the plant is unionized, was also included to filter out wage affects on employment. Of the thirteen plants involved, five were union (uaw.com). In addition, it should be noted that future wage rates were calculated for the four assembly plants that are yet to be completed (GM: Lansing, Michigan; Honda: Lincoln, Alabama; Nissan: Jackson, Mississippi; Ford: Dearborn, Michigan) corresponding to their respective projected openings in 2001 (first two) and 2003 (second pair). This was done through an OLS regression estimation in which the wage was estimated as a quadratic function of a time trend. Table A contains the summary statistics for my data.

Despite the small size and rough nature of the data, as I show in the next section, I am still able to isolate some effects of incentives. Thus, notwithstanding the data's difficulties, this still serves as a reasonable first pass.

III *Results*

Since the data provided by the University of Michigan's Transportation Research Institute brought forth the most significant effects, I report only those results. Regressions were also run with data from the Harbour Report, but proved not as significant.

With the aim of this paper delving into the employment benefits established in the individual plants, the results were startling. There was a strong correlation between total incentives received by the firm and employment within the manufacturing facility, as shown in Table B. Unfortunately, for state and local governments, this effect proved meager. The data produced t-scores significant at or near the 1% level for the linear incentive estimates. Stronger still, the variables that were logged (ln) produced results that were even more significant, as found in Table C. In this format, t-scores were measured as high as 5.926.

Other variables were included in the scenario to assist in rooting out employment effects. None of these yielded significant results.

Although capacity was also viewed to be positively correlated with overall employment, this too was insignificant. The reason for this was not clear, though it may be due to the technology used in auto production. With the rising use of high-technology

advancements in auto manufacturing, larger capacity may not necessarily mean significantly more employment.

When all of this is put together, the story is somewhat dismal for states seeking to tout the benefits of business incentives. In essence, for every one million dollars thrown into the incentive pool, employment at the factory rises approximately 3.6 workers. For the log specification, an additional million in incentives increases average employment by 18.

This can be viewed from several angles. First, this measure only refers to direct, in-plant employment. As such, spillover effects upon future supporting industries are not accounted for. Also, this measure also ignores employment gained from plant construction. Alternatively, the meager in-plant employment benefits gained may be constrained by the forces of modern assembly measures.

IV *Conclusions*

This project establishes a strong correlation between total plant incentives received by the manufacturing firm and the employment to be gained through the establishment of such subsidies. Although significant, the number of jobs created is astonishingly small.

These findings, however, do not attempt to answer the larger question as to the proper amount of state involvement, for, as stated previously, there remains some disagreement. Many noted individuals have attempted to ascertain the costs and benefits of the policies currently in place. Still, there is no resounding and definitive answer. Attempting to find one is beyond the scope of this paper. Adding to the debate through a useful study of in-plant employment was the guiding purpose to this endeavor. Hopefully, in this regard, it has been successful.

TABLE A : SUMMARY DATA

COMPANY	PLANT LOCATION	DATE OF INCEPTION	1997 PRODUCTION	CAPACITY (IN THOU)	EMPLOYEES	INCENTIVES (IN MILLIONS)
Auto Alliance (Mazda)	Flat Rock, Michigan	Sept. 87	100,394	240.0	3,665	52
BMW	Spartanburg, S. Carolina	Sept. 94	62,943	90.0	1,350	200
General Motors	Lansing, Michigan	2001	na	211.0	2,000	111
Honda	Marysville, Ohio	Nov. 82	415,588	430.0	5,800	16.4
Honda	Lincoln, Alabama	2001	na	120.0	1,500	158
Mercedes Benz	Vance, Alabama	1993	19,462	70.0	1,500	300/253
Nissan	Jackson, Mississippi	2003	na	120.0	3,300	295
Mitsubishi/Chrysler	Normal, Illinois	Sept. 88	189,086	240.0	4,000	118.3/83.3
Nissan	Smyrna, Tennessee	Jun. 83	398,308	450.0	6,000	66/33
Saturn (GM)	Spring Hill, Tennessee	Dec. 87	271,471	268.5	3,000	80/70
Subaru-Izuzu	Lafayette, Indiana	Sept. 89	186,891	180.0	2,300	90/86
Toyota	Georgetown, Kentucky	May. 88	431,811	400.0	6,000	478.2/325
Ford Motor Co.	Dearborn, Michigan	2003	na	na	6,500	222

TABLE B

	DEPENDANT VARIABLE		
	EMPLOYMENT	**EMPLOYMENT**	**EMPLOYMENT**
CONSTANT	**1758.651**	571.399	- 4750.886
(t-statistic)	*(3.011)*	*(.707)*	*(-.430)*
INCENTIVE	**1.376**	**3.505**	**3.848**
	(3.978)	(3.055)	(2.119)
INCENTIVE^2		-.588	-.642
		(-1.927)	*(-1.428)*
DATE			35.121
			(.366)
UNION			-825.55
			(-.850)
PLANT CAPACITY			-.7906
			(-.466)
WAGE			169.321
			(.843)
F-TEST	15.82	11.72	3.64
R^2	.590	.701	.785
ADJUSTED R^2	.553	.641	.569
N	13	13	13

TABLE C

	DEPENDANT VARIABLE	
	(ln)EMPLOYMENT	**(ln)EMPLOYMENT**
CONSTANT *(t-statistic)*	**3.925** *(5.603)*	2.381 *(.216)*
(ln)INCENTIVE	**.598** (5.926)	**.574** (3.319)
(ln)INCENTIVE^2		
(ln)DATE		184 *(.089)*
(ln)UNION		-.687 *(-.207)*
(ln)PLANT CAPACITY		-.391 *(-.759)*
(ln)WAGE		.339 *(.504)*
F-TEST	35.11	6.29
R^2	.761	.818
ADJUSTED R^2	.740	.688
N	13	13

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