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Geographic Redistribution of U.S. Manufacturing and the Role of State Development Policy

by Yoonsoo Lee

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Competition among state and local governments to lure businesses has attracted considerable interest from economists, as well as legislators and policy makers. This paper quantifies the role of plant relocations in the geographic redistribution of manufacturing employment and examines the effectiveness of state development policy. Only a few studies have looked at how manufacturing firms geographically locate their production facilities and have used either small manufacturing samples or small geographic regions. This paper provides broader evidence of the impact of plant relocations using confidential establishment level data from the U.S. Census Longitudinal Research Database (LRD), covering the full population of manufacturing establishments in the United States over the period from 1972 to 1992. This paper finds a relatively small role for relocation in explaining the disparity of manufacturing employment growth rates across states. Moreover, it finds evidence of very weak effects of incentive programs on plant relocations.

JEL Codes: J23, H25, H73, R58
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1 Introduction

Many state and local governments have used economic development incentives to influence business relocation, expansion, or start-ups. Over the past three decades, state and local governments have continued to expand their economic development activities with a variety of tax and financial incentive programs, replicating one another's programs. These efforts to foster economic stimulation, once characterized as smokestack chasing, usually involve the provision of various incentive packages to businesses in an attempt to induce them to relocate into or expand within the state. Such programs usually include tax abatements, direct subsidies, the issuing of bonds, subsidized loans, and public funding of employee training. Despite the large amount of attention and resources devoted to these programs by policymakers, there is little systematic empirical evidence concerning the cost-effectiveness and impact of such business incentives.

While there exists a huge body of literature on the impact of state and local taxes, only a modest amount of research has focused on economic development incentives [See Newman and Sullivan (1988), Bartik (1991), and Fisher and Peters (1997) for a survey of previous research]. For example, de Bartolome and Spiegel (1997) find that economic development expenditures by the state are significantly related to the growth of manufacturing industries. In a study examining employment growth in 37 industries across metropolitan statistical areas, O'hUallachain and Satterthwaite (1992) find that job growth is positively correlated with the presence of targeted economic development programs, such as enterprise zones and university parks. Most of the studies having focused on the effects of economic development incentives on the aggregate employment growth at the regional and industry level; however, relatively little is known about how firms respond to these incentives. While the location decisions of manufacturing firms may have major consequences for the ability of local governments to raise revenue and provides services, there has been relatively little research on whether state and local governments can influence firms' relocation decisions. Although some studies such as Carlton (1983), Walker and Greenstreet (1991), and Gabe and Kraybill (2002) have examined plant locations, firm births, or plant expansions, they do not explicitly consider the relocation decisions of existing firms. Mainly due to the unavailability of the data, no empirical research has examined patterns of firms relocating production facilities across locations in the face of legislative changes affecting the business climate. Given that the most common targets of state and local incentives are new branch plants of large firms (much of the popular debate over economic development incentives has focused on highly publicized "firm specific incentives"), empirical evidence concerning the degree of mobility or responsiveness of firms to state development incentives is essential to legislators crafting such incentive programs. I address this need by providing summary measures of the patterns of location changes in U.S. manufacturing industries and by examining the effects of state economic development incentives on the growth of manufacturing plants in the United States over the period from 1972 to1992.

As an initial step, I summarize the patterns of plant relocations in U.S. manufacturing industries and examine the importance of relocations on the growth of local labor markets. Previous studies using aggregate data sources at the industry level document a clear movement of economic activity from the Rust Belt to Sun Belt states in the South (Newman 1983, Topel 1986, Crandall 1993, and Blanchard and Katz 1992). However, very little is known about the role of manufacturing firms in the geographic redistribution of manufacturing industries across states. Most of these studies — which are based on regional changes in output and employment at the aggregate level rather than geographic shifts of individual firms' production facilities — do not provide insights into the importance of relocation; to what extent the relocation of individual establishments explains geographic shifts of U.S. manufacturing industries.

So far, research on relocation has mainly focused on the urban economic aspects of the decision using either relatively small samples from manufacturing or small geographic regions. Burns (1977) indicates that vertical (from central cities to suburbs) movers are attracted by the lower expenses, while horizontal movers (relocations between cities) are more interested in factors reflecting agglomeration economics. Erickson and Wasylenko (1980) find the availability of a labor force and other agglomeration economics to be the main reasons for vertical relocations of firms in Milwaukee and its suburbs. Using privately constructed data from some plants around Cincinnati, New England, and nationally within the Fortune 500 group, Schmenner (1980, 1982) finds that the typical moving of a plant is characterized by managerial considerations and space problems. While these studies provide valuable insights on business relocation, their limited samples can hardly represent U.S. manufacturing plants as a whole, and their methods are subject to limitations of survey research, such as discussed in Barkley and McNamara (1994).

Compared to previous studies, I provide broader evidence about the patterns of plant relocations. I employ confidential data from the U.S. Bureau of the Census, which covers the universe of manufacturing establishments present in the U.S. Using individual plant and firm level data collected in the last five Censuses of Manufactures from the Longitudinal Research Database (LRD), I identify and measure relocations in U.S. manufacturing between 1972 and1992. In this paper, I focus on a multi-unit firm's plant relocation, the case in which an incumbent firm opens a new plant that produces the same product, (*i.e.* the same four-digit industry), by shifting its production processes from one location to another.

I also investigate job creation and destruction caused by plant relocations in order to examine to what extent job flows across geographic units are explained by firms' reallocating jobs between plants. Numerous studies about job reallocations in U.S. manufacturing have documented the fact that labor markets are characterized by large and pervasive job flows among establishments. However, most of these studies have focused on employment at individual plants; therefore, little is known about job flows between firms or the role of firms in job creation and destruction. As an initial study, Schuh and Triest (2001) provide new evidence about the role of firms and corporate reorganization in the determination of job creation and destruction. I quantify the role of plant relocations in the geographic redistribution of manufacturing employment across states in the United States and ask how the pattern of relocation differs between growing states and declining states.

To assess the effectiveness of state development policy in attracting new businesses and in discouraging the outflow of businesses, I estimate a multinomial logit model for a plant's decision to shut down, relocate, or continue in the same location. I use the listings of economic development programs collected annually by Conway Data, Inc in the "50 States Legislative Climate Survey" of the *Site Selection and Industrial Development*, to examine whether a newly implemented incentive program are successful in retaining the businesses in the state. This paper complements previous studies concerning the effect of state fiscal policies on new plant births by providing insights about how factors affecting business location decisions influence plant turnover and relocation decisions.

In the next section (Section 2), I present an overview of the data set and construct measures of plant entry, exit, and relocation. My study differs from previous ones in that it distinguishes entry due to relocation from entry by *new* firms, and exit due to relocation from *permanent* exit (i.e., plant shutdown without relocation) to assess the relative importance of entry, relocation, and exit in the local labor market, in terms of both numbers and size.

I summarize empirical findings on plant entry, exit, and relocation in the following section. In Section 3, I report the average level of entry, relocation, and exit rate and relative sizes of entrants, relocated plants, and exiting plants across the continental states for each five-year period between census years. Over a typical five-year period, I find more than nine percent of closed multi-unit plants are relocated to other states. For every 100 new plants opened in a state over a five-year period, more than 10 plants turn out to be relocating from other states.

Furthermore, I investigate the impact of plant turnovers and relocations on local labor markets by examining how much of the employment growth in each state can be explained by the four distinctive phases of individual plants, that is birth, growth, death, and relocation. I find plant relocations within the same firm account for at least four percent of the variation in employment growth rates across states during the period from 1972 to 1992. I also find that the disparity of manufacturing employment growth rates across states is driven not only by the differences in net entry rate and net relocation rate, but also by the differences in the size of entering and exiting plants between growing and declining states.

In Section 4, the effects of state development on geographic redistribution of manufacturing industries are examined on both intensive and extensive margins. First, I briefly describe the tax and financial incentive programs that I examine in this study. I fit the relocation decisions of existing plants to a standard discrete choice model in order to examine the effectiveness of these state development policies in retaining businesses in state as well as in attracting business from other states. Overall, I find very weak evidence of the role of tax and financial incentives in explaining the patterns of plant relocations.

2 Measuring Plant Relocation with Census of Manufactures Data

In this section, I define relocation and discuss possible issues that may occur in identifying relocation. Following Dunne, Roberts, and Samuelson (1988), I construct summary measures of entry, relocation, and exit, as well as their sizes relative to other firms in the state. Previous literature on entry and exit ignores possibilities that plants can be reopened (relocated) after shutting down. I distinguish entry due to relocation from entry of *de novo* plants — new plants without relocation from incumbent plants —, and exit due to relocation from *permanent* exit — shutting down a plant without relocating the production processes to other new plant.

2.1 Data and Identifying Relocation

The plant-level data used in this study are taken from the LRD maintained by the Center for Economic Studies (CES) at the U.S. Bureau of the Census. The LRD is constructed by linking individual establishment records from the Census of Manufactures (CM) which is taken every 5 years and the Annual Survey of Manufactures (ASM) which is taken every non-census year. The LRD contains data on output and detailed information on the factors of production and costs, such as the levels of capital, labor, energy and materials used as inputs, for individual manufacturing establishments. An important feature of the LRD is its plant classification and identification information including firm affiliation, location, product, industry, and various status codes which identify birth, death, and ownership changes. These identifying codes — permanent plant number (ppn) or firm ID — are used in developing the longitudinal linkages of individual plants or firms.

In this study, I use the last five Censuses of Manufactures (1972, 1977, 1982, 1987 and 1992) on 300,000-400,000 plants to develop measures of relocation for each establishment. Since the Census of Manufactures cover the universe of manufacturing plants in the U.S., the measurement of entry and exit is likely to be more reliable when full CM files are used. Because the CM is only taken at five-year intervals, however, it is not possible to observe plants that enter and also exit or relocate between census years.[1]

[1] Entry, exit, and relocation rates across adjoining census years may underestimate the actual number of entries, exits, and relocations. Including the ASM does not fully solve this problem because the data are only collected for a subsample of the establishments represented in the CM during non-census years. For a more complete description of the LRD, see McGuckin and Pascoe (1988) and Davis, Haltiwanger, and Schuh (1996).

I define relocation as a firm's geographic shift of production processes. For example, a firm with a plant in New Jersey opens a new plant in Pennsylvania producing the same product (four-digit industry) as a previously existing plant in New Jersey. This process can occur either when a firm expands into a new geographic market by opening a branch plant or when changes in the economic environment results in the movement of an establishment to a new location. In the first case, the firm will keep the production in the original location, while in the second case, it will probably shut down or contract the original plant. Since most of the studies in the literature deals with the second case, I focus mainly on the complete relocation of a production process from one location to another. To distinguish relocation as distinct from simple expansion, I classify a shift of production processes as relocation only when a previously existing plant reduced total employment in the original location by more than 50% in the following census year. In addition, for a new plant to be considered a relocated plant, it should be located in a "new location" away from the "original location" of the plant. In this paper, a new plant is considered to have relocated only when it is moved more than 50 miles from the county the plant was previously located in.[2] I label a previously existing plant in the original location — one that was operated by the same firm *before* the firm shifted production processes — as an *origin* plant and a new plant *after* relocation as a *destination* plant.

2.2 Measuring Entry, Relocation, and Exit

Throughout this paper, entry, relocation, and exit are measured as plant opening or closing — entry into or exit from a local labor market or an industry. Entry is defined to as the opening of an establishment that was not operating in a location in the previous censuses ($t \leq t-5$), but is operating in the current census. Exit is defined as the closing of an establishment that was operating in a location in the previous census ($t-5$), but is not operating in the current (t) and later censuses ($t \geq t+5$).[3] To

[2] The distance between counties is calculated based on the longitude and latitude of the county center. Given that most workers in the U.S. commute less than 45 minutes, relocating a plant more than 50 miles away will affect most workers involved. The criteria of 50 miles is also used in Holmes (1999) in his study on localization of industry. Lee (2003) explains identification and limitations of data and relocation measures in more detail.

[3] Note that this measure is different from entry and exit measures in industry, where definition of entry and exit includes entry and exit of an existing (continuing) establishment by changing the mix of products they produce between two census years as well. Since I am interested in firm's location choice and the impact of plant turnover on the location involved, I exclude entry and exit of continuing plants and focus on entry and exit by plant opening and closing.

examine which states have experienced frequent relocations relative to others, I construct summary measures of entry, exit, and relocation. First, I define a set of variables to assess overall measures of plants (and firms) that enter, relocate, or exit in each state in the following Definition Table A:

Definition Table A.

Variable	Definition
$Number\ Entering_i\ (t)$	the number of entering plants in state i between census years $t-5$ and t
$Number\ Relocation\ New\ Locale_i(t)$	the number of relocated (destination) plants in new locale (opening plants by existing firms' relocation process) in state i between census years $t-5$ and t
$Number\ Relocation\ Old\ Locale_i(t-5)$	the number of relocated (origin) plants in old locale (origin plants that shut down by existing firms' relocation process) in state i between census years $t-5$ and t
$Number\ eXiting_i(t-5)$	the number of exiting plants in state i between census years $t-5$ and t
$Number\ Total_i(t)$	the total number of plants in state i in census year t

Using these variables, I define the entry rate ($Entry\ Rate_i(t)$), relocation rates ($Relocation\ Rate\ New\ Locale_i(t)$, $Relocation\ Rate\ Old\ Locale_i(t-5)$, $Ratio\ of\ Relocation\ to\ Entry_i(t)$, or $Ratio\ of\ Relocation\ to\ eXit_i(t-5)$), and exit rate ($Exit\ Rate_i(t-5)$) for each state i between a pair of census years $t-5$ and t in the following table:

Definition Table B.

Variable	Definition
Entry Rates (opening plants)	
$Entry\ Rate_i(t)$	$\dfrac{Number\ Entering_i(t)}{Number\ Total_i(t)}$
$Relocation\ Rate\ New\ Locale_i(t)$	$\dfrac{Number\ Relocation\ New\ Locale_i(t)}{Number\ Total_i(t)}$
$Ratio\ of\ Relocation\ to\ Entry_i(t)$	$\dfrac{Number\ Relocation\ New\ Locale_i(t)}{Number\ Entering_i(t)}$
Exit Rates (closing plants)	
$Exit\ Rate_i(t-5)$	$\dfrac{Number\ Exiting_i(t-5)}{Number\ Total_i(t-5)}$
$Relocation\ Rate\ Old\ Locale_i(t-5)$	$\dfrac{Number\ Relocation\ Old\ Locale_i(t-5)}{Number\ Total_i(t-5)}$
$Ratio\ of\ Relocation\ to\ eXit_i(t-5)$	$\dfrac{Number\ Relocation\ Old\ Locale_i(t-5)}{Number\ eXiting_i(t-5)}$

Note that there are four different rates measuring relocation. First two relocation rates (*Relocation Rate New Locale*$_i$*(t)* and *Relocation Rate Old Locale*$_i$*(t – 5)*) measure how many plants opened or closed due to relocations among total number of plants. The other two relocation rates (*Ratio of Relocation to Entry*$_i$*(t – 5)* or *Ratio of Relocation to eXit*$_i$*(t)*) measure fraction of original (or relocated) plants among opening (or closing) plants. Since the number of closing plants (origin plants) and opening plants (destination plants) may differ for a firm, *Relocation Rate New Locale*$_i$ and *Relocation Rate Old Locale*$_i$ are not always equal.

In section 3, I distinguish relocated plants out of state from relocated plant within state. For these interstate relocation, I define four different "out-of-state" relocation rates (*Out-of-State Relocation Rate in New Locale*$_i$*(t), Out-of-State Relocation Rate in Old Locale*$_i$*(t-5), Ratio of Out-of-State Relocation to Entry*$_i$*(t)* , or *Ratio of Out-of-State Relocation to eXit*$_i$*(t-5)*) in the same way.

Relative Size

To assess the relative importance of origin and destination plants in the labor market, I measure the relative size of origin and destination plants compared to existing plants in the state. For entering plants and destination plants, I examine the average size of entrants and destination plants in new locale relative to existing plants in that locale (*Entrant Relative Size* and *Relocation New Locale Relative Size*), as well as the average size of destination plants (in new locale) relative to other non-relocated entrants (*Relocation New Locale Relative Size compared to Entrants*). For example, the average size of entrants in a new locale relative to existing plants is defined as,

$$Entrant\ Relative\ Size_i(t) = \frac{Average\ Size\ of\ Entrants}{Average\ Size\ of\ Incumbents}$$

$$= \frac{\left(\dfrac{Employees\ Entering_i(t)}{Number\ Entering_i(t)}\right)}{\left(\dfrac{Employees\ Total_i(t) - Employees\ Entering_i(t)}{Number\ Total_i(t) - Number\ Entering_i(t)}\right)},$$

where

Employees Entering$_i$ (t) = the number of employees in entering plants in state (or industry) i between census years t – 5 and t;

Employees Total$_i$(t) = the total number of employees in state (or industry) i in census year t.[4]

[4]Relative size measures of destination plants are defined as,

$$Relocation\ New\ Locale\ Relative\ Size_i(t) = \frac{\left(\dfrac{Employees\ Relocation\ New\ Locale_i(t)}{Number\ Relocation\ New\ Locale_i(t)}\right)}{\left(\dfrac{Employees\ Total_i(t) - Employees\ Entering_i(t)}{Number\ Total_i(t) - Number\ Entering_i(t)}\right)}$$

$$Relocation\ New\ Locale\ Relative\ Size\ compared\ to\ Entrants_i(t)$$

$$= \frac{\left(\dfrac{Employees\ Relocation\ New\ Locale_i(t)}{Number\ Relocation\ New\ Locale_i(t)}\right)}{\left(\dfrac{Employees\ Entering_i(t) - Employees\ Relocation\ New\ Locale_i(t)}{Number\ Entering_i(t) - Number\ Relocation\ New\ Locale_i(t)}\right)}$$

where *Employees Relocation New Locale*$_i$(t) = the number of employees in relocated (destination) plants in new locales (opening plants by existing firms' relocation process) in state (or industry) i between census years t – 5 and t.

For exiting plants and destination plants, I examine the average size of exiting plants and origin plants relative to that of continuing plants (*Exiting plant Relative Size* and *Relocation Old Locale Relative Size*), and the average size of origin plants relative to other non-relocated closing plants (*Relocation Old Locale Relative Size Compared to Exiting Plants*).

Relative size measures for exiting plants are constructed in a manner corresponding to the construction of relative size measures for entering plants as described above. These measures allow us to compare the average size of i) entrants and existing plants, ii) relocated plants and existing plants, iii) relocated plants and other non-relocated entrants, iv) exiting plants and continuing plants, v) origin plants and continuing plants, and vi) origin plants and other non-relocated exiting plants.

3 Entry, Relocation, and Exit Statistics

I describe relocation patterns compared to entry and exit patterns using the measures defined in the previous section. Entry, relocation, and exit are measured across states to provide information on patterns of relocation by geographic area.[5] I examine the differences in manufacturing employment growth from patterns of entry, relocation, and exit between growing states and declining states. Then I quantify the role of plant relocations in manufacturing employment growth across states.

3.1 Average Entry, Relocation, and Exit Statistics Across States

Recently available business data from numerous national census bureaus allow researchers to generate a great number of stylized facts on the entries and exits of businesses. As most research has been focused on industry differences, however, our knowledge of the geographic distribution of births, growth, and deaths of individual businesses is still quite limited. In this section, I describe how manufacturing firms have relocated their production facilities across geographic area, directing attention to entry, relocation, and exit patterns in the 48 contiguous states and the District of Columbia. Contrary to previous findings that manufacturing firms usually move plant operations over short distances within states (Schmenner 1980, 1982), I find that more than 80% of relocations occur across

[5] In this section, unless I specify otherwise, I only count relocations after completely shutting down origin plants in old locales, to avoid the variation of relocation statistics as the criteria of contraction rate (50%) in origin plants changes.

state borders.[6] Table 1 reports average rates of entry, relocation, and exit across states between each pair of census years. In addition to variables regarding relocation across counties, I also report variables for plants that relocate out of state in Tables 1 and 2.

On average, about 25% of multi-unit plants (41% of all plants) operating in each state in each census year are new plants that were not in production in that state in the previous census year. I find that an average of 12% of plant openings in each state are accounted for by relocations from other states. The average ratios of relocation to entry vary from .108 to .133 across census years. A pattern similar to that observed in the case of entry and exit in industries is present. I find that the average size of entrants is less than the average size of incumbents, which is consistent with Dunne, Roberts, and Samuelson (1988) and Cable and Schwalbach (1991). The ninth row of the table indicates that destination plants are 43 percent of the size of incumbents. Compared to non-relocated entrants, however, destination plants are shown to have larger work forces. On average, destination plants hire 37.5 percent more workers than do *de novo* entrants as seen in the last row of the top half.

The exit variables in the bottom panel of Table 1 reveal a pattern similar to that observed in entry variables. On average, less than 3% of plants operating in a state are relocated to other states in a given census year. Origin plants that are relocated out of state after being shut down account for 7.8~12.2% of plant closings across states in each census year. The average size of destination plants is less than the average size of continuing plants but is greater than that of non-relocated closing plants. In general, origin plants hire less than half the workers hired by average-sized incumbent plants in the same state, but they employ 40% more workers than non-relocated closed plants.

Entry, Exit, and Relocation Rates Across States – Correlations Between Entry and Exit

In order to explore how patterns of entry, relocation, and exit differ across the United States, Table 2 presents the average values of entry, relocation, and exit variables over the four time-periods observations for all states within each of the Census Regional Divisions. Table 2 reports results from the sample of multi-unit plants only, since my focus is on the relocation of multi-unit plants. The upper panel represents variables for entrants (new plants and destination plants in their new locales) and the

[6] If I consider short distance movers within 50 miles from the origin as relocated plants, 50% of relocations occur across state borders.

lower panel presents variables for exiting plants (closing plants and origin plants in their old locales). The average entry rates across Census Regional Divisions vary from a low of .201 in the East North Central division to a high of .318 in the Mountain division. The average relocation rate and the average out-of-state relocation rate are also highest in the Mountain Division (.051 and .045 respectively). The average relocation rate and the average out-of-state relocation rate are relatively lower in the Rust Belt states in the Middle Atlantic (.017 and .018) and East North Central (.020 and .017) divisions. The Rust Belt states in these two divisions also have relatively lower ratios of out-of-state relocation to entry. For example, 8.4 percent of new plants opened in a state in the East North Central division are actually destination plants from other states. This ratio is highest in the East and West South Central Divisions (.144 and .142).[7]

As noted above, destination plants employ fewer workers than incumbents but hire more workers than non-relocated entrants in the same state. Compared to the average relative size of entrants, the variation in the average relative size of destination plants is substantial. While destination plants relocated to states in the South Atlantic division have the smallest work forces — only 1.5 percent higher than non-relocated entrants within the same state — destination plants in the Pacific division are almost as big as the incumbents, employing more than three times more workers than non-relocated entrants. The lower half of the table indicates that the average relative size of closing plants reveals a similar pattern to that observed for opening plants. However, there are no substantial differences in the variation of relative sizes between closing plants and origin plants.

The average values of exit rates are reported at the bottom of Table 2. I find that the average exit rate is higher than the average entry rate in most of the Census divisions. An interesting pattern revealed in Table 2 is the similarity between the average entry and exit rates as observed in the studies on entry and exit in manufacturing industries. This pattern is clearly observed in Figure 1, where the average entry and exit rates for each state are represented on the map of the United States. As expected from the previous research using the aggregated data, growing states in the South and West have relatively higher entry rates compared to states in the Rust Belt and Midwest. However, the average

[7] While the variation among entry, relocation, exit variables across four-digit industries within a two-digit sector is substantial, this kind of variation is not observed for states within a Census division. Table A1 in the Appendix presents the average of entry, relocation, and exit rates across census years for each state.

exit rates are also higher in these states with higher entry rates. This suggests that growing states in the South and West have as many plant closings as openings, while states in the Rust Belt and Midwest have relatively fewer plant closings during the sample period.

This similarity across Census divisions is stronger for relocation rates than it is for entry and exit patterns.[8] Table 2 indicates that a Census division with a higher average relocation rate in new locale (entry) also has a higher average relocation rate in old locale (exit) for all three measures of relocation — relocation rate, out-of-state relocation, and ratio of out-of-state relocation to entry (or exit). However, the pattern of relocation rates shows a different picture from that of entry and exit rates [Figure 1 and 2]. Although relocation rates of entrants are lower in declining states in the Rust Belt, Middle Atlantic, and North Central Census divisions, they are not always high in growing states in the South and West. For example, while entry rates are low in North Carolina and South Carolina, relatively many plants have moved to these states. On the other hand, higher entry rates in California, Texas, or Florida do not necessarily imply that these states have attracted many existing plants from other states. In the case of closing plants, exit rates are higher in the Pacific and Mountain Census divisions but the ratios of relocation to exit are relatively lower suggesting that these states did not lose many plants to other states. In contrast, while a small fraction of plants have shut down in the Rust Belt, a large fraction of plants shutting down in Illinois, Indiana, and West Virginia have actually relocated to other states.

Employment Growth and Differences in Entry, Exit, and Relocation Rates

A natural question that arises regarding entry and exit rates across states concerns the impact on employment growth of the entry, relocation and exit of businesses. Although entry and exit rates show a high correlation across Census divisions, I find that employment growth rates across states in each census year are positively correlated with entry rates and negatively correlated with exit rates. The simple correlation between net entry rates and net employment growth rates is .622. For relocation

[8]The simple correlation between the average relocation rates in new locales and the average relocation rates in old locales is .872, while the simple correlation between the average entry rates and the average exit rates is .473 The simple correlation between the average out-of-state relocation rates in new locales and the average out-of-state relocation rates in old locales is .816, and the simple correlation between the average ratios of out-of-state relocation to entry and the average ratios of out-of-state relocation to exit is .866.

rates, although state employment growth rates are positively correlated with both the out-of-state relocation rates in new locales and the out-of-state relocation rates in old locales, net relocation rates — the former minus the latter — are also positively correlated with state employment growth rates (.126). While there seem to be no substantial differences in entry, exit, and relocation rates between growing regions and declining regions in Table 2, state level comparisons from Table A1 in the Appendix imply that states with higher employment rates in manufacturing industry have relatively more plants built on their territory — whether these are *de novo* or relocated plants — than they have plants that shut down or relocate to other states.

Differences in the size of entrants and exiting plants also seem to play a role in accounting for disparities in state employment growth rates. Although there are no substantial differences between the relative size of exiting plants and entrants except in the South Atlantic division, I find that the relative size of destination plants in new locales is much smaller than that of origin plants in old locales in declining divisions such as the Middle Atlantic, East North Central, and South Atlantic divisions. However, these size measures in Table 2 are relative to plants within the same state. Considering the heterogeneities in size distribution across states, the examination of average size of plants is more useful in comparing plant sizes between states.

To explore patterns in the size distribution of entrants and exiting plants in growing states versus declining states, I divide states into these two groups based on positive versus negative growth rates in total manufacturing employment for each census year. Then, I compare the average size of entrants, exiting plants, and relocated plants in old locales (closings) and in new locales (openings) between growing and declining states. As graphically presented in Figure 3, I find that on average plants opening in growing states employ four more new workers than opening plants in declining state employ. On the other hand, the average size of closing plants is about the same between growing and declining states. The differences in the size of opening plants and closing plants between growing states and declining states are much bigger for relocated plants. Growing states on average create 23 more jobs every time they have a new plant relocated from other states while declining states on average lose 16 more jobs every time they have a plant shutting down to be relocated to another state. Overall the results in this section suggest that the geographic redistribution of the manufacturing industry in the U.S. is driven by differences in the size distributions of entering, exiting, and relocating plants as well as by differences in the net entry and relocation rates across states. I find similar patterns when I compare the Rust Belt states with states in the south.

3.2 Plant Relocation and Job Flows Across States

The evidence from the previous section suggests that growing states have higher net entry and relocation rates than declining states. Growing states are successful not only in building more new plants, but also in attracting businesses that would provide more jobs than would new plants opening in declining states. However, the extent to which plant relocations account for the disparities in employment growth across states remains a question.

In this section, I explore the role of manufacturing firms in the geographic redistribution of the manufacturing industries across states. I quantify the role of manufacturing firms in employment growth across states and examine how much of the growth in each state can be explained by the four distinctive states of individual plants: plant birth, growth, death, and relocation.

Quantifying the Role of Relocations (across States) in Employment Growth

To examine how much relocation of manufacturing firms explains variations of employment changes across states, I decompose changes in employment for each state into the following:

$$\Delta E_s(t) = \underbrace{\left\{ |Birth_s(t)| + |Expansion_s(t)| - |Contraction_s(t)| - |Death_s(t)| \right\}}_{Changes\ Within\ State} + \underbrace{\left\{ |Reloc\_In(t)| - |Reloc\_Out(t)| \right\}}_{Changes\ Between\ State}$$

where

$Birth_s(t)$: Employment gains due to plant openings (exclude relocations between states but include relocations within state) in state *s* from *t – 5* to *t*.

$Death_s(t)$: Employment losses due to plant closings (exclude relocations between states but include relocations within state) in state *s* from *t – 5* to *t*.

$Expansion_s(t)$ ($Contraction_s(t)$): Employment gains (losses) in continuing plants in state *s* from *t – 5* to *t*.

$Reloc\_In_s(t)$: Employment gains from plant openings due to relocation from other states to state *s* from *t – 5* to *t*.

$Reloc\_Out_s(t)$: Employment losses from plant closings due to relocation from state *s* to other states from *t – 5* to *t*.

Dividing total employment changes into between-state changes and within-state changes, I rewrite the equation above as

$$\underbrace{\Delta E}_{\text{Total Employment Changes}} = \underbrace{\Delta Eb}_{\text{Employment Changes between states}} + \underbrace{\Delta Ew}_{\text{Employment Changes within state}} .$$

To examine the extent to which interstate plant relocations explain the variation of employment growths across states, I decompose the variance of total employment change (ΔE) as follows:[9]

$$1 = \frac{Var(\Delta E)}{Var(\Delta E)} = \frac{Cov(\Delta E, \Delta Eb + \Delta Ew)}{Var(\Delta E)} = \frac{Cov(\Delta Eb, \Delta E)}{Var(\Delta E)} + \frac{Cov(\Delta Ew, \Delta E)}{Var(\Delta E)} .$$

This decomposition is equivalent to examining the coefficients from independently regressing ΔEb (employment changes between states) and ΔEw (employment changes within a state), respectively, on ΔE (total employment changes). The results of this decomposition provide an answer to the question concerning the importance of inter-state job reallocations within the same firm in accounting for differences in state employment growth; i.e., how many jobs are expected to be imported from other states (via plant relocations) and how many jobs are expected be created within the state, when one more job is created in one state relative to the mean of the other 48 states. On average, plant relocations account for about 7 percent of variations in net employment growth across states. The remaining 93 percent is accounted for by within-state changes such as employment growth within continuing plants, *de novo* plant openings, *permanent* closings without relocation, and intrastate plant relocations.

[9] To do this, I attribute $Cov(\Delta Eb, \Delta Ew)$ equally in the variance decomposition.

Differences in Job Flows across States

To examine how these plant employment flows vary across states, I quantify the degree to which employment gains and losses in each state are accounted for by plant births, relocations within states, relocations between states, and plant deaths across census years. If the gross employment flows due to plant relocations consist primarily of the reallocation of employment from declining to growing states, then growing states will have a higher share of employment gains and a lower share of employment losses attributable to relocation in the form of plant openings and plant closings respectively.

Overall, plant openings and closings respectively account for approximately half of the employment gains and losses in each state for each five-year period. If I focus on plant openings and closings for multi-unit firms, I find that jobs created from the openings of multi-unit plants account for 24 percent of total employment gains in each state for each five-year period. On average, jobs lost from the closings of multi-unit plants account for 29 percent of total employment losses in each state for each five-year period. To examine how much of these employment changes are attributable to relocations across states, I break down total employment gains from multi-unit plant openings into employment gains from *de novo* plant births, relocations within a state, and relocations between states. In the same way, I break down total employment losses from multi-unit plant closings into employment losses from permanent deaths without relocation, relocations within a state, and relocations between states.

Table 4 presents the average values of these variables — percentages of employment gains (losses) from multi-unit plant births (deaths), relocations within states, and relocations between states — over the four five-year period for all states within a Census Regional Division. For more detail, the average values for each state across census years are presented in Table A2 in the Appendix. In most of the regions, relocations within firms account for more than 10% of employment gains from multi-unit plant openings. The percentages of employment gains from plant relocations are a bit lower in states with a traditional manufacturing base, such as those in the Middle Atlantic and East North Central divisions. In the East North Central division, new jobs created from relocations across states account for 18.6 percent of employment gains from multi-unit plant openings in each state. In other words, over the four five-year periods, for every 100 jobs created from new multi-unit plants built in a state in the East North Central division, 18.6 jobs on average are imported from other states. The percentage of employment losses from multi-unit plant closings accounted for by plant relocations across states ranges from a low of 8.8 in states in the New England division to a high of 15.9 in the West North Central division. This means that on average 15.9 jobs are exported to other states for every 100 jobs lost from multi-unit plant closings in a state in the West North Central division.

The evidence from Table 4 does not imply that growing regions have relatively higher ratios of employment gains from relocation to employment gains from plant openings, or lower ratios of employment losses from relocation to employment losses from plant closings. When I divide the 49 continental states into growing and declining states based on the change in their total employment, I find that both the average ratios of employment gains from relocation to employment gains from plant openings and the average ratios of employment losses from relocation to employment losses from plant closings are higher in the group of growing states. Although net employment gains from plant relocations are higher for growing states, the large offsetting employment flows caused by plant relocations in both growing and declining states suggests that manufacturing firms have relocated jobs from declining states to expanding states as well as from expanding states to declining states.[10] Overall, the employment shift of multi-unit firms via plant relocations accounts for only a small part of the disparity in employment growth across states. This result is not surprising considering the fact that there may be little scope for job reallocations within firms, most of which own only one or two plants. Results in this section must be interpreted with some caution since my estimates of employment changes caused by plant relocations are limited to those of multi-unit firms. Without further analysis of the behavior of single-unit firms, which unfortunately is almost impossible with the currently available LRD, it may be premature to draw a firm conclusion about the role of manufacturing firms in employment changes across states. However, given that job creation and destruction in multi-unit plants account for about 70% of the job reallocations in manufacturing industries (Davis, Haltiwanger, and Schuh 1996), the finding of the relatively small role of plant relocations in explaining inter-state employment growth rates should hold even after accounting for the relocations of single unit plants.[11]

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[10] This result in part agrees with Dunne, Roberts, and Samuelson (1989b) who find both substantial job creation in plants in contracting regions and job loss in plants in expanding regions. Their results suggest that net employment change at the sector does not provide an accurate measure of gross employment flow across regions. I follow their suggestion and examine job gains and losses separately.

[11] Single unit plants are more likely to be tied to a location for reasons such as the owner's personal ties to the given location.

4. The Role of State Development Incentives

Since the 1970s, the number of states providing tax incentives to businesses has steadily increased. By 1992, more than 40 states offered tax concessions or credits to businesses for land and capital improvement, equipment and machinery, manufacturers' inventories, goods in transition, investment, and job creation. Many state-level economic development agencies have been established over the past 20 years. Other tax exemption programs linked to corporate income tax and personal income tax became popular in many states during this period. Similarly, the number of states with financial-incentive programs has also increased over the past two decades. In 1992, more than 40 states offered special subsidized loans for building construction, equipment, machinery, or plant expansion especially in areas of high unemployment [See Appendix Figure A1].

State Development Incentives

A critical problem faced by all studies that examine the economic impact of development incentives has been quantifying those incentives in a meaningful way. The literature on tax and non-tax development incentives is relatively small; moreover, the measures of state and local development incentive efforts used in these studies are crude and sometimes misrepresent the true development incentive position of state and local governments (Fisher and Peters 1997). One popular method of measuring development incentives is to create an index reflecting the number of state incentive programs provided to businesses (Carlton 1983, Wasylenko and McGurire 1985). Lacking measures of the generosity of the incentives offered, however, these studies are subject to the criticism that simple program counting measures may not represent a state or city's commitment to economic development. Moreover, most of these studies do not separately analyze various policy instruments, ignoring the possibility that some policies could have mutually counteractive effects on economic conditions represented by dependent variables. For example, tax incentives on capital investment may induce firms to pursue labor saving capital improvements leading to a decrease in employment. Therefore, research that relies on the index measures, by failing to consider such contrary effects of individual policies, may result in findings which are overly generalized and do not provide a detailed picture of the effects of the various policy instruments. A small number of recent studies have tried to find better summary measures of state development efforts by using state agency spending from the NASDA (National Association of State Development Agency) data base (Goss 1994, de Bartolome and Spiegel 1997). However, economic development expenditure data from the NASDA also have deficiencies. Most critically, they omit some crucial categories of economic development programs such as loan guarantees and loan subsidies. These loan related programs, as well as other development credit programs, provide the most generous state incentives available but are not included in state development agency expenditures since they involve few direct costs to the agencies. Moreover, the NASDA expenditure and salary survey data are only available for years since 1982 and are not suitable for studies that examine earlier time periods.

In this paper, instead of simply counting the number of programs, I treat each individual incentive program as a dummy variable. Although this approach to measuring development incentives is open to the same criticism concerning counting measures, it allows a separate examination of the effects of individual programs. Furthermore, by looking at changes in a policy (i.e. the introduction of an incentive program) rather than the existence of policy in a given year, this measure provides a more proper way to examine the impact of a *new* policy on *changes* in economic conditions that are of the interest to researchers and policy makers. Using the listings of economic development programs catalogued annually by Conway Data, Inc in the "50 States Legislative Climate Survey" of the *Site Selection and Industrial Development*, I identify states that have introduced a new set of tax or financial incentives during the sample period.[12] I create an indicator variable for each of the incentive programs, that indicator being equal to 1 if a state has introduced that specific program. I use the establishment-level Census of Manufactures data to examine the effect of legislative changes in business incentives on the employment, output, and net investment of plants that are located in states that have made legislative changes directly affecting businesses. In the empirical results that follow, I explore the following tax and financial incentives.

Corporate income tax exemption. The objective of tax programs is to keep effective tax rates of businesses low. The number of states offering exemptions or credits against corporate income tax

[12] The District of Columbia is excluded from the analysis in this section since data on tax and financial incentives are unavailable for the sample periods.

increased from 19 in 1972 to 35 in 1992. As with most other tax incentives, the characteristics of the program vary across states. In 1972, Nevada, Ohio, Texas, and Wyoming did not collect corporate income tax. In 1992, firms located in South Dakota and Washington did not have to pay corporate income tax as well as those in Nevada, Texas, and Wyoming. In that year, the state government of Ohio, while collecting corporate income tax, gave corporate franchise tax or personal income tax credit for a portion of personal property tax paid on new machinery or equipment. In many states, corporate income tax credit is allowed for new or expanding plants creating new jobs or investing in excess of specified threshold levels.

Personal income tax exemption. Lowering effective personal income tax rates is an important business development tool because many small companies are not incorporated and their profits thus are taxed at the personal income rates of the owners. In 1992, seven states did not collect personal income tax. Credit is allowed in a similar way to that which is given against corporate income tax for plants that hired new employees or made qualified capital investments.

Excise tax exemption. In some states, tax credit has been expanded to apply to the excise tax paid by corporations. In Tennessee, for example, businesses receive excise tax credit equal to 1% of the purchase, installation and/or repair of qualified industrial machinery and the purchase of telephone and computer related equipment.

Tax exemptions on land and capital. This variable indicates whether a state has introduced one of the following tax incentive programs: i) Land and capital improvements tax exemption; ii) Equipment and machinery tax exemption; iii) Sales and/or use tax on new equipment exemption. By providing tax concessions for the installation of new and reconditioned machinery and equipment, states have long pursued a policy of encouraging the modernization of businesses to maintain and improve productive capability. Exemption applies not only to machinery and equipment associated with manufacturing plants, but also to equipment important to other businesses, such as commercial vessels, airplanes, and railroad rolling stock. Tax reductions for the repair and improvement of such machinery and equipment are also included. The sales and use tax exemption on machinery and equipment is an incentive usually made available to new and expanding businesses who use such equipment at a fixed location to manufacture, process, compound, or produce tangible personal property for sale, or for exclusive use in spaceport activities.

Accelerated depreciation. Accelerated depreciation lets businesses write off the costs of their machinery and buildings faster than they actually wear out. In practice, this incentive sharply lowers tax bills for corporations and individuals that can take advantage of tax breaks.

Manufactures' inventories tax exemption. Inventories are subject to property taxes in many states. Inventories on hand during the tax year might include not only finished products awaiting sale but also raw materials and component parts that will eventually become finished products. Although some states levy a separate inventory tax, the majority of states include inventories as a component of the ad valorem property tax. The most frequent form of tax relief, therefore, is an exemption from property taxes, or a separate classification for inventories resulting in a lower rate of property taxation.

Research and development tax exemption. R&D equipment may be classified as manufacturer's machinery and equipment and be eligible for tax exemptions. In some states, local governments may classify the tangible personal property of R&D firms as distinct from that of other taxpayers and tax it at a different rate.

State bond financing. Bond financing permits state and local governments to issue tax-exempt municipal bonds to raise capital for public purposes. Because interest earned by investors is exempt from federal and, in some cases, state income taxes, municipal bonds are marketed by government entities at a rate of interest less than that of taxable corporate bonds. In this study, I examine the role of industrial revenue bonds and general obligation bonds. Industrial bonds are municipal bonds used to finance the construction of manufacturing or commercial facilities for a private user. Business revenues are the only security backing an industrial revenue bond issue, unless the facility itself is pledged in a mortgage. In contrast, general obligation bonds have the full faith and credit of the government issuing the bond as a pledge of security. In the event of a default in payment of the bond principal and interest by the facility user, the state or local government would have to repay the outstanding principal and interest of the obligation bond from its revenues. A state authority responsible for providing financial assistance such as issuing industrial revenue bonds has been established in some states as law makers approved bond issues.

State loans and loan guarantees. Loans permit firms to borrow money directly from the state government or its agents such as economic development corporations and financial authorities. New or small firms without established lines of credit or credit ratings find state loan programs particularly advantageous. An example of state loans program is the Community Economic Betterment Account (CEBA) program in Iowa, which provides financial assistance of up to 1 million dollars to companies that create new employment opportunities and/or retain existing jobs, and make new capital investment.   Guarantees of loans by private or other government lenders are provide by some states to reduce the lenders' risk. Lenders, in turn, are encouraged to make loans that otherwise could not be made or to provide lower interest rates, making the loan feasible for the borrower.

The Conway data contain other economic development policies adopted in many state governments, such as raw materials for manufacturing tax exemption, job creation tax incentive exemption, industrial investment tax incentive, and inventory tax exemption on goods in transit. I exclude these incentives from the analysis because they were not available for the whole sample period or were used either in virtually every state or in only a few states, providing a poor basis for discrimination.

4.1 Discrete Choice of Entry, Relocation, and Exit

One objective of the state economic development policy may be characterized as smokestack chasing, encouraging manufactures to relocate in the state, either from other states or from abroad. Early state development efforts focused on bringing new business establishments to the state since new plant openings created the most visible impact on communities by creating jobs and economic activity. Spurred largely by the experience of the Northeast and Midwest in their competition with southern and western states for new plants, many states have become increasingly aware of the importance of businesses already located within their boundaries. As states began to pay attention to the needs and potential of in-state businesses, an increasing number of states expanded their programs to cover in-state businesses, hoping to keep them grow within the state.

Decision to Shut Down, Relocate, or Continue

To examine how state governments' efforts to lure new businesses and to stem the outflow of businesses affect a firm's decision to shut down, relocate, or stay in the state, I employ standard tools of discrete choice analysis: multinomial logit and probit. I assume that the decision structure of a firm has the following two stages. In the first stage, a firm decides either to shut down a plant permanently, to keep operating in the same location, or to relocate the plant to a new location. In the second stage, conditional on the decision to relocate in the first stage, a firm decides whether to relocate within or outside the state. I choose to model the first stage decision as an unordered choice model with three alternatives that depend on plant and state characteristics: "Shut down (permanent exit)", "Stay", and "Relocate." The multinomial logit model used in estimation is

$$\Pr(y_{pt} = k) = \frac{\exp(\beta'_k X_{p,t})}{\exp(\beta'_{ShutDown} X_{p,t}) + \exp(\beta'_{Stay} X_{p,t}) + \exp(\beta'_{Relocate} X_{p,t})} \quad ,$$
$$k = Shut\ Down, Stay, Relocate$$

where β_{Stay} is normalized to zero for identification. The term $X_{p,t}$ is a vector containing a set of tax and financial incentive variables representing differences in policy from state to state. It also includes various plant characteristics such as total employment of the plant; three indicators specifying whether the plant has operated for at least 10 years, 15 years, or more, respectively; labor productivity; the primary product specialization ratio as a measure of specialization; capital intensity measured by total capital stock divided by total employment; non-production worker wage shares in total payrolls; and energy expenditure as a share of total shipment. Previous studies by Dunne, Roberts, and Samuelson (1989a) and Evans (1987a, 1987b) find that these variables are important determinants of plant survival and growth. To control for location-specific characteristics that may affect the decision to relocate, $X_{p,t}$ also includes the average of employee wages of all manufacturing plants in the same two-digit industry within the county as a measure of labor costs as well as the average cost of electricity in the county as a measure of energy costs. Union membership rate and effective corporate tax rate of the state are also included[13]. To adjust for agglomeration effects suggested by recent research on the economics of geography (Krugman 1991), I control for capital-intensity (the average of capital stock per worker), skill-intensity (the average of the wage share of non-production workers) and employment density within the county as well as neighborhood counties within 50 miles of the county where the

[13] Variables on union membership rates among wage and salary workers in each state are obtained from Hirsch, Macpherson, and Vroman (2001). Aggregate state effective tax rates on businesses are calculated following the method suggested by Wheaton (1983). See the Appendix of Lee (2003) for construction of variables in more detail.

plant is located. Since relocation is identified among multi-unit plants only, this section focuses on the decision of multi-unit plants only. A probit model is fitted to the second stage decision of the firm.

It is difficult to interpret the coefficients from the multinomial logit model, especially since the marginal effects of the independent variable do not necessarily have the same sign as the coefficients of the model. To measure how much the introduction of an individual program changes the probability of choosing one of the three alternatives, I create “adjusted” probabilities conditional on plant and state characteristics. Using the “method of recycled predictions,” I vary the policy dummies of interest across the whole data set and calculate the average of the predicted values for each distinguished event; introduction versus non-introduction of the policy. That is to say, I first estimate a multinomial logit using all plant and state characteristics of interests as independent variables. Then, I pretend that all plants in the data set are located in states that did not introduce corporate income tax exemption. To do so, I go back to the raw data and code as 0 the dummy variable indicating the introduction of the policy, for example, a policy of corporate income tax exemptions. Using the parameter estimates from the multinomial estimation, I calculate a predicted value for the probability of the outcome for each individual plant, by multiplying the estimated coefficients by the corresponding individual values for the independent variables. I calculate the means of these predicted values for the probabilities of shutting down and of relocation, which are the adjusted percentages for shutting down and relocation. I report these figures in Columns A and D respectively, in Table 6. Next, I pretend that all plants are in states that have introduced a corporate income tax exemption and code the dummy variable for the introduction of corporate income tax exemption as 1. After that, I calculate means of the predicted probabilities for shutting down and for relocation in Columns B and E respectively, in Table 6. The difference in those two sets of adjusted probabilities is the difference due to the policy change, holding other characteristics constant. The likelihood-ratio statistic, calculated from estimating the restricted (without the indicator for the introduction of corporate income tax exemption) and unrestricted multinomial logit estimation, shows that the introduction of corporate income tax exemption do not significantly change the probability of shutting down or relocating.

In Table 6, I present adjusted probabilities from the multinomial logit estimation that includes state and year fixed effects, the parameter estimates of which are reported in the Appendix (Column 2 of Table A3).[14] To the right of these adjusted probabilities, I report the likelihood-ratio test statistic for whether the coefficients on the incentive programs, corresponding to "Permanent Exit" and "Relocation" decisions, are jointly zero. The results in Table 6 suggest that most incentive programs change the probability of a plant's shutting down or relocating only marginally. I find that personal income tax exemptions, incentives on capital, incentives for research and development, and accelerated depreciation all slightly reduce the probability of a plant shutting down permanently. The finding of the relatively small effects of tax on location choices is consistent with findings from previous studies using much smaller samples. To find out how big these changes are, I compare these reductions in probability to such changes in the predicted value of the probability of shutting down that would have occurred if the state's average wage for production workers were hypothetically reduced, holding other factors constant. A reduction of .4% in the probability is equivalent to the magnitude of change in predicted probability that occurs when the average wage of production workers decreases by about 5% from the mean value. This finding stands in contrast to previous research, which found a small effect for tax reduction in comparison to the effect of lower wage. However, the comparison to wage effects can be problematic since the average wage of production workers is correlated with skill or labor productivity, which may bias the coefficient representing the wage effect. Although corporate income tax exemptions and other financial incentives increase the probability of a plant shutting down, the magnitudes of these increases are relatively small.

On the contrary, the introduction of tax and financial incentives increase the probability of relocation in most of the programs examined. The introduction of personal income tax exemption, incentives on capital, accelerated depreciation, and tax exemptions on inventories increase the probability of relocation by about .3%. Considering that a 5% decrease in the wages of production workers would have resulted in a .6% decrease in the predicted probability of relocation, the magnitude of the change in probability created by the implementation of these policies is relatively significant. However, this does not imply that these policies are inducing firms to run away from the state since the choice of relocation in this estimation includes relocation within the state (37%).

[14] I estimated a probit model of the binomial choice of shutting down versus staying in the state (to continue or relocate within the state) and find a similar result to the multinomial logit estimation concerning the effect of the incentives on the probability of shutting down.

The result for the probit model of relocation decisions at the second stage (i.e. whether to relocate in-state or out-of-state) is reported in Table 7, where the dependent variable is whether to relocate within the state (y=1) or outside the state (y=0). The coefficients reported measure the change in the probability of relocation within the state for a discrete change in the value of a policy dummy variable (i.e. the implementation or the presence of the policy). The changes in predicted probabilities are evaluated at the mean of each independent variable. The specification in the first column includes industry by period fixed effects to control for industry specific transitory shocks affecting a firm's relocation decision. Among the incentive programs that increase the probability of relocation in the first stage decision (Table 6), I find that personal income tax exemptions, accelerated depreciation, and bond financing each increase the probability that relocations will occur within the state border. Although the effects of accelerated depreciation and bond financing are marginal and indistinguishable from zero, the introduction of a personal income tax exemption increases the probability that a firm keeps a plant, which it has decided to replace, within the same state by as much as 7%. This result may be due to the fact that firms benefiting from personal income tax exemptions are most likely to be non-incorporated small firms which may be tied to the location for reasons such as the owners' personal life and circumstances. Incentives that are more likely to help big firms, such as corporate income tax exemptions and tax exemption on inventories, seem to be unrestrained in increasing the likelihood of the outflow of firms from the state.

The specification in the second column of Table 7 includes state fixed effects, where the parameters of interest are identified within states that have enacted legislative changes in a particular incentive program. The results of these changes are similar to those of Column 1 although the magnitudes of most coefficients are smaller than those in Column 2. The effect of accelerated depreciation is now significantly positive, increasing the probability of keeping a relocated plant within the state by about 3.6%

De Novo Entrants, Continuing Plants, or Relocated Plants

The results of the previous section examine how effective a state development policy can be in keeping firms from shutting down or from relocating out of the state. In this section, I examine whether a state development policy has been successful in obtaining its main objective of attracting new plants to the state. In a similar way to previous section, I classify the plants at time *t* into three exclusive categories, depending on the status of the plants at a previous point in time period *(t – 5)*. These categories are: *de novo* entrants, continuing plants, and relocated plants. Continuing plants are plants that operated in the same location as they did in the previous census year; whereas, relocated plants are opening plants that previously operated in another location either outside or within the state. Relocated plants are again divided into two sub-groups, consisting of relocations from within the state, as opposed to relocations from outside the state. To examine how changes in development policy are correlated with the probability that each outcome transpires, I employ the same statistical tools used in the previous section. The interpretation of the multinomial logit estimation in this section is not quite the same as that of the traditional discrete choice model based on the random utility model (McFadden 1974), given that I am looking backward from time *t* at these decisions, which were made between *t – 5* and *t*. However, estimates from the multinomial logit are very useful to describe the relationship between the policy dummies and the probability that a plant belongs to each category. To make the evaluation of policies parallel to that of previous section, here I employ the same statistical analyses.[15] In the previous section, I evaluated the effectiveness of the policy by looking *forward* from the decision of a firm in the time horizon (i.e. looking at the decision made between *t – 5* and *t*, as evaluated at *t – 5*). In this section, I examine the effectiveness of the policy by looking backward from the outcome of each alternative (i.e. looking at the decision made between *t – 5* and *t*, as evaluated at *t*).

To make it easier to interpret the coefficients from the multinomial logit estimation, I create "adjusted" probabilities, conditional on plant and state characteristics, using the "method of recycled predictions" as in the previous section. In Table 8, I present adjusted probabilities and likelihood-ratio statistics from the multinomial logit estimation, including state and year fixed effects. The parameter estimates of the model are reported in the Appendix (Column 2 of Table A4). The results in Table 8 suggest that most tax and financial incentive programs are not successful in attracting new plants into the state. Corporate income tax exemptions, accelerated depreciation, and state loan guarantees seem to increase the probability of opening a new plant at least three times more than a 5% reduction of

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[15] Most empirical studies on plant births use the multinomial logit model of location choice developed by McFadden. In this paper, I use the multinomial logit model with three alternatives, rather than a choice among 50 alternative states, to avoid computational burdens from dimensionality.

average wages of production workers in the state would have. On the other hand, corporate income tax exemptions and accelerated depreciation decrease the probability of relocation (i.e., the probability that a state will attract a plant from another state or retain a relocated plant within the state). As was found in the previous section, when implemented by law makers, no programs examined in this paper significantly increased the probability of a state seeing relatively more plant openings, either relocated plants or *de novo* entrants.

The results for the probit model of relocation at the second stage (i.e. whether it is relocated from within the state or from outside the state) are reported in Table 9, where the dependent variable is whether to relocate from outside the state (y=1) or from within the state (y=0). Again, I report the change in the probability for a discrete change in a policy indicator variable, where the change in the predicted probability is evaluated at the mean of each independent variable. As in Table 7, the specification in the first column includes industry by period fixed effects to control for industry specific transitory shocks. Caution is needed in interpreting the results in Table 9. Given that both of the alternatives for relocated plants, (i.e. the dependent variable y=1 or 0), actually occur in the state, the negative coefficient on a policy variable does not always imply that policies are not successful in keeping the businesses in the state.

Among the incentive programs that increase the probability of relocation in the first stage decision (Table 8), only tax exemptions on inventories and loans or loan guarantee programs increase the probability that relocations will occur from outside the state border. The comparison of coefficients between Table 8 and 9 suggests that policies which are not successful in attracting businesses from other states are not necessarily less likely to encourage plant openings in the state. For example, personal income tax exemptions decrease the probability of relocation from outside the state but increase the probability of plant openings.

4.2 The impact on Plant Growth

The results in previous sections suggest that the role of relocations is relatively small in explaining the geographic redistribution of manufacturing industries. Moreover, state development policies have only marginally affected the decision to relocate existing plants. Given that in-state businesses play an important role in the growth of state economy, an evaluation of the effectiveness of state development policy requires a thorough examination of such effects on the growth of businesses in the state as well as on the births and deaths of businesses.

Numerous studies of the growth of firms have focused on the link between growth rates and internal conditions such as the size and age of firms (Evans 1987a, 1987b, Hall 1987, Dunne Roberts, and Samuelson 1989a). In this paper, I explore the effects of incentives on employment growth by extending empirical growth models used in previous studies to include additional industry and location growth factors that may affect establishment growth. Following Greenstone (2002), the establishment-level data are fit to the following reduced-form equations:[16]

$$\begin{aligned} \%\Delta S_{pt} &= \frac{S_{pt} - S_{p,t-5}}{(S_{pt} + S_{p,t-5})/2} \\ &= \alpha_s + \beta_1 X_{p,t-5} + \beta_2 IND_{it} + \sum_k \gamma_k \cdot Intro\_Incentive(k)_{st,t-5} + \Delta u_{pt}, \end{aligned} \tag{1}$$

where Δu_{pt} is the plant-specific error term. Here *p* indexes a plant, *i* indexes industry, *s* references state, and *t* and *t – 5* respectively index the last and first years of a period between censuses. The dependent variable, $\%\Delta S_{pt}$, is the percentage change in plant size, which is measured in employment, capital stock, and total value of shipments, between *t* and *t – 5*. The term α_s represents state fixed effects, while IND_{it} indicates industry-specific period effects. State fixed effects capture differences in the resources across states while industry*time indicators control for unobserved industry-specific economic shocks.

The term $X_{p,t-5}$ is a vector containing plant characteristics, as in the previous section. The term $Intro\_Incentive(k)_{st,t-5}$ is a dummy variable indicating whether the state government *s* has introduced a new incentive program *k* between time *t* and *t – 5*. The parameter γ_k captures the variation in the dependent variables specific to plants located in a state that has introduced a new

[16] This empirical model is based on Greenstone (2002), who examined the impacts of the Clean Air Act amendments on manufacturing activity using the Census of Manufactures. The measure of percentage change used in dependent variables is an alternative to the traditional way of taking the difference of the natural logarithms of the year *t* and *t-5* levels. This measure of growth ranges from -2.0 (when employment goes from positive in year *t-5* to zero in *t*) to +2.0 (when employment is zero in *t-5* and positive in *t*). This measure allows the sample to contain observations on “births” and “deaths” and to describe expansion and contraction symmetrically (Davis, Haltiwanger, and Schuh 1996).

program relative to plants in other states. These parameters provide the correlation between the introduction of a new development program and the average employment growth of plants that operate in the state. Although I expect the coefficients of these policy dummies to be positive, there are situations in which these coefficients may be negative. For example, if a state that has experienced a severe decline in employment introduces development programs to improve economic conditions, I may observe that an indicator representing the implementation of a program is negatively correlated with plant level growth.

Given that the dependent variables measure changes in manufacturing activity, it is natural to examine the effects of innovations in state development policy. However, examining only the effects of changes in policies may be problematic, since it would not capture the impact of policies in force at that time. Besides the problem of time lag for a policy, this examination can be particularly problematic when polices focus on expanding business and benefit only opening or growing businesses. In such a case, existing policies, introduced more than a decade ago, may affect on the growth of plants. To control for such effects from policies in existence at time $t - 5$, I include dummies for the presence of each incentive program.

Without information on which plants have directly benefited from a newly introduced program, the parameters on the policy variable would not measure the direct effects of legislative change. To control for unobserved factors that may permanently affect a plant's investment decisions, one of the specifications includes plant fixed effects. Plant fixed effects will capture correlations between the incentive dummy variable and unobserved plant characteristics, which may occur if the plant is located in an enterprise zone or has received firm-specific tax breaks or other benefits.

Empirical Results

Total Employment

In Table 10, the results from the estimation of (1) are presented for three different equation specifications.[17] The dependent variable in Table 10 is a plant's five-year growth rate for total

[17] The coefficients in Table 1 are correlations between the dependent variable and independent variables and do not necessarily imply a causal relation.

employment that has a mean of 6%. The results in Table 10 suggest that plants have modestly increased total employment when the state government implemented some new tax incentive programs, while other incentive programs are negatively correlated with plant level employment. For example, the introduction of corporate income tax exempt, tax exemptions to encourage research and development, and state loans or loan guarantee programs was correlated with moderate, but statistically significant increase in employment. Some incentive programs in existence at $t - 5$ also have impact on plant level employment growth. In particular, plants located in states that have either corporate income tax exemptions or tax exemption on inventories had increased total employment more than four percent relative to similar plants in other states over the five-year period.

However, the introduction of incentives for capital and land improvement, tax exemptions on manufacturers' inventories, and state authorized bond financing (industrial revenue bond or obligation bond) programs are negatively correlated with plant employment growth. Although coefficients on these incentive variables are statistically significant, their magnitude is small economically. In the case of a state authorized bond financing program, plants located in states that have newly authorized this kind of concessions have decreased employment about 1.8 percent more than plants in other states. The negative effect of incentives on capital or tax exemptions on inventories is smaller.

In Column (2), industry by period fixed effects are introduced to control for unobserved industry-specific transitory economic shocks, as well as industry differences in the impact of the development incentive programs. An *F*-test easily rejects the null hypothesis that the additional parameters are jointly equal to zero. In this specification, the introduction of a personal income tax exemption is now significantly correlated with plant level employment growth. Other than that, the industry by period fixed effects do not change the estimated coefficients from those in Column (1). Moreover, the results in Column (2) do not significantly change when I used the four-digit industry code for industry classification instead of the two-digit industry code.

The results from the least restrictive model are reported in Column (3). This specification includes a full set of plant fixed effects to control for all permanent differences in plant growth rates. As discussed above, plant fixed effects will reduce the possible biases of the coefficients on the variable representing the legislation which may occur when the state government provides firm-specific benefits to encourage growth (e.g. a job training program, tax breaks, or easy access to infrastructure).

The reduction in the coefficients on incentives on capital could be explained by this notion, if I assume that individual firm-specific incentives, given in the form of credit against capital investments, had (unobservable) positive effect on employment growth. Although the coefficients on the introduction of tax exemption on inventories and accelerated depreciation program become significantly positive and the magnitudes of some coefficients increase, the results in Column (3) do not dramatically change after accounting for plant fixed effects.[18]

To summarize, the results in Table 10 suggest that most tax and financial incentives are positively correlated with changes in employment, although incentives on capital and state bond financing show negative correlation in most specifications. A possible explanation for the negative correlation is the existence of policy lag or of endogenous changes in policy. If state governments introduce these incentives to encourage a depressed labor market, and it takes a while until the policies have an impact, these legislative changes may be negatively correlated with employment changes in the short run. In order to examine the effects of a policy change with a lag, I did the same regression analysis using a lag of indicator variables for each incentive program [Appendix Table A5]. I find that a state bond financing program introduced in the previous 5-year period (between $t - 10$ and $t - 5$) is positively correlated with employment growth. However, the introduction of incentives on capital is negatively correlated with employment growth in a specification including plant fixed effects. This suggests another possibility that these incentives on capital in particular have a negative impact on employment by inducing plants to replace labor with new machinery or equipment, which has become relatively cheaper as a result of the incentives.

While much of the discussion of development incentives assumes that all incentives can be expected to stimulate the creation of jobs, recent research finds that incentives may produce the

[18] In a specification not reported in Table 10, I introduce Census division by period fixed effects to control for transitory regional shocks that may affect manufacturing activity. I find that census division by period fixed effects reduce the magnitude of the estimated effects of the legislative changes in development incentives. The coefficients on corporate income tax exemption, personal income tax exemption, tax exemption on inventories, research and development become less than the half of the estimates in Column (3). Although this kind of changes in estimates may occur when the variation in policy variables across states are partly absorbed in the census division by period fixed effects, it is not possible to identify changes in employment due to policy changes from other transitory location-specific factors without further information. This kind of change (i.e., census division by period fixed effects absorb the effects of the introduction of incentive programs) is more likely to occur when state governments competitively introduce new incentives following the lead of neighborhood states.

opposite effect (Fisher and Peters 1997). Incentives affecting factor prices, which in turn lower the price of capital goods, have both a positive effect (by increasing production and employment when costs are lowered, i.e., a scale effect) and a negative effect (by substituting capital for labor, i.e., a substitution effect). If the substitution effect dominates the scale effect, an incentive may reduce employment. To examine the second possibility, I explore the correlation between changes in capital stock and development incentives.

Capital Stock and Total Value of Shipments

The top panel of Table 11 presents parallel analyses for the relationship between the enactment of legislation concerning development incentives and the growth in capital stock, which can be interpreted as net investment. If changes in state policies affect a plant's conjectures about future profitability, these changes in the plant's expectations will be reflected in their investments. Attracting capital investment is one of the main objectives of state development policy since an increase in capital stock is likely to result in higher employment and wage levels. Although it takes time for a plant to adjust its capital stock with adjustment costs in capital, the length of time of the samples (five years) should show a plant's response to legislative changes.

The investment results are very similar to the employment results in Table 10. Although excise tax exemptions and personal income tax exemptions now have a negative correlation in some specifications, other coefficients are similar to those in employment results, both in the sign and the magnitude. The results in Columns (3), which include state and plant fixed effects, suggest that the introduction of corporate income tax exemptions is associated with a 6.5 percent increase in capital stock in plants located in that state. While the addition of plant fixed effects in Column (3) and (4) greatly reduces the degree of freedom, the R^2 markedly increases as in the case of total employment. The standard errors remain relatively stable across specifications, preserving most coefficients as statistically significant.

As in Table 10, the introduction of incentives on capital and bond financing both have negative correlations in most specifications. It is surprising that incentives designed to encourage the investment of capital are in fact negatively correlated with changes in capital stock. Moreover, the magnitude of the negative effect is even bigger compared to that on the employment growth. This stands in marked contrast to the substitution scenario suggested in previous literature, in which incentives on capital may substitute capital for labor.[19] Overall, the similarity of the coefficients in Tables 10 and 11 implies that these incentives affect labor and capital in a similar way.

The bottom panel of Table 11 presents estimation results for the growth of the real value of shipments. Overall, legislative changes in development incentives show similar patterns in plant level output growth to those observed in employment and capital stock. As predicted in the results from previous subsections, the introduction of most tax and financial incentive programs is positively correlated with plant-level growth in terms of total value of shipments. Tax incentives on capital and bond financing have negative correlations with the growth of shipments, as in the case of employment and capital stock.

The results in Tables 10 and 11 suggest that most tax and financial incentives affect employment, investment, and output in a similar way. In particular, in the specification including plant fixed effects in Column (3), the estimates are approximately equivalent across dependent variables in the signs and magnitudes of the coefficients. Overall, the estimates suggest that the enactment of tax and financial incentives legislation have increased the growth of employment, capital stock, and shipments in the plants located in states that enact such a legislative change affecting the business environment. However, the magnitude of these effects is economically small, given that the plant-level growth is measured over a five-year period.

5. Conclusion

I have analyzed the LRD to document the patterns of plant entry, exit, and relocation within the U.S. manufacturing industry and to examine the influence of state development incentives on plant relocation. By examining the full population of manufacturing establishments present in the national market over the period from 1972 to 1992, I provide new evidence of the role of plant relocations in the

[19] When I used the lag of introduction of tax incentives in the same regression analysis, incentives on capital showed a positive correlation with changes in capital stock in the second specification with state and industry by period fixed effects. Although it is statistically significant at 10% level, the magnitude is very small (1%). In other specifications, the implementation of incentives on capital is negatively, but not significantly, correlated with changes in capital stock.

process of geographic redistribution of manufacturing industries. The examination of relocated plants, as well as that of entrants and exiting plants in terms of the size of their workforce, reveals considerable differences in the size distribution of entering and exiting plants in growing states, as compared with declining states. I find that the differences are even more significant among relocated plants, suggesting that geographic redistribution in the U.S. manufacturing industry has been driven not only by the differences in the number of plants entering and exiting a state, but also by interstate differences in the number of jobs created and destroyed from plant startups and shutdowns.

While plant relocations across states account for 10 percent of plant turnovers in a state, the employment shift via plant relocations accounts for only a small part of the disparity in employment growth across states. Furthermore, the empirical results show that most of development incentive programs have only marginally affected the relocation decisions of existing plants. Among relocated plants, tax incentives seem to play only a small role in explaining whether relocation occurs within or across a state border. Exploring the effects of incentives on the plant-level growth in a given state, I find that plants located in states that implemented new incentive programs have increased total employment, capital, and output only slightly more than plants in other states have. However, the effects of new incentive programs are small, even if they are significant, with some programs, such as incentives for capital investment, negatively correlated with net investment as well as with employment and output growth. Overall, the results of this study support previous findings that the use of public funds for tax incentives to attract large industrial plants is not very effective. Those conclusions were not robust to changes in time period and were subject to criticism due to their limited sample size, while this study addresses those deficiencies.

The results in this paper should be interpreted with caution, since these estimates are not derived from randomized experiments, and therefore, do not necessarily imply causal relations. Although this paper does not address the indirect tax revenue effects of development incentive programs, cost-benefit analysis of incentives would be necessary for a complete accounting of the programs. Numerous theoretical studies on tax incentives find justification from the externalities created by the opening of large plants. Given that incentives are costly per job created, empirical research on tax incentives will require measuring the size of benefits that relocated plants bring in to the community, which is in line with Greenstone and Moretti (2003). My future work in exploring which type of firms, for example either small in-state firms or large out-of-state firms, are likely to provide greater social benefits will help policy makers target specific firms for greater policy effectiveness.

REFERENCES

Barkley, David L. and McNamara, Kevin T., "Manufacturer's Location Decisions: Do Surveys Provide Helpful Insights?" *International Regional Science Review*, 1994, 17(1), pp.23-47.

Bartik, Timothy, *Who Benefits from State and Local Economic Development Policies?* Kalamazoo: W.E. Upjohn Institute for Employment Research, 1991.

Berry, William D., Fording, Richard C., "Measuring State Tax Capacity and Effort," *Social Science Quarterly*, March 1997, 7.8(1), pp.158-166.

Blanchard, Olivier J. and Katz, Lawrence F., "Regional Evolutions", *Brookings Papers on Economic Activity*, 1992, 1, pp. 1-75.

Burns, L. S., "The Location of Headquarters of Industrial Companies: A comment." *Urban Studies*, June 1977, 14, pp.211-14.

Cable, John R. and Schwalbach, J, "International Comparisons of Entry and Exit," *Entry and market contestability: An international comparison*, Oxford and Cambridge: Blackwell, 1991, pp.257-81.

Carlton, Dennis, "The Location and Employment Choices of New Plants: An Econometric Model with Discrete and Continuous Endogenous Variables," *Review of Economics and Statistics*, 1983.

Crandall, Robert W., *Manufacturing on the Move*, Washington, D.C., Brooking Institution, 1993.

Davis, Steven J., Haltiwanger, John C., and Schuh, Scott, *Job Creation and Destruction*, Cambridge, MA. The MIT Press, 1996.

de Bartolome, Charles and Spiegel, Mark, "Does State Economic Development Spending Increase Manufacturing Employment," *Journal of Urban Economics*, 41, 153-175.

Dunne, Timothy, Roberts, Mark J. and Samuelson, Larry, "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries," *Rand Journal of Economics*, Winter 1988, 19(4), pp. 495-515.

_______, "The Growth and Failure of U.S. Manufacturing Plants," *Quarterly Journal of Economics*, Nov. 1989a, 104(4), pp.671-98.

_______, "Plant Turnover and Gross Employment Flows in the U.S. Manufacturing Sector," *Journal of Labor Economics*, Nov. 1989b, 7, pp.48-71.

Erickson, R. A., and Wasylenko, M., "Firm Relocation and Site Selection in Suburban Municipalities," *Journal of Urban Economics*, July 1980, 8, pp.69-85.

Evans, David S. "The Relationship between Firm Growth, Size, and Age: Estimates for 100 manufacturing Industries," *Journal of Industrial Economics*, June 1987a, 35(4), pp. 567-81

_______, "Tests of Alternative Theories of Firm Growth," *Journal of Political Economy*, Aug. 1987b, 95(4), pp.657-74.

Fisher, Peter S. and Peter, Alan H., "Tax and Spending Incentives and Enterprise Zones," *New England Economic Review*, March/April 1997, pp. 109-130.

Gabe, Todd M. and Kraybill, David S., "The Effect of State Economic Development Incentives on Employment Growth of Establishments," *Journal of Regional Science*, 2002, 42(4), pp. 703-730.

Goss, Ernest, "The Impact of Infrastructure Spending on New Business Formation: The Importance of State Economic Development Spending," *Review of Regional Studies*, 1994, 24(3), pp. 265-79.

Greenstone, Michael, "The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures," *Journal of Political Economy,* 2002, 110(6), pp.1175-1219.

Greenstone, Michael, and Moretti, Enrico, "Bidding for 'Million Dollar Plants': Do Local Subsidies Increase Local Welfare?" 2003, mimeo, University of Chicago.

Hall, Bronwyn, "The Relationship Between Firm Size and Firm Growth in the U.S. Manufacturing Sector," *Journal of Industrial Economics*, 1987, 35, pp.583-606.

Hirsch, Barry T., Macpherson, David A., and Vroman, Wayne G., "Estimates of Union Density By State," *Monthly Labor Review*, July 2001, 124(7).

Holmes, Thomas J., "Localization of Industry and Vertical Disintegration," *Review of Economics and Statistics*, 1999, 81, pp.314-25.

Krugman, Paul, "Increasing Returns and Economic Geography," *Journal of Political Economy*, 1991, 99(3), pp.483-99.

Lee, Yoonsoo, "Patterns of Plant Relocation in the U.S. Manufacturing," September 2003, mimeo, University of Rochester.

McFadden, Daneil L., "Conditional Logit Analysis of Qualitative Choice Behavior," in P.Zarembka, ed., Frontiers in Econometrics,1974, pp. 105-142, New York: Academic Press.

McGuckin, Robert H, and Pascoe, George A. "The Longitudinal Research Data Base (LRD): Status and Research Possibilities", *Survey of Current Business*, 1988, 68, pp. 30-37.

National Association of State Development Agencies (NASDA), *Directory of incentives for business investment and development in the United States : a state-by-state guide*, Washington, D.C. : Urban Institute Press, 1983, 1986, and 1991.

Newman, Robert J., "Industry Migration and Growth in the South," *Review of Economics and Statistics*, February 1983, 65(1), pp. 76-86.

Newman, Robert J. and Sullivan, Dennis, "Econometric Analysis of Business Tax Impacts on Industrial Location: What Do We Know, and How Do We Know It?" Journal of Urban Economics, 1988, 23, pp. 215-34

O'hUallachain, Breandan and Satterthwaite, Mark A., "Sectoral Growth Patterns at the Metropolitan Level: An Evaluation of Economic Development Incentives," *Journal of Urban Economics*, 1992, 31, pp. 25-58.

Schmenner, Roger W., *Making Business Location Decisions*, Englewood Cliffs, NJ: Prentice Hall, 1982.

_______, "Choosing New Industrial Capacity: On-Site Expansion, Branching, and Relocation," *Quarterly Journal of Economics,* Aug.1980, 95(1), pp.103-19.

Schuh, Scott and Triest, Robert K., "Gross Job Flows and Firms," Federal Reserve Bank of Boston Working Paper 99-10, 1999.

Site Selection and Industrial Development, Various Issues, 1967-1997.

Topel, Robert H. "Local Labor Markets," *Journal of Political Economy*, June 1986, 94(3), S111-S43.

Walker, Robert and Greenstreet, David, "The Effects of Government Incentives and Assistance on Location and Job Growth in Manufacturing," *Regional Studies*, 1991, 25(1), pp.13-30.

Wasylenko, Michael and McGuire, Threse, "Jobs and Taxes: The Effect of Business Climate on State's Employment Growth Rates," *National Tax Journal*, 38, pp. 497-511.

Wheaton, William C., "Interstate Differences in the Level of Business Taxation," *National Tax Journal,* December 1983, 36(4).

Table 1. Entry, Exit, and Relocation Variables in Manufacturing
(Averages of 49 States)

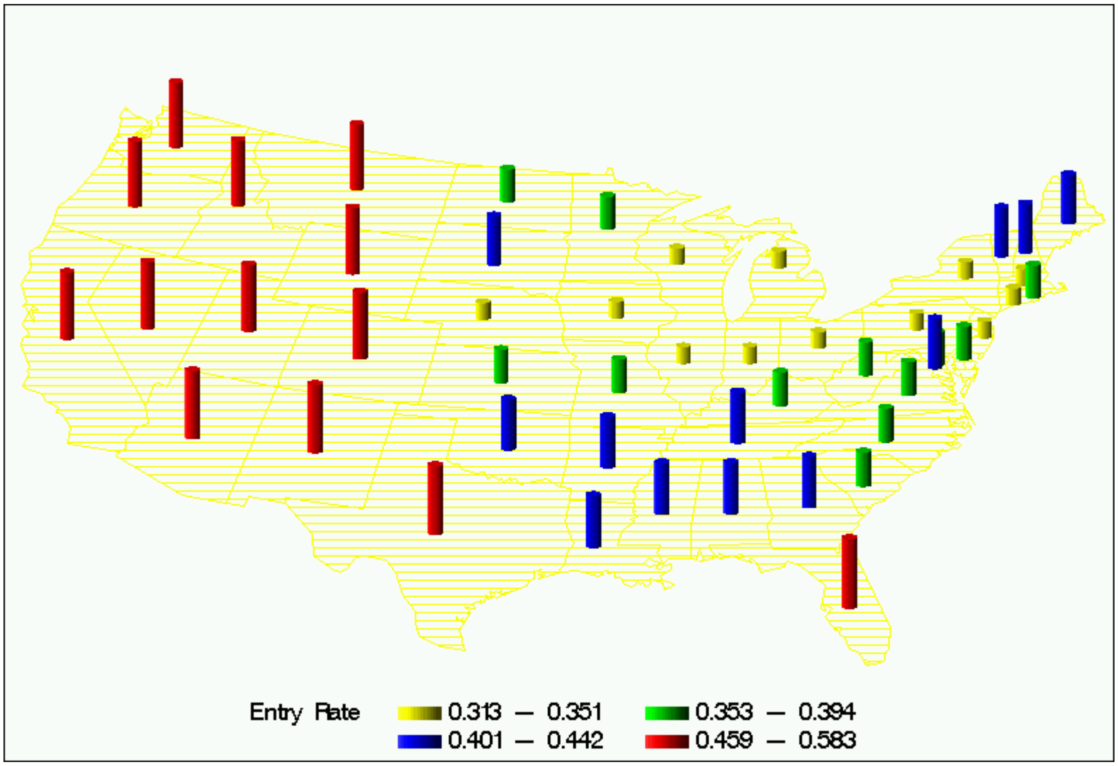
	all years pooled	72-77	77-82	82-87	87-92
Entry Rate					
All plants	0.408	0.448	0.393	0.383	0.408
multi-unit plants	0.245	0.294	0.214	0.234	0.237
Relocation Rate New Locale					
All plants	0.007	0.007	0.007	0.007	0.006
multi-unit plants	0.032	0.035	0.032	0.033	0.030
Out-of-State Relocation Rate New Locale					
All plants	0.006	0.007	0.006	0.006	0.005
multi-unit plants	0.029	0.032	0.029	0.031	0.026
Ratio of Out-of-State Relocation to Entry					
multi-unit plants	0.120	0.108	0.133	0.128	0.109
Entrant Relative Size					
multi-unit plants	0.347	0.295	0.320	0.356	0.416
Relocation New Locale Relative Size					
relative to incumbents	0.430	0.385	0.415	0.419	0.500
relative to other entrants	1.375	1.399	1.378	1.228	1.496
Exit Rate					
All plants	0.371	0.357	0.403	0.354	0.368
multi-unit plants	0.264	0.226	0.255	0.293	0.282
Relocation Rate Old Locale					
All plants	0.006	0.006	0.006	0.005	0.006
multi-unit plants	0.028	0.031	0.028	0.024	0.030
Out-of-State Relocation Rate Old Locale					
All plants	0.005	0.006	0.005	0.005	0.005
multi-unit plants	0.026	0.029	0.026	0.023	0.026
Ratio of Out-of-State Relocation to Exit					
multi-unit plants	0.098	0.122	0.099	0.078	0.095
Exiting plant Relative Size					
multi-unit plants	0.364	0.319	0.295	0.411	0.431
Relocation Old Locale Relative Size					
relative to continuing plants	0.451	0.467	0.321	0.486	0.529
relative to other exiting plants	1.413	1.648	1.187	1.296	1.527

Table 2. Entry, Relocation, and Exit Variables across States
(Means across Years and States within Each Census Regional Division)

Census Division	Entry Rates				Relative Size		
	Entry Rate	Relocation Rate	Out-of-State Relocation Rate	Out-of-State Relocation/Entry	Entrants	Destination Plants (relative to incumbents)	Destination Plants (relative to entrants)
New England	0.219	0.022	0.023	0.104	0.349	0.465	1.607
Middle Atlantic	0.205	0.017	0.018	0.086	0.336	0.390	1.291
E. North Central	0.201	0.020	0.017	0.084	0.290	0.344	1.196
W. North Central	0.227	0.029	0.026	0.121	0.385	0.481	1.409
South Atlantic	0.251	0.034	0.033	0.136	0.278	0.288	1.015
E. South Central	0.222	0.036	0.032	0.144	0.348	0.443	1.391
W. South Central	0.253	0.037	0.031	0.126	0.347	0.418	1.265
Mountain	0.318	0.051	0.045	0.142	0.409	0.405	1.088
Pacific	0.257	0.029	0.023	0.090	0.399	0.912	3.188

Census Division	Exit Rates				Relative Size		
	Exit Rate	Relocation Rate	Out-of-State Relocation	Out-of-State Relocation/Exit	Exiting Plants	Origin plants	Origin plants (relative to exiting plants)
New England	0.278	0.021	0.021	0.076	0.359	0.390	1.125
Middle Atlantic	0.305	0.024	0.024	0.078	0.388	0.528	1.410
E. North Central	0.233	0.023	0.020	0.088	0.343	0.543	1.721
W. North Central	0.233	0.026	0.024	0.104	0.375	0.478	1.717
South Atlantic	0.261	0.028	0.030	0.109	0.326	0.374	1.403
E. South Central	0.210	0.025	0.021	0.104	0.361	0.377	1.044
W. South Central	0.256	0.030	0.025	0.098	0.349	0.481	1.526
Mountain	0.311	0.040	0.035	0.115	0.401	0.501	1.408
Pacific	0.284	0.030	0.023	0.085	0.399	0.431	1.187

Figure 1. Entry Rate and Exit Rate (Means across Years, 1972 – 1992)



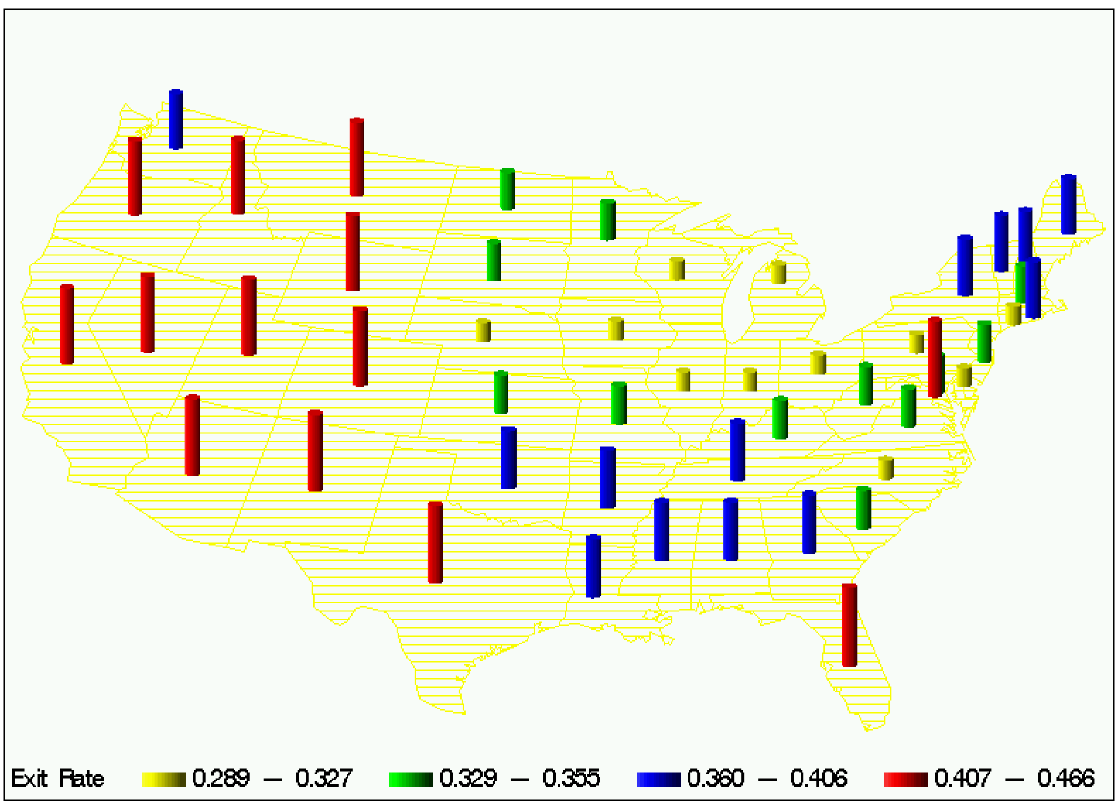
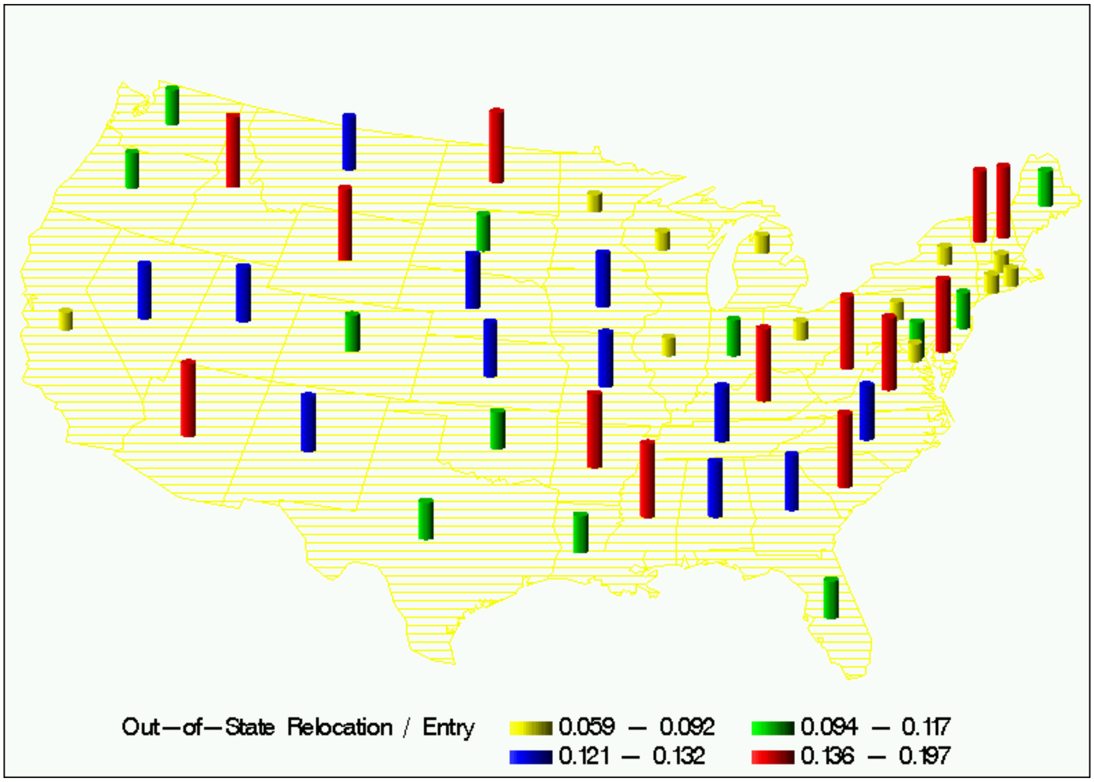


Figure 2. Relocation Rates – Ratios of Relocation to Entry / Exit (Means across Years, 1972 – 1992)



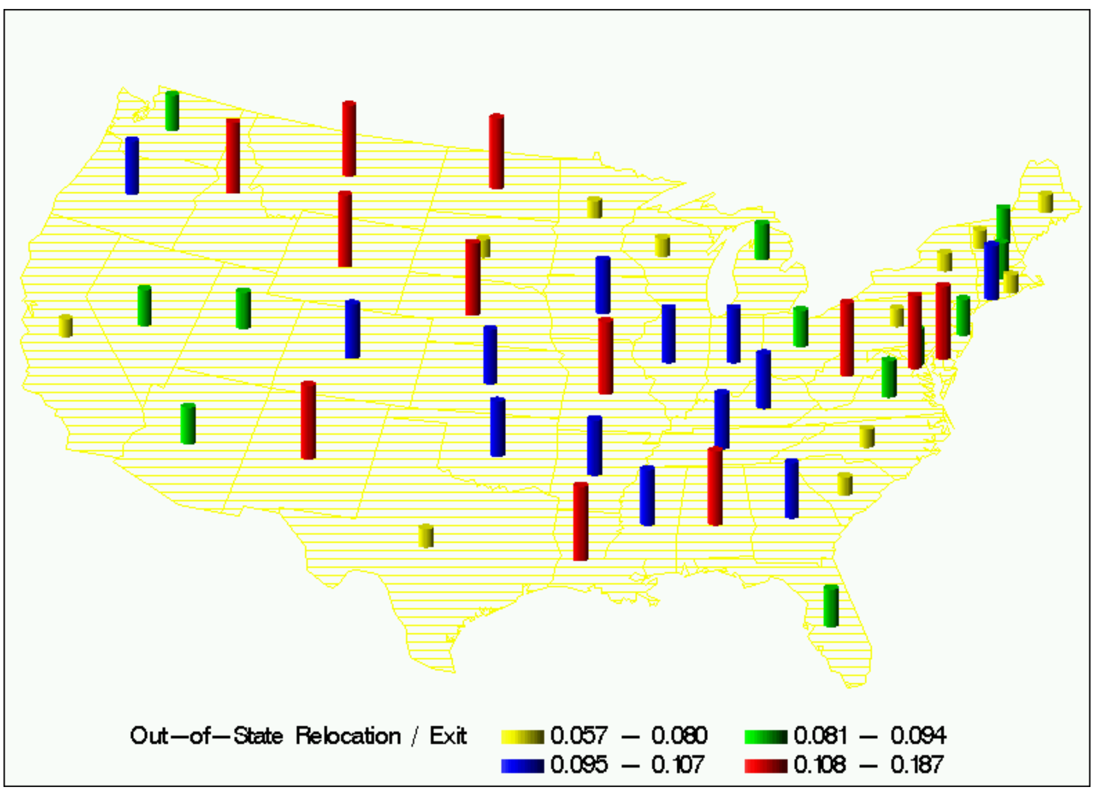


Figure 3A.

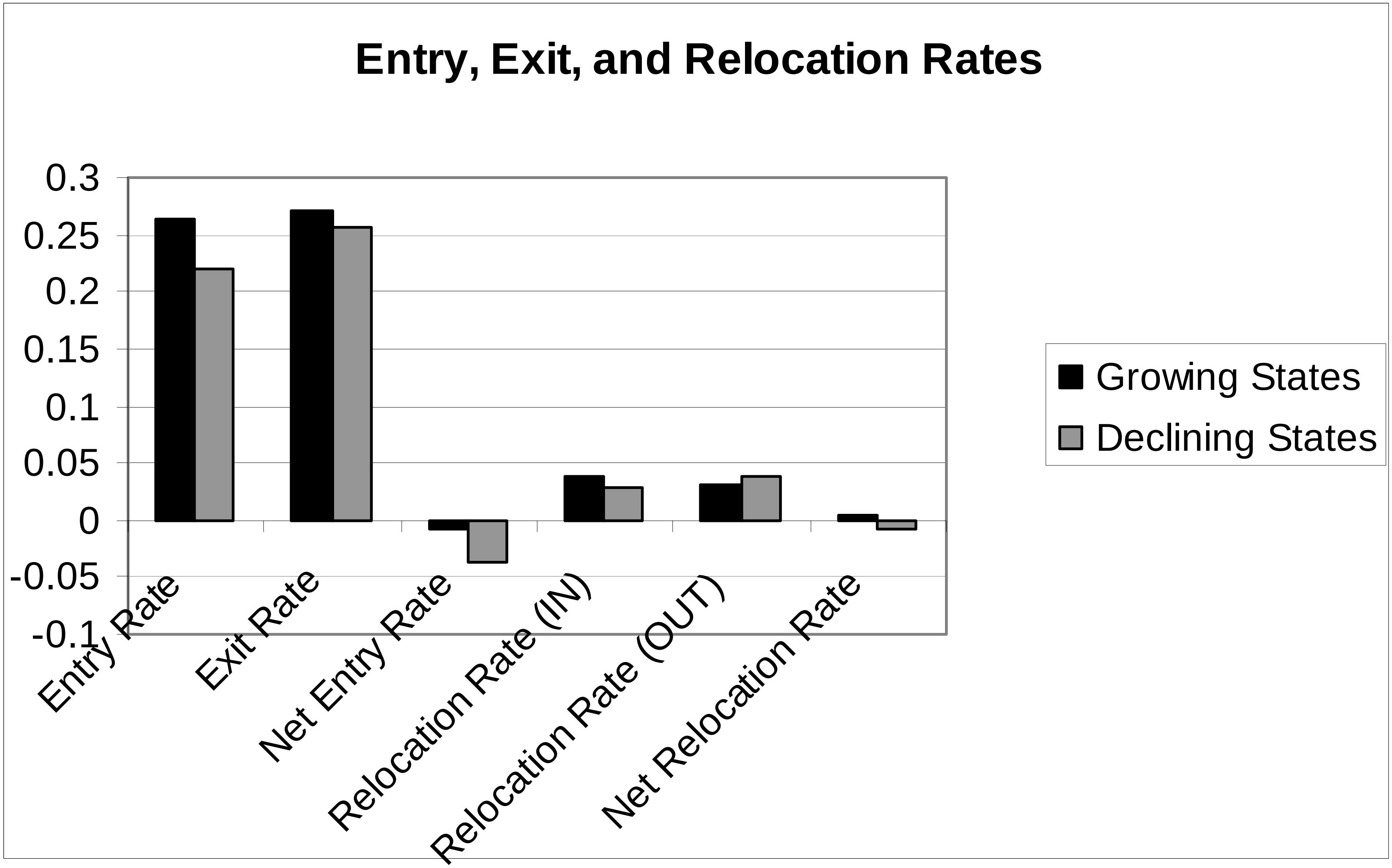
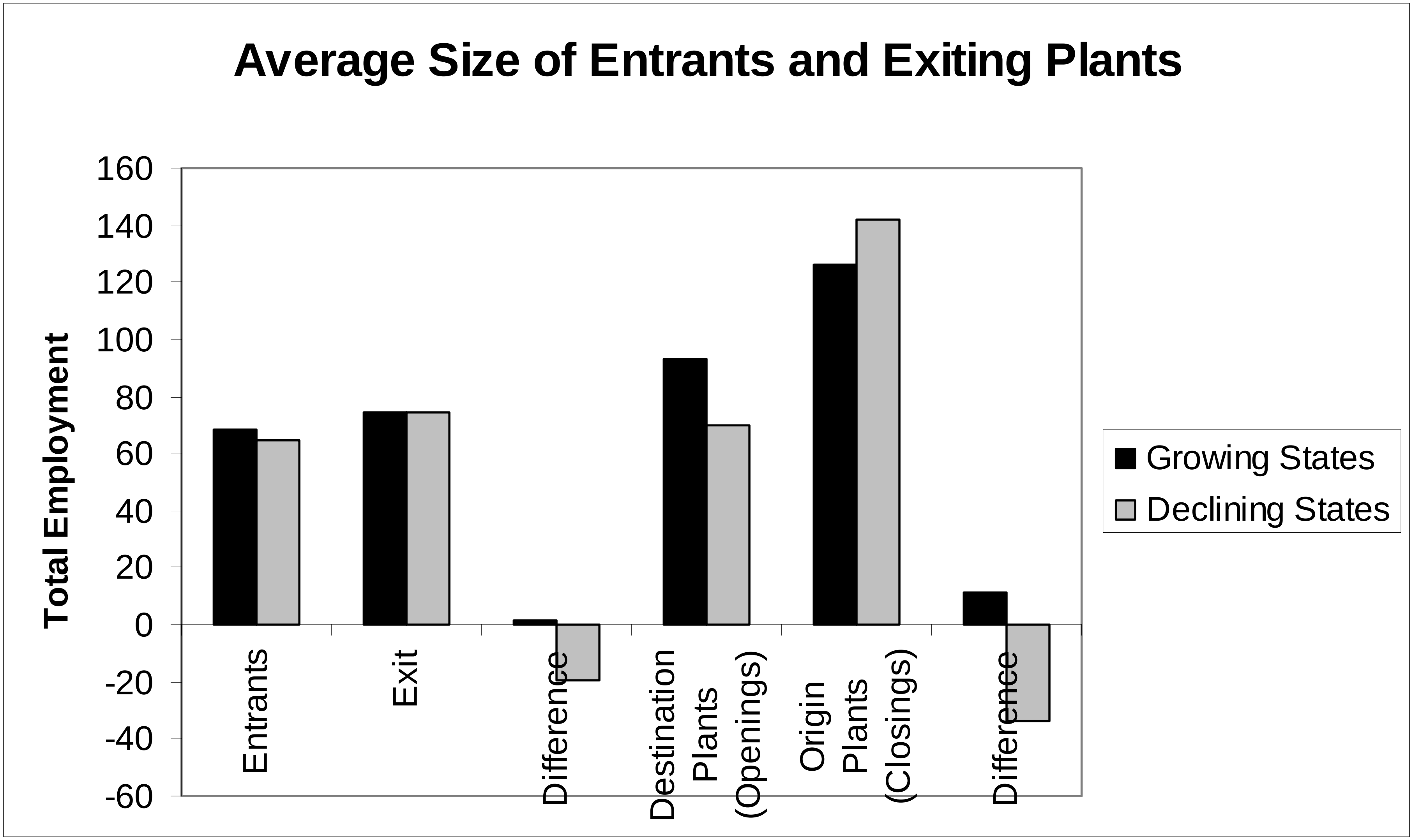

Entry, Exit, and Relocation Rates
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
Entry Rate
Exit Rate
Net Entry Rate
Relocation Rate (IN)
Relocation Rate (OUT)
Net Relocation Rate
Growing States
Declining States

Figure 3B.



Average Size of Entrants and Exiting Plants
Total Employment
160
140
120
100
80
60
40
20
0
-20
-40
-60
Entrants
Exit
Difference
Destination Plants (Openings)
Origin Plants (Closings)
Difference
Growing States
Declining States

Table 3. The Roles of Between-State and Within-State Employment Changes in Employment Growth across States

	$\frac{Cov(\Delta Eb, \Delta E)}{Var(\Delta E)}$	$\frac{Cov(\Delta Ew, \Delta E)}{Var(\Delta E)}$
	Between-state changes	Within-state changes
All years (1972-1992)	0.068	0.932
	(0.020)	(0.020)
1972-1977	0.064	0.936
	(0.015)	(0.015)
1977-1982	0.042	0.958
	(0.012)	(0.012)
1982-1987	0.047	0.953
	(0.017)	(0.017)
1987-1992	0.148	0.852
	(0.022)	(0.022)

Notes: Standard errors are in parentheses
Only multi-unit plants included. This table includes results when relocations after contracting originals more than 50% are included in the analysis.

Table 4. Components of Employment Changes Due to Plant Openings and Closings
(Components of Relocation)

Census division	Employment Gains By Plant Openings (Percentage of Total Gains from Plant Openings)			Employment Losses By Plant Closings (Percentage of Total Losses from Plant Closings)		
	New Plants (*de novo*)	Relocation Within	Relocation In	Permanent Shutdowns	Relocation Within	Relocation Out
New England	67.4%	16.5%	16.2%	82.7%	8.9%	8.8%
Middle Atlantic	68.6%	20.6%	10.9%	80.1%	9.5%	10.3%
E. North Central	69.7%	18.9%	11.4%	76.2%	11.3%	12.5%
W. North Central	68.8%	14.4%	17.3%	72.4%	11.7%	15.9%
South Atlantic	72.1%	12.4%	15.3%	80.4%	7.8%	13.3%
E. South Central	70.7%	7.1%	22.3%	83.7%	6.0%	10.3%
W. South Central	71.9%	10.5%	17.6%	79.7%	7.0%	13.3%
Mountain	68.8%	11.1%	19.6%	78.0%	7.7%	13.8%
Pacific	66.8%	14.9%	18.3%	79.1%	11.4%	9.4%

Notes: Only multi-unit plants included. This table includes results when relocations after contracting originals more than 50% are included in the analysis.

Averages of four five-year periods between a pair of census years are reported. For state level averages, see Table A2 in the appendix.

"Relocation Within" includes employment changes from plant relocations within the neighborhood of the plant (movement within 50 miles) to distinguish employment changes in *de novo* entrants (or permanent shutdowns) from relocated plants.

Table 5. Transition Matrix of Relocations for the Nine Census Divisions

		Destination								
	Census division	NE	MA	ENC	WNC	SA	ESC	WSC	MT	PAC
Origin	New England	24.3	10.8	13.0	7.9	14.5	8.3	9.4	3.9	8.1
	Middle Atlantic	4.3	29.4	14.3	5.4	15.5	6.8	9.4	4.9	10.1
	E. North Central	3.5	9.2	36.0	8.3	14.0	6.7	9.9	4.4	7.9
	W. North Central	2.5	8.2	15.0	31.1	10.5	6.5	11.8	6.4	8.0
	South Atlantic	2.3	6.9	9.0	9.1	42.0	18.0	11.9	12.1	10.6
	E. South Central	2.9	6.9	12.8	5.9	20.1	23.6	13.8	4.7	9.4
	W. South Central	2.6	6.8	10.6	5.0	13.3	7.6	35.4	5.3	13.4
	Mountain	2.6	8.0	10.1	6.6	14.7	5.9	13.1	24.1	15.0
	Pacific	2.4	6.7	11.0	4.6	15.4	6.0	10.5	6.7	36.8

Table 6. Covariate Adjusted Percentage of Permanent Shut-downs and Relocation (Marginal Effect of the Introduction of a Program)

	Permanent Exit			Relocation			
	A	B	C	D	E	F	LR test* (*p*-value)
	Not Introduced	Introduced	Difference (B – A)	Not Introduced	Introduced	Difference (E – D)	
Program introduced							
Corp. Income Tax Exemption	20.17%	20.28%	0.11%	6.18%	5.76%	-0.42%	2.78 (0.250)
Personal Income Tax Exemption	20.06%	19.42%	-0.64%	5.81%	6.20%	0.39%	5.22 (0.074)
Excise Tax Exemption	19.87%	20.07%	0.20%	5.97%	5.95%	-0.02%	0.19 (0.908)
Capital (Land, Equipment & Machine)	20.24%	19.62%	-0.63%	5.55%	5.89%	0.33%	1.74 (0.420)
Accelerated Depreciation	19.90%	19.45%	-0.45%	5.86%	6.19%	0.33%	3.91 (0.142)
Tax Exemption on Inventories	20.37%	20.52%	0.16%	6.01%	6.40%	0.38%	2.11 (0.349)
Research and Development	20.41%	19.98%	-0.44%	5.86%	5.90%	0.04%	1.83 (0..401)
Bond Financing	19.77%	20.14%	0.37%	5.95%	6.11%	0.16%	1.85 (0.396)
Loan or Loan Guarantee (for Building or Equipment)	20.10%	20.27%	0.16%	5.71%	5.80%	0.09%	0.37 (0.829)

Note: Number of observations=262,649.
*Likelihood-ratio test for the policy indicator variables appearing in the multinomial logit estimations. See Appendix Table A3 for parameter estimates.

Table 7. Estimated Probit of Relocation Within State (y=1) Versus Relocation Out-of-State (y=0) Given Relocation

	[1]		[2]	
Program introduced during the 5-year period (between *t – 5* and *t*)				
Tax Incentives (Enacted)	dF/dX	Z stat	dF/dX	Z stat
Corp. Income Tax Exemption	-0.032	-2.02	-0.010	-0.45
Personal Income Tax Exemption	0.069	4.45	0.045	2.23
Excise Tax Exemption	-0.024	-1.46	-0.042	-1.69
Capital (Land, Equipment & Machine)	-0.018	-0.67	-0.051	-1.63
Accelerated Depreciation	0.011	0.78	0.036	1.98
Tax Exemption on Inventories	-0.053	-2.69	-0.063	-2.65
Research and Development	-0.046	-3.49	-0.029	-1.69
Financial Incentives (Enacted)				
Bond Financing	0.012	0.76	-0.003	-0.17
Loan or Loan Guarantee (for Building or Equipment)	-0.033	-2.01	-0.017	-0.81
Tax and Financial Incentives at *t – 5*				
Corp. Income Tax Exemption	-0.042	-3.25	-0.013	-0.52
Personal Income Tax Exemption	0.053	4.76	0.031	1.53
Excise Tax Exemption	-0.038	-2.71	-0.042	-1.63
Capital (Land, Equipment & Machine)	0.019	0.85	-0.026	-0.82
Accelerated Depreciation	0.024	2.09	0.073	3.52
Tax Exemption on Inventories	-0.007	-0.41	-0.028	-1.11
Research and Development	-0.030	-2.38	-0.002	-0.08
Bond Financing	-0.029	-2.02	-0.021	-1.06
Loan or Loan Guarantee (for Building or Equipment)	-0.029	-1.99	-0.046	-1.90
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Industry by Period fixed effects	Yes		Yes	
observations	15,572		15,572	
Log-Likelihood	-9744.14		-9601.88	
χ^2 Statistic	1148.36		1432.88	

Table 8. Covariate Adjusted Percentage of De Novo Entry and Relocation
(Marginal Effect of the Introduction of a Program)

	De Novo Entry			Relocation			
	A	B	C	D	E	F	LR test* (*p*-value)
	Not Introduced	Introduced	Difference (B – A)	Not Introduced	Introduced	Difference (E – D)	
Program introduced							
Corp. Income Tax Exemption	17.21%	17.64%	0.42%	6.72%	6.29%	-0.43%	2.91 (0.234)
Personal Income Tax Exemption	17.44%	17.67%	0.23%	6.55%	6.53%	-0.01%	0.90 (0.638)
Excise Tax Exemption	17.56%	17.00%	-0.56%	6.35%	7.25%	0.90%	6.37 (0.041)
Capital (Land, Equipment & Machine)	18.62%	17.82%	-0.80%	6.70%	6.83%	0.13%	0.94 (0.626)
Accelerated Depreciation	17.38%	17.82%	0.44%	6.63%	6.50%	-0.13%	2.57 (0.277)
Tax Exemption on Inventories	16.81%	17.06%	0.25%	6.78%	7.10%	0.32%	1.15 (0.562)
Research and Development	17.41%	17.49%	0.07%	6.72%	6.58%	-0.14%	0.45 (0..797)
Bond Financing	17.95%	17.52%	-0.43%	6.42%	6.85%	0.42%	2.98 (0.225)
Loan or Loan Guarantee (for Building or Equipment)	16.99%	17.34%	0.35%	6.27%	6.81%	0.54%	9.51 (0.009)

Note: Number of observations=267,245.
*Likelihood-ratio test for the policy indicator variables appearing in the multinomial logit estimations. LR statistics is calculated from the restricted (without the policy indicator variable) and unrestricted regressions. See Appendix Table A4 for parameter estimates.

Table 9. Estimated Probit of Relocation (from) Outside the State (y=1) Versus Relocation (from) within the State (y=0) Given Relocation

	[1]		[2]	
Program introduced during the 5-year period (between *t – 5* and *t*)				
Tax Incentives (Enacted)	dF/dX	Z stat	dF/dX	Z stat
Corp. Income Tax Exemption	0.034	1.92	-0.031	-1.26
Personal Income Tax Exemption	-0.059	-3.71	-0.018	-0.82
Excise Tax Exemption	-0.059	-3.15	0.000	0.01
Capital (Land, Equipment & Machine)	-0.206	-3.40	0.005	0.07
Accelerated Depreciation	-0.003	-0.21	0.012	0.51
Tax Exemption on Inventories	0.081	3.47	0.008	0.19
Research and Development	0.019	1.40	0.023	1.25
Financial Incentives (Enacted)				
Bond Financing	-0.050	-2.74	0.010	0.43
Loan or Loan Guarantee (for Building or Equipment)	0.005	0.27	0.016	0.63
Tax and Financial Incentives at *t – 5*				
Corp. Income Tax Exemption	0.068	5.60	0.012	0.47
Personal Income Tax Exemption	-0.074	-7.19	-0.031	-1.43
Excise Tax Exemption	0.000	-0.01	0.024	0.79
Capital (Land, Equipment & Machine)	-0.162	-3.07	-0.026	-0.35
Accelerated Depreciation	-0.025	-2.11	-0.018	-0.88
Tax Exemption on Inventories	0.113	5.83	0.043	0.97
Research and Development	0.047	4.07	0.044	2.18
Bond Financing	0.003	0.18	0.011	0.46
Loan or Loan Guarantee (for Building or Equipment)	-0.024	-1.60	-0.039	-1.55
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Industry by Period fixed effects	Yes		Yes	
observations	17,809		17,809	
Log-Likelihood	-10754.78		-10572.00	
χ^2 Statistic	2498.11		2863.67	

Table 10. Estimated Regression Models for Plant Level Percentage Change in Employment

	[1]		[2]		[3]	
Program introduced during the 5-year period (between $t-5$ and t)						
Tax Incentives (Enacted)	γ	(std. error)	γ	(std. error)	γ	(std. error)
Corp. Income Tax Exemption	0.023	(0.004)	0.018	(0.004)	0.051	(0.004)
Personal Income Tax Exemption	0.004	(0.003)	0.011	(0.003)	0.018	(0.004)
Excise Tax Exemption	0.009	(0.004)	0.010	(0.004)	0.003	(0.005)
Capital (Land, Equipment & Machine)	-0.015	(0.006)	-0.019	(0.006)	-0.079	(0.006)
Accelerated Depreciation	-0.001	(0.003)	-0.001	(0.003)	0.034	(0.004)
Tax Exemption on Inventories	-0.009	(0.005)	-0.011	(0.005)	0.046	(0.005)
Research and Development	0.036	(0.003)	0.032	(0.003)	0.052	(0.003)
Financial Incentives (Enacted)						
Bond Financing	-0.018	(0.003)	-0.025	(0.004)	-0.051	(0.004)
Loan or Loan Guarantee (for Building or Equipment)	0.024	(0.004)	0.019	(0.004)	0.015	(0.004)
Tax and Financial Incentives at $t-5$						
Corp. Income Tax Exemption	0.043	(0.004)	0.039	(0.004)	0.105	(0.005)
Personal Income Tax Exemption	-0.015	(0.004)	-0.009	(0.004)	-0.035	(0.004)
Excise Tax Exemption	0.013	(0.005)	0.013	(0.005)	-0.009	(0.005)
Capital (Land, Equipment & Machine)	-0.022	(0.006)	-0.021	(0.006)	-0.086	(0.007)
Accelerated Depreciation	-0.009	(0.004)	-0.009	(0.004)	0.047	(0.004)
Tax Exemption on Inventories	0.046	(0.004)	0.041	(0.005)	0.123	(0.005)
Research and Development	0.032	(0.004)	0.026	(0.004)	0.059	(0.005)
Bond Financing	-0.001	(0.004)	-0.004	(0.004)	-0.022	(0.004)
Loan or Loan Guarantee (for Building or Equipment)	0.025	(0.004)	0.023	(0.004)	-0.040	(0.005)
Lag(Employment Growth)	-0.197	(0.002)	-0.197	(0.002)	-0.360	(0.002)
R^2	0.609		0.610		0.828	
Other Plant level variables	Yes		Yes		Yes	
State fixed effects	Yes		Yes		Yes	
Period fixed effects	Yes		No		No	
Industry fixed effects	Yes		No		No	
Industry by Period fixed effects	No		Yes		Yes	
Plant fixed effects	No		No		Yes	

Note: Standard Errors in parentheses. Number of observations = 1,716,337

Table 11. Estimated Regression Models for Plant Level Percentage Change in Capital Stock and Shipments

	[1]		[2]		[3]	
Program introduced during the 5-year period (between *t* – *5* and *t*))						
Capital Stock (N = 1,740,868)	γ	(std. error)	γ	(std. error)	γ	(std. error)
Corp. Income Tax Exemption	0.030	(0.004)	0.022	(0.004)	0.065	(0.005)
Personal Income Tax Exemption	-0.006	(0.004)	0.002	(0.004)	0.000	(0.004)
Excise Tax Exemption	-0.010	(0.005)	0.003	(0.005)	-0.008	(0.005)
Capital (Land, Equipment & Machine)	-0.035	(0.006)	-0.030	(0.006)	-0.101	(0.007)
Accelerated Depreciation	0.001	(0.004)	0.003	(0.004)	0.040	(0.004)
Tax Exemption on Inventories	-0.021	(0.005)	-0.009	(0.005)	0.051	(0.006)
Research and Development	0.030	(0.003)	0.029	(0.003)	0.050	(0.004)
Bond Financing	-0.019	(0.004)	-0.025	(0.004)	-0.055	(0.004)
Loan or Loan Guarantee (for Building or Equipment)	0.018	(0.004)	0.019	(0.004)	0.010	(0.005)
Lag(Change in Capital Stock)	-0.189	(0.002)	-0.188	(0.002)	-0.294	(0.002)
R^2	0.566		0.568		0.798	
Total Value of Shipments (N = 1,774,033)						
Corp. Income Tax Exemption	0.031	(0.004)	0.027	(0.004)	0.062	(0.004)
Personal Income Tax Exemption	0.001	(0.003)	0.004	(0.003)	0.007	(0.004)
Excise Tax Exemption	0.010	(0.004)	0.012	(0.004)	0.005	(0.005)
Capital (Land, Equipment & Machine)	-0.033	(0.006)	-0.035	(0.006)	-0.091	(0.006)
Accelerated Depreciation	-0.002	(0.003)	-0.003	(0.003)	0.031	(0.004)
Tax Exemption on Inventories	-0.010	(0.004)	-0.010	(0.005)	0.046	(0.005)
Research and Development	0.032	(0.003)	0.028	(0.003)	0.050	(0.003)
Bond Financing	-0.022	(0.003)	-0.028	(0.003)	-0.055	(0.004)
Loan or Loan Guarantee (for Building or Equipment)	0.019	(0.004)	0.018	(0.004)	0.017	(0.004)
Lag(Change in Shipments)	-0.097	(0.002)	-0.097	(0.002)	-0.266	(0.002)
R^2	0.622		0.623		0.832	
Tax and Financial Incentives at *t* – *5*	Yes		Yes		Yes	
Other Plant level variables	Yes		Yes		Yes	
State fixed effects	Yes		Yes		Yes	
Year dummy	Yes		No		No	
Industry fixed effects	Yes		No		No	
Industry by Year fixed effects	No		Yes		Yes	
Plant fixed effects	No		No		Yes	

Note: Standard Errors in parentheses.

Appendix

Appendix Table A1. Averages of Entry, Relocation, and Exit Rates for Each State over All Years.

State	Entry Rate (MU only)	Entry Rate (All plants)	Relocation Rate New Locale	Out-of-State Relocation Rate	Out-of-State relocation /Entry	Within-State relocation /Entry	Exit Rate (MU only)	Exit Rate (All plants)	Relocation Rate Old Locale	Out-of-State Relocation Rate	Out-of-State relocation /Exit	Within-State relocation /Exit
ME	0.209	0.404	0.024	0.023	0.112	0.053	0.260	0.397	0.016	0.015	0.060	0.049
NH	0.245	0.432	0.030	0.035	0.141	0.041	0.279	0.366	0.024	0.025	0.094	0.032
VT	0.213	0.431	0.034	0.030	0.144	0.041	0.226	0.366	0.018	0.016	0.066	0.048
MA	0.212	0.326	0.017	0.016	0.079	0.090	0.307	0.336	0.025	0.024	0.081	0.067
RI	0.228	0.353	0.011	0.014	0.059	0.070	0.318	0.360	0.016	0.018	0.057	0.042
CT	0.206	0.326	0.015	0.018	0.087	0.070	0.276	0.315	0.025	0.026	0.099	0.052
NY	0.203	0.345	0.015	0.012	0.062	0.100	0.340	0.399	0.025	0.027	0.079	0.055
NJ	0.219	0.323	0.016	0.023	0.105	0.089	0.322	0.349	0.026	0.027	0.084	0.056
PA	0.192	0.318	0.020	0.018	0.092	0.091	0.254	0.322	0.020	0.018	0.071	0.065
OH	0.190	0.314	0.020	0.015	0.079	0.092	0.228	0.295	0.023	0.019	0.087	0.078
IN	0.218	0.349	0.026	0.025	0.115	0.062	0.223	0.312	0.025	0.023	0.107	0.064
IL	0.189	0.313	0.018	0.015	0.081	0.105	0.254	0.311	0.026	0.024	0.096	0.070
MI	0.212	0.346	0.015	0.012	0.060	0.079	0.261	0.325	0.024	0.021	0.083	0.072
WI	0.198	0.331	0.021	0.016	0.086	0.086	0.200	0.289	0.017	0.013	0.065	0.081
MN	0.235	0.384	0.023	0.018	0.076	0.101	0.265	0.329	0.026	0.021	0.080	0.084
IA	0.199	0.342	0.029	0.026	0.132	0.040	0.194	0.321	0.021	0.019	0.098	0.044
MO	0.210	0.364	0.029	0.026	0.126	0.067	0.243	0.339	0.030	0.029	0.121	0.051
ND	0.257	0.394	0.038	0.040	0.174	0.030	0.249	0.344	0.027	0.029	0.118	0.058
SD	0.255	0.401	0.028	0.024	0.097	0.052	0.213	0.343	0.017	0.016	0.066	0.056
NE	0.189	0.351	0.029	0.022	0.121	0.123	0.220	0.326	0.034	0.030	0.140	0.106
KS	0.243	0.382	0.029	0.029	0.121	0.057	0.248	0.355	0.028	0.026	0.107	0.060
DE	0.222	0.357	0.036	0.042	0.197	0.045	0.222	0.320	0.024	0.027	0.121	0.062
MD	0.231	0.381	0.025	0.027	0.116	0.048	0.282	0.352	0.026	0.026	0.094	0.046
DC	0.378	0.412	0.021	0.030	0.082	0.044	0.446	0.429	0.047	0.079	0.187	0.030

State	Entry Rate (MU only)	Entry Rate (All plants)	Relocation Rate New Locale	Out-of-State Relocation Rate	Out-of-State relocation /Entry	Within-State relocation /Entry	Exit Rate (MU only)	Exit Rate (All plants)	Relocation Rate Old Locale	Out-of-State Relocation Rate	Out-of-State relocation /Exit	Within-State relocation /Exit
VA	0.231	0.389	0.035	0.033	0.141	0.059	0.220	0.344	0.023	0.019	0.090	0.065
WV	0.199	0.358	0.035	0.034	0.168	0.047	0.245	0.354	0.030	0.034	0.139	0.022
NC	0.230	0.376	0.035	0.030	0.129	0.068	0.211	0.327	0.021	0.015	0.073	0.076
SC	0.216	0.389	0.036	0.034	0.156	0.039	0.193	0.352	0.017	0.015	0.077	0.042
GA	0.249	0.419	0.035	0.032	0.128	0.076	0.229	0.386	0.027	0.023	0.104	0.081
FL	0.299	0.501	0.045	0.033	0.111	0.098	0.298	0.442	0.037	0.027	0.090	0.089
KY	0.219	0.376	0.036	0.034	0.156	0.062	0.201	0.329	0.023	0.021	0.105	0.062
TN	0.221	0.404	0.034	0.029	0.132	0.059	0.219	0.360	0.024	0.021	0.099	0.055
AL	0.226	0.418	0.034	0.028	0.125	0.077	0.218	0.382	0.028	0.023	0.108	0.069
MS	0.223	0.419	0.041	0.037	0.163	0.057	0.202	0.373	0.024	0.020	0.103	0.063
AR	0.215	0.417	0.041	0.039	0.180	0.048	0.207	0.374	0.022	0.020	0.099	0.046
LA	0.237	0.410	0.035	0.028	0.115	0.084	0.264	0.398	0.036	0.031	0.118	0.070
OK	0.270	0.442	0.035	0.030	0.113	0.064	0.270	0.402	0.029	0.025	0.095	0.061
TX	0.289	0.463	0.038	0.028	0.096	0.091	0.285	0.407	0.032	0.022	0.079	0.082
MT	0.226	0.495	0.049	0.028	0.132	0.112	0.275	0.442	0.052	0.041	0.150	0.061
ID	0.227	0.476	0.046	0.039	0.175	0.052	0.264	0.419	0.051	0.042	0.158	0.054
WY	0.373	0.502	0.076	0.073	0.189	0.022	0.394	0.448	0.057	0.054	0.138	0.028
CO	0.312	0.510	0.042	0.037	0.117	0.068	0.320	0.430	0.036	0.032	0.103	0.076
NM	0.339	0.528	0.045	0.043	0.132	0.018	0.319	0.457	0.038	0.036	0.115	0.021
AZ	0.334	0.543	0.053	0.045	0.136	0.057	0.297	0.437	0.035	0.026	0.090	0.063
UT	0.303	0.494	0.042	0.040	0.130	0.030	0.275	0.408	0.025	0.023	0.085	0.032
NV	0.430	0.583	0.053	0.052	0.121	0.028	0.343	0.466	0.029	0.027	0.082	0.053
WA	0.266	0.471	0.034	0.031	0.117	0.066	0.282	0.406	0.028	0.023	0.085	0.057
OR	0.233	0.462	0.027	0.022	0.094	0.087	0.253	0.408	0.029	0.024	0.101	0.071
CA	0.271	0.459	0.026	0.016	0.059	0.106	0.317	0.410	0.032	0.022	0.070	0.101

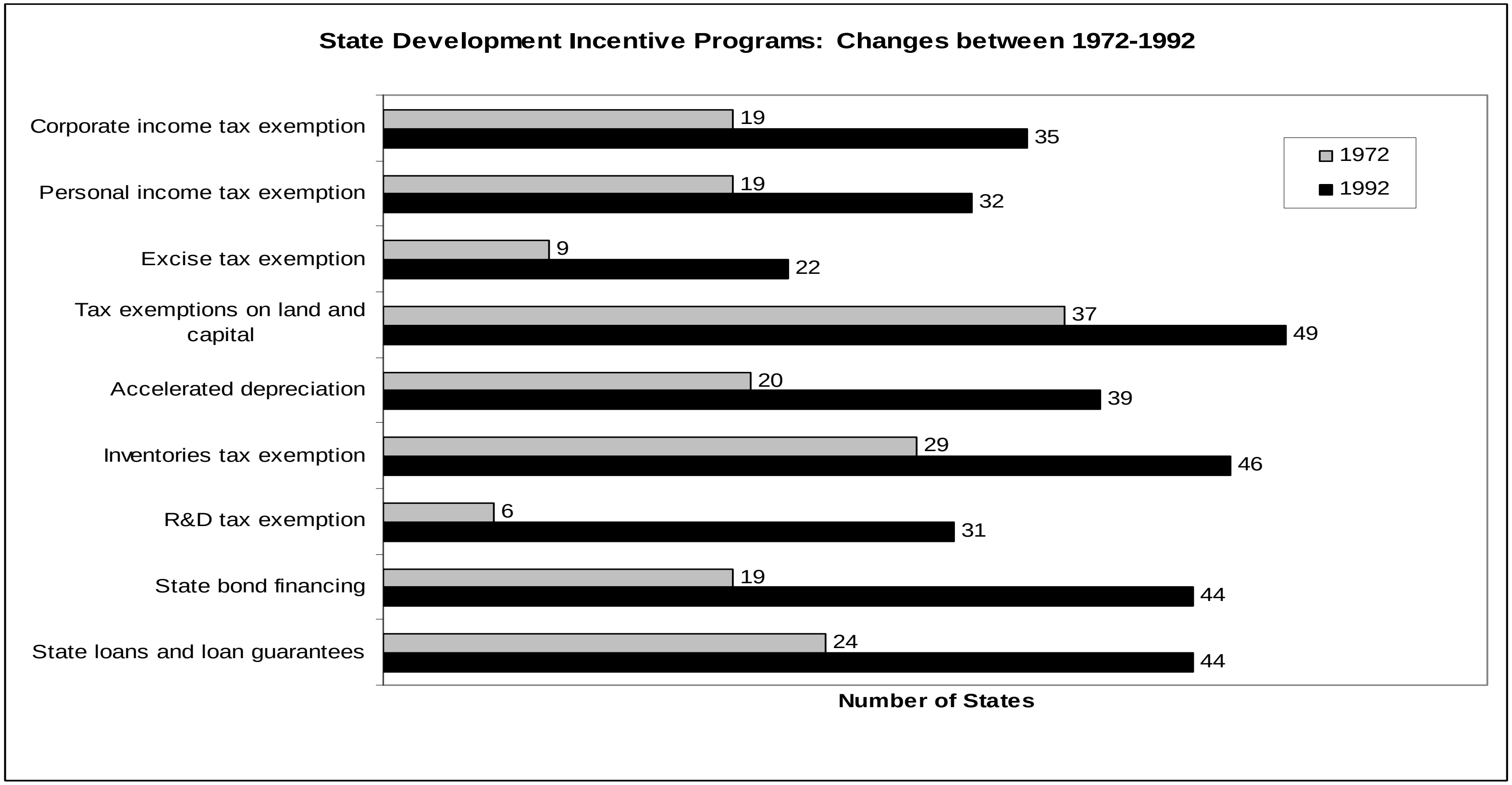
Appendix Table A2. Components of Employment Changes Due to Plant Openings and Closings in Each State.

State	Fraction of Employment Gains from plant openings	Fraction of employment gains from plant openings (Multi-unit only)	Employment Gains from Plant Openings (Percentage of Total Gains from Plant Openings)			Fraction of employment losses from plant closings	Fraction of employment losses from plant closings (Multi-unit only)	Employment Losses from Plant Closings (Percentage of Total Losses by Closing Plants)		
			New Plants (*de novo*)	Relocation Within	Relocation In			Exiting Plants	Relocation Within	Relocation Out
ME	47.09%	25.37%	67.18%	18.03%	14.79%	53.92%	34.09%	86.47%	7.76%	5.76%
NH	52.44%	28.44%	71.72%	9.36%	18.93%	54.04%	34.77%	81.93%	6.91%	11.17%
VT	47.69%	20.48%	71.86%	2.09%	24.36%	45.59%	20.65%	91.90%	4.51%	6.67%
MA	44.06%	20.13%	74.44%	13.15%	12.41%	50.00%	29.22%	79.93%	7.28%	12.79%
RI	48.35%	19.45%	80.19%	12.20%	7.61%	50.70%	25.36%	85.60%	9.93%	4.47%
CT	44.13%	23.12%	64.61%	26.13%	9.26%	46.89%	30.63%	72.42%	15.89%	11.69%
NY	48.83%	16.46%	69.49%	21.83%	8.68%	55.26%	24.01%	79.87%	10.57%	9.57%
NJ	49.92%	21.75%	74.49%	13.93%	11.58%	55.86%	32.85%	82.52%	7.00%	10.48%
PA	45.75%	21.43%	74.61%	15.12%	10.27%	47.56%	28.33%	77.99%	11.06%	10.96%
OH	43.23%	24.16%	78.10%	13.74%	8.16%	41.38%	28.75%	80.06%	8.77%	11.17%
IN	45.64%	26.38%	69.38%	14.34%	16.28%	41.70%	29.57%	72.03%	14.97%	13.00%
IL	42.82%	20.75%	76.90%	15.09%	8.01%	44.77%	29.01%	77.10%	9.09%	13.81%
MI	42.38%	20.61%	71.67%	21.72%	6.61%	46.06%	30.96%	70.67%	15.81%	13.52%
WI	39.29%	20.49%	78.84%	12.65%	8.51%	39.76%	23.73%	80.90%	7.88%	11.22%
MN	43.07%	22.44%	72.60%	17.85%	9.56%	48.72%	29.05%	71.77%	14.60%	13.63%
IA	43.31%	26.56%	66.81%	13.01%	20.18%	43.38%	28.71%	72.34%	12.06%	15.60%
MO	41.04%	21.65%	73.29%	15.08%	11.63%	47.20%	30.91%	74.00%	8.48%	17.52%
ND	44.82%	20.83%	73.18%	8.78%	21.65%	51.65%	21.22%	87.40%	7.01%	12.08%
SD	54.50%	33.05%	84.11%	8.24%	15.12%	56.80%	33.74%	76.83%	12.93%	5.71%
NE	39.35%	21.27%	81.93%	3.69%	14.38%	48.60%	28.98%	66.86%	2.62%	30.52%
KS	43.29%	28.61%	65.40%	21.75%	12.85%	54.64%	37.53%	63.53%	23.08%	13.40%
DE	39.53%	21.75%	69.87%	14.63%	15.50%	38.27%	24.57%	78.75%	8.02%	13.24%
MD	42.35%	20.56%	81.74%	8.02%	10.23%	46.80%	30.00%	84.59%	7.17%	8.24%
DC	49.78%	22.88%	48.34%	48.24%	2.47%	50.81%	26.33%	46.07%	11.29%	42.24%
VA	47.20%	27.75%	74.73%	7.70%	17.57%	48.19%	32.22%	85.02%	6.36%	8.62%
WV	49.49%	24.73%	85.63%	2.52%	11.94%	44.92%	28.73%	86.29%	1.81%	10.18%
NC	48.90%	30.63%	75.56%	8.92%	15.51%	46.71%	29.83%	82.72%	10.56%	6.73%
SC	47.51%	30.91%	77.19%	5.27%	17.53%	42.70%	29.26%	89.56%	5.42%	5.02%
GA	50.36%	29.63%	73.36%	11.70%	14.94%	49.87%	30.13%	76.39%	11.47%	12.14%
FL	52.69%	20.85%	77.61%	9.42%	12.98%	59.87%	28.98%	78.17%	8.17%	13.66%
KY	46.54%	27.61%	75.11%	4.92%	19.97%	41.52%	27.35%	86.06%	4.61%	9.32%

State	Fraction of Employment Gains from plant openings	Fraction of employment gains from plant openings (Multi-unit only)	Employment Gains from Plant Openings (Percentage of Total Gains from Plant Openings) New Plants (*de novo*)	Relocation Within	Relocation In	Fraction of employment losses from plant closings	Fraction of employment losses from plant closings (Multi-unit only)	Employment Losses from Plant Closings (Percentage of Total Losses by Closing Plants) Exiting Plants	Relocation Within	Relocation Out
TN	47.18%	26.17%	74.40%	6.66%	18.94%	47.01%	29.70%	82.03%	5.38%	12.60%
AL	47.98%	25.23%	75.94%	6.94%	17.12%	49.24%	27.82%	81.57%	7.01%	11.43%
MS	48.74%	27.14%	76.27%	5.41%	18.32%	46.86%	26.89%	85.04%	7.07%	7.88%
AR	45.16%	28.08%	73.29%	7.87%	18.85%	47.92%	31.08%	82.70%	5.08%	12.22%
LA	50.50%	23.27%	79.23%	9.53%	11.24%	52.78%	29.50%	78.29%	7.96%	13.74%
OK	50.42%	26.64%	79.33%	5.92%	14.75%	51.43%	29.17%	78.69%	4.75%	16.56%
TX	51.34%	27.01%	75.91%	10.10%	13.99%	52.51%	29.50%	79.21%	10.29%	10.51%
MT	55.43%	16.38%	76.87%	12.84%	10.29%	61.92%	26.38%	78.84%	4.74%	16.42%
ID	50.49%	25.54%	75.06%	17.06%	7.88%	56.63%	29.84%	64.71%	12.92%	22.37%
WY	65.75%	27.38%	66.66%	9.25%	21.12%	70.07%	33.89%	67.87%	8.53%	19.95%
CO	50.59%	25.35%	71.39%	16.34%	12.27%	53.29%	28.96%	79.71%	11.36%	8.93%
NM	55.16%	24.99%	79.73%	1.91%	18.36%	62.20%	27.15%	78.86%	3.46%	17.68%
AZ	57.63%	32.99%	73.04%	12.40%	14.57%	51.43%	28.01%	79.12%	10.95%	9.92%
UT	48.85%	24.87%	80.95%	1.62%	17.43%	56.46%	30.68%	89.32%	1.98%	8.70%
NV	66.55%	27.13%	86.13%	2.90%	10.06%	71.40%	31.16%	84.49%	7.54%	5.99%
WA	47.37%	23.00%	65.65%	6.35%	28.00%	57.26%	31.47%	83.81%	5.31%	10.88%
OR	50.27%	22.97%	65.92%	17.27%	16.81%	52.94%	26.94%	75.27%	16.52%	8.21%
CA	50.77%	21.19%	78.67%	16.18%	5.16%	56.87%	30.75%	78.35%	12.44%	9.21%

Note: The first (sixth) column of the table present fraction of employment gains (losses) from plant births (deaths). The second (seventh) column present fraction of employment gains (losses) from “multi-unit” plant births (deaths). In the third, fourth, and fifth (eighth, ninth, and tenth) columns, I decompose total employment gains (losses) from multi-unit plant births (deaths) into employment gains (losses) from *de novo* plant births (plant deaths without relocations), relocations within state, relocations between states.

Appendix Figure A1.



Source: Compiled and reclassified by the author from *Site Selection and Industrial Development,* Conway Data Inc.

Appendix Table A3. Multinomial Logit Estimation of Shut Down, Stay, and Relocation. (Parameters for Staying are Normalized to Zero)

	[1]		[2]	
Program introduced during the 5-year period (between *t – 5* and *t*)	Shut Down	Relocate	Shut Down	Relocate
Tax and Financial Incentives (Enacted)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)
Corp. Income Tax Exemption	0.010 (0.020)	-0.063 (0.033)	0.001 (0.028)	-0.075 (0.045)
Personal Income Tax Exemption	-0.030 (0.020)	0.095 (0.031)	-0.040 (0.026)	0.060 (0.041)
Excise Tax Exemption	0.064 (0.020)	0.034 (0.034)	0.014 (0.032)	-0.001 (0.052)
Capital (Land, Equipment & Machine)	-0.078 (0.037)	-0.120 (0.054)	-0.039 (0.043)	0.053 (0.065)
Accelerated Depreciation	-0.134 (0.019)	-0.007 (0.030)	-0.027 (0.023)	0.053 (0.037)
Tax Exemption on Inventories	-0.087 (0.026)	-0.044 (0.040)	0.018 (0.033)	0.071 (0.050)
Research and Development	0.025 (0.017)	-0.002 (0.028)	-0.030 (0.022)	0.000 (0.036)
Bond Financing	0.029 (0.020)	-0.012 (0.032)	0.029 (0.025)	0.035 (0.040)
Loan or Loan Guarantee (for Building or Equipment)	0.007 (0.022)	0.015 (0.034)	0.013 (0.027)	0.019 (0.044)
Tax and Financial Incentives at *t – 5*				
Corp. Income Tax Exemption	-0.092 (0.017)	-0.126 (0.026)	-0.031 (0.031)	-0.081 (0.050)
Personal Income Tax Exemption	0.081 (0.014)	0.127 (0.023)	0.007 (0.027)	0.029 (0.042)
Excise Tax Exemption	0.081 (0.017)	0.034 (0.028)	0.044 (0.034)	-0.029 (0.055)
Capital (Land, Equipment & Machine)	-0.134 (0.032)	-0.183 (0.046)	-0.008 (0.044)	0.073 (0.066)
Accelerated Depreciation	-0.041 (0.015)	0.039 (0.024)	0.025 (0.026)	0.016 (0.043)
Tax Exemption on Inventories	-0.067 (0.022)	-0.061 (0.034)	-0.037 (0.034)	-0.038 (0.052)
Research and Development	0.036 (0.016)	-0.012 (0.025)	-0.077 (0.030)	0.025 (0.048)
Bond Financing	-0.004 (0.019)	-0.018 (0.030)	0.019 (0.026)	-0.009 (0.041)
Loan or Loan Guarantee (for Building or Equipment)	0.023 (0.019)	0.006 (0.030)	-0.007 (0.031)	0.057 (0.049)
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Period fixed effects	No		Yes	

Note: Standard Errors in parentheses. Number of observations = 262,649.

Appendix Table A4. Multinomial Logit Estimation of De Novo Entrants, Continuing Plants, and Relocated Plants. (Parameters for Continuing plants are Normalized to Zero)

	[1]		[2]	
Program introduced during the 5-year period (between $t-5$ and t)	Shut Down	Relocate	Shut Down	Relocate
Tax and Financial Incentives (Enacted)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)
Corp. Income Tax Exemption	0.158 (0.054)	0.016 (0.045)	0.059 (0.083)	-0.045 (0.070)
Personal Income Tax Exemption	0.708 (0.049)	0.470 (0.039)	0.071 (0.075)	0.037 (0.062)
Excise Tax Exemption	0.540 (0.058)	0.413 (0.047)	-0.020 (0.101)	0.147 (0.084)
Capital (Land, Equipment & Machine)	-0.045 (0.177)	-0.001 (0.159)	-0.241 (0.265)	-0.107 (0.230)
Accelerated Depreciation	0.301 (0.051)	0.077 (0.042)	0.118 (0.078)	0.041 (0.065)
Tax Exemption on Inventories	-0.606 (0.072)	-0.396 (0.062)	0.136 (0.150)	0.131 (0.127)
Research and Development	0.662 (0.042)	0.437 (0.035)	-0.002 (0.062)	-0.027 (0.052)
Bond Financing	0.121 (0.053)	0.136 (0.046)	-0.064 (0.084)	0.040 (0.070)
Loan or Loan Guarantee (for Building or Equipment)	0.633 (0.055)	0.523 (0.047)	0.206 (0.086)	0.214 (0.070)
Tax and Financial Incentives at $t-5$				
Corp. Income Tax Exemption	0.211 (0.031)	0.079 (0.030)	0.090 (0.079)	0.043 (0.071)
Personal Income Tax Exemption	-0.004 (0.028)	-0.031 (0.026)	0.020 (0.066)	0.054 (0.060)
Excise Tax Exemption	-0.192 (0.030)	-0.106 (0.030)	0.043 (0.089)	0.249 (0.082)
Capital (Land, Equipment & Machine)	-0.311 (0.170)	-0.206 (0.154)	-0.406 (0.259)	-0.228 (0.226)
Accelerated Depreciation	-0.065 (0.032)	-0.082 (0.030)	0.017 (0.062)	0.024 (0.057)
Tax Exemption on Inventories	-0.351 (0.051)	-0.263 (0.047)	0.194 (0.143)	0.077 (0.124)
Research and Development	-0.234 (0.030)	-0.214 (0.029)	-0.014 (0.060)	-0.026 (0.054)
Bond Financing	0.057 (0.040)	0.059 (0.038)	-0.157 (0.076)	-0.037 (0.065)
Loan or Loan Guarantee (for Building or Equipment)	0.048 (0.041)	0.030 (0.039)	0.244 (0.079)	0.224 (0.070)
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Period fixed effects	No		Yes	

Note: Standard Errors in parentheses. Number of observations = 267,245.

Table A5. Estimated Regression models for Plant Level Percentage Change in Employment with a 5-year Lag in the Policy Variable

	[1]		[2]		[3]	
Program introduced during the 5-year period (**between *t - 10* and *t-5***)						
Tax Incentives (Enacted)	γ	(std. error)	γ	(std. error)	γ	(std. error)
Corp. Income Tax Exemption	-0.011	(0.004)	-0.007	(0.004)	0.000	(0.004)
Personal Income Tax Exemption	-0.007	(0.003)	-0.011	(0.003)	-0.031	(0.003)
Excise Tax Exemption	0.024	(0.004)	0.021	(0.004)	0.011	(0.004)
Capital (Land, Equipment & Machine)	0.001	(0.005)	0.005	(0.005)	-0.009	(0.005)
Accelerated Depreciation	-0.013	(0.003)	-0.018	(0.003)	0.028	(0.003)
Tax Exemption on Inventories	0.050	(0.004)	0.053	(0.004)	0.095	(0.004)
Research and Development	0.019	(0.004)	0.014	(0.004)	0.037	(0.004)
Financial Incentives (Enacted)						
Bond Financing	0.014	(0.003)	0.016	(0.003)	0.021	(0.003)
Loan or Loan Guarantee (for Building or Equipment)	0.003	(0.003)	0.007	(0.003)	-0.047	(0.004)
Tax and Financial Incentives at *t – 5*						
Corp. Income Tax Exemption	-0.027	(0.004)	-0.024	(0.004)	0.005	(0.004)
Personal Income Tax Exemption	0.016	(0.004)	0.011	(0.004)	-0.019	(0.004)
Excise Tax Exemption	-0.012	(0.004)	-0.006	(0.004)	-0.042	(0.005)
Capital (Land, Equipment & Machine)	-0.009	(0.005)	-0.002	(0.005)	-0.019	(0.006)
Accelerated Depreciation	-0.016	(0.004)	-0.021	(0.004)	0.028	(0.005)
Tax Exemption on Inventories	0.072	(0.004)	0.069	(0.004)	0.131	(0.005)
Research and Development	0.001	(0.005)	-0.002	(0.005)	0.020	(0.005)
Bond Financing	0.027	(0.003)	0.032	(0.003)	0.037	(0.004)
Loan or Loan Guarantee (for Building or Equipment)	-0.006	(0.004)	0.004	(0.004)	-0.050	(0.004)
Lag(Employment Growth)	-0.197	(0.002)	-0.197	(0.002)	-0.359	(0.002)
R^2	0.609		0.610		0.828	
Other Plant level variables	Yes		Yes		Yes	
State fixed effects	Yes		Yes		Yes	
Period fixed effects	Yes		No		No	
Industry fixed effects	Yes		No		No	
Industry by Period fixed effects	No		Yes		Yes	
Plant fixed effects	No		No		Yes	

Note: Standard Errors in parentheses. Number of observations = 1,716,337.

Federal Reserve Bank
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Research Department
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Cleveland, OH 44101

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