GEOGRAPHIC REDISTRIBUTION OF THE U.S . MANUFACTURING AND THE ROLE OF STATE DEVELOPMENT POLICY

by

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CES 07-06 March, 2007

Abstract

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 locate their production facilities geographically; they 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 Classification: J23, H25, H73, R58,

Key Words: entry, exit, relocation, tax incentive

* This is a chapter of my dissertation at the University of Rochester. I am very grateful to Mark Bils for his valuable advice and encouragement. I thank Gordon Dahl, Jeff Dominitz, Tim Dunne, Thomas Holmes, Lance Lochner, Scott Schuh, James Walker, and Michael Wolkoff for very helpful conversations and suggestions. Randy Becker, Tim Dunne, Renee Fields, Shawn Klimek, and David Merrell were especially generous with their time in helping me with the LRD. The views expressed in this paper are solely the responsibility of the author and should not be interpreted as reflecting the views of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System. The research in this paper was conducted while the authors were Special Sworn Status researchers of the U.S. Census Bureau at the Carnegie Mellon University Census Research Data Center and Michigan Census Research Data Center. Research results and conclusions expressed are those of the authors and do not necessarily reflect the views of the Census Bureau. This paper has been screened to insure that no confidential data are revealed. Support for this research at the Michigan RDC from NSF (awards no. SES-0004322 and ITR-0427889) is gratefully acknowledged. Financial support from an NSF Doctoral Dissertation Research Improvement Grant SES-0136927 is also gratefully acknowledged.

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. Despite the large amount of attention and resources that policymakers have devoted to these programs, there is little systematic empirical evidence concerning the cost-effectiveness and impact of such business incentives.

While the location decisions of manufacturing firms may have major consequences for the ability of local governments to raise revenue and provide services, there has been relatively little research on whether state and local governments can influence the relocation decisions which firms make. Although some studies such as Carlton (1983) 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 because of the unavailability of data, no empirical research has examined patterns of firms relocating production facilities across locations in the face of legislative changes that affect 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 (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 on geographic shifts of individual firms' production facilities — do not provide insights into the importance of relocation, specifically to what extent the relocation of individual establishments explains geographic shifts of U.S. manufacturing industries.

So far, research on relocation has focused mainly on the urban economic aspects of the decision, using either relatively small samples from the manufacturing sector or small geographic regions. Burns (1977) indicates that vertical movers (relocations from central cities to suburbs) are attracted by 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 economic factors 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 into business relocation, their limited samples can hardly represent U.S. manufacturing plants as a whole, and their methods are subject to the 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 and the role of state development incentive programs. I employ confidential data from the U.S. Bureau of the Census, covering 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 and 1992. 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.* in 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 the extent to which 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) provided 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 investigate the ways in which 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 business, 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 newly implemented incentive programs are successful in retaining the businesses in the state. Although a modest amount of research has focused on economic development incentives, relatively little is known about how firms respond to these incentives. So far, most of these studies have focused on the aggregate employment growth at the regional and industry level. For example, de Bartolome and Spiegel (1997) find that economic development expenditures by the state are related to a significant degree 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.[1] This paper complements previous studies concerning the effect of state fiscal policies on new plant births by providing insights into the ways in which factors affecting business location decisions influence plant turnover and relocation decisions.

In Section 2, I construct measures of entry, exit, and relocation. In Section 3, I summarize empirical findings on plant entry, exit, and relocation. 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. Although net employment gains from plant relocations are higher for growing states, I find large offsetting employment flows caused by plant relocations in both growing and declining states. I find plant relocations within the same firm account for about seven percent of the variation in employment growth rates across states during the sample period.

Overall, relocations of individual firms play a relatively small role in explaining geographic redistribution of the manufacturing employment.

In Section 4, I examine the effects of state development on geographic redistribution of manufacturing industries. 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 plants in the state. Previous literature on entry and exit ignores the possibility that plants can be reopened (relocated) after shutting down. I distinguish the entry due to relocation from the entry of *de novo* plants — new plants unrelated to the relocation of incumbent plants —, and exit due to relocation from *permanent* exit — shutting down a plant without relocating the production processes to any 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.

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[1] See Newman and Sullivan (1988), Bartik (1991), and Fisher and Peters (1997) for a survey of previous research.

In this study, I use the five CM files (1972, 1977, 1982, 1987 and 1992) on 300,000-400,000 plants to develop measures of relocation for each establishment. Since the CM covers 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 two consecutive census years.[2]

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 deal 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 outside the state.[3] 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 the *origin* plant and a new plant *after* relocation as the *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 state. 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

[2] 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).

[3] While I focus on relocations across states, I separately examine relocations within the state to distinguish relocated plants from de novo entrants or permanent shutdowns. Since the focus of this paper is relocations across states, relocation rates in this paper measure "out-of-state" relocation rates unless specified otherwise.

current (t) and later censuses ($t \geq t+5$).[4] To examine which states have experienced frequent relocations relative to others, I construct summary measures of entry, exit, and relocation in the following Definition Table:

Definition Table.

Variable	Definition
Entry Rates (opening plants)	
$Entry\ Rate_i(t)$	$\frac{\text{the number of opening plants in state i}}{\text{the total number of plants in state i in census year t}}$
$Relocation\ Rate\ New\ Locale_i(t)$	$\frac{\text{the number of relocated (destination) plants in new locale}}{\text{the total number of plants in state i in census year t}}$
$Ratio\ of\ Relocation\ to\ Entry_i(t)$	$\frac{\text{the number of relocated (destination) plants in new locale}}{\text{the number of opening plants in state i}}$
Exit Rates (closing plants)	
$Exit\ Rate_i(t-5)$	$\frac{\text{the number of closing plants in state i}}{\text{the total number of plants in state i in census year t - 5}}$
$Relocation\ Rate\ Old\ Locale_i(t-5)$	$\frac{\text{the number of relocated (origin) plants in old locale}}{\text{the total number of plants in state i in census year t - 5}}$
$Ratio\ of\ Relocation\ to\ eXit_i(t-5)$	$\frac{\text{the number of relocated (origin) plants in old locale}}{\text{the number of closing plants in state i}}$

Note that there are four different rates measuring relocation. *Relocation Rate New Locale*$_i$*(t)* and *Relocation Rate Old Locale*$_i$*(t – 5)*) respectively measure how many plants opened or closed due to relocations among the 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 the 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.

Relative Size

[4] 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.

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,

$$Entrant\ Relative\ Size_i(t) = \frac{Average\ Size\ of\ Entrants_i(t)}{Average\ Size\ of\ Incumbents_i(t)},$$

where *Average Size of Entrants* is calculated from dividing the number of employees in entering plants by the number of entering plants and *Average Size of Incumbents* is calculated from dividing the number of employees in continuing plants by the number of continuing plants in the state. [5]

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 comparisons between 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

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

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

$$Relocation\ New\ Locale\ Relative\ Size = \frac{Average\ Size\ of\ Relocated\ (Destination)\ Plants}{Average\ Size\ of\ Continuing\ Plants}$$

$$Relocation\ New\ Locale\ Relative\ Size\ compared\ to\ Entrants = \frac{Average\ Size\ of\ Relocated\ (Destination)\ Plants}{Average\ Size\ of\ (de\ novo)\ Entrants}.$$

industry differences, however, 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 areas, directing attention to entry, relocation, and exit patterns in the 48 contiguous states and the District of Columbia. Contrary to previous findings, indicating that manufacturing firms usually move plant operations over short distances within states (Schmenner 1980, 1982), I find that more than 50% of relocations occur across state borders. This contrasting finding of relatively frequent out-of-state relocations is the result of the broader coverage of the data used in this study, in terms of its geographic scope. Since previous studies used data that fail to distinguish between establishments and firms, it was not easy to identify ownership transfers or relocations from the births and deaths of establishments. While such limitations may have led previous researchers to understate relocations, the use of the LRD enables this study to overcome such limitations found in previous studies.

3.1 Average entry, relocation, and exit statistics across states

Table 1 reports the average rates of entry, relocation, and exit across states between each pair of census years.[6] 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 studies of entry and exit across 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), as well as with Cable and Schwalbach (1991). The sixth row of the table indicates that destination plants are 43% 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 of the table.

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

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

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 closed plants that have not been relocated.

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, I present in Figures 1 and 2 the average values of entry, exit, and relocation rates over the four time-period observations, as displayed on a map of the United States. An interesting pattern thereby revealed is the similarity between the average entry and exit rates across states. As expected from 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 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 states is stronger for relocation rates than it is for entry and exit patterns.[7] In general, a state with a higher average relocation rate for new locales (entry) also has a higher average relocation rate for old locales (exit) in terms of 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 [see Figures 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, a relatively large number of 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.

[7] 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, while 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.

This pattern is clearly observed in Table 2, which presents a transition matrix of relocation flows across census divisions, and in which I report the fraction of relocated plants moving from the Origin (row) to the Destination (column). The diagonal of the matrix shows the fraction of relocated plants that stayed within the same census division while the off diagonal of the matrix represents the fraction of relocation across census divisions. While New England and the Middle Atlantic suffered from plants losses, with smaller share of plants moving into the area than the share moving out, the South Atlantic, West South Central, and Pacific divisions have attracted a relatively large number of plants from all across the country. In fact, the South Atlantic (in Column 5) shows a slightly higher share than the other off diagonal columns in each row, suggesting that a relatively higher percentage of relocated plants chose the South Atlantic as their new production site. Three other findings are worth mentioning. First, there exist a lot of relocations from one census division to another. This finding suggests that previous studies on relocation, due to the narrow coverage of the data, may have failed to account for such long distance movers. Second, while I find that some plants relocate over a long distance, relatively higher share of relocations occur within neighboring states. I find that a firm is more likely to keep a large portion of existing jobs in a nearby location by relocating bigger plants over shorter distances while relocating smaller ones over longer distances. Third, although plants tend to relocate from declining states into growing states, there are relatively large offsetting flows from growing states to declining states.

Employment Growth and Differences in the Pattern of Entry, Exit, and Relocation

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 states, I find that employment growth rates across states in each census year are positively correlated with entry rates and negatively correlated with exit rates.[8] Overall, states with higher employment rates in manufacturing industries 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.

Furthermore, differences in the size of entrants and exiting plants also seem to play a role in accounting for disparities in state employment growth rates. To explore patterns in the size distribution of

[8] The simple correlation between net entry rates and net employment growth rates is .622. For relocation 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).

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 a growing state employ four more new workers than do opening plants in a declining state. 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 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 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.

Differences in the Role of Plant Turnovers in Employment Growth across States

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, the 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.

Figure 4 presents the average values of these variables — the percentages of employment gains (losses) from multi-unit plant births (deaths), relocations within states, and relocations between states — over the four five-year periods for all states within a Census Division. 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, 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.

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. However, the evidence from Figure 5 implies that this is not necessarily the case. I find that states with higher employment growth rates tend to have higher share of employment gains from relocation. However, I don't find higher share of employment losses from relocation in declining 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.

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

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

$$\underbrace{\Delta E}_{Total\ Employment\ Changes} = \underbrace{\{|Birth| + |Expansion| - |Contraction| - |Death|\}}_{Changes\ Within\ State} + \underbrace{\{|Reloc\_In| - |Reloc\_Out|\}}_{Changes\ Between\ States}$$

$$= \underbrace{\Delta Ew}_{Employment\ Changes\ Within\ State} + \underbrace{\Delta Eb}_{Employment\ Changes\ Between\ States}$$

where $Birth$ and $Expansion$ respectively measure employment gains due to plant openings and expansions of continuing plants and $Death$ and $Contraction$ respectively measure employment losses due to plant closings and contraction of continuing plants.[9] While these four terms reflect changes in employment within states, $Reloc\_In$ and $Reloc\_Out$ reflect changes between states due to relocations. $Reloc\_In$ measures employment gains from plant openings due to relocation into the state and $Reloc\_Out$ measures employment losses from plant closings due to relocation out of the state.

The following decomposition of the variance of total employment change (ΔE) quantifies the extent to which interstate plant relocations explain the variation of employment growths across states:[10]

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

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.

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

[9] Births and deaths include relocations *within* state in this case.
[10] To do this, I attribute $Cov(\Delta Eb, \Delta Ew)$ equally in the variance decomposition.

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 impossible with the currently available LRD, it may be premature to draw a firm conclusion about the role of manufacturing firms' relocation in employment changes across states. However, single unit plants are more likely to be tied to a location for reasons such as the owner's personal ties to the given geographic area. Furthermore, 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 a relatively small role for plant relocations in explaining inter-state employment growth rates should hold even after accounting for the relocations of single unit plants.

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. Over the past two decades, the number of states with financial-incentive programs has also increased. 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 Figure 6].

4.1 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. As used in many of these studies, crude measures of state and local development incentive efforts have been criticized for misrepresenting the true development incentive positions 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 the 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, by failing to consider such contrary effects of individual policies, research that relies on the index measures 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. 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 a new set of tax or financial incentives during the sample period.[11] In particular, I create an indicator variable for each incentive program, that indicator being equal to 1 if a state has that specific program in the first two years of the five-year period over which the change of location is measured. Given that the dependent variables represent 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.

I measure the presence of business incentive programs in the first two years for the following reasons. First, in any give year many states have implemented a new set of incentive programs. Measuring the presence of policy only at the beginning of the sample year may not capture some policies that have been implemented during the 5-year sample period. Although it is very difficult to determine the exact time lag of such a policy, I can incorporate changes in the policy that have occurred in the earlier part of the sample period and may have affected a firm's decision. Second, I can exclude policies that have been implemented

[11] 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.

later part of the sample period to avoid possible endogeneity issue. If the policy is introduced toward the end of the 5 year window, firms may not have enough time to respond to the policy (within the 5-year window of data collection). Furthermore, besides the problem of the time lag for a policy to produce results, a state that has lost many plants is more likely to introduce such policies to keep plants. There may exist an endogeneity issue, which may lead to a negative correlation between the policy dummies and the independent variable. Such endogeneity will become more an issue for policies that have been implemented in the later part of the sample period. In the empirical results that follow, I explore the following tax and financial incentives [see NASDA (1983, 1986, 1991) for the detail of individual programs].

Corporate income tax exemption. The objective of tax programs is to keep the effective tax rates on businesses low. As with most other tax incentives, the characteristics of such programs 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, in addition to those in Nevada, Texas, and Wyoming. In that year, the state government of Ohio, while collecting corporate income tax, gave a corporate franchise tax or personal income tax credit for a portion of personal property tax paid on new machinery or equipment. In many states, a 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 manner similar 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 taxes paid by corporations. In Tennessee, for example, businesses receive an excise tax credit equal to 1% of the purchase, installation and/or repair of qualified industrial machinery, as well as 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. The sales and/or use tax exemption on machinery and equipment is an incentive usually made available to new and expanding businesses, which 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 individuals and corporations 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. Since the majority of states include inventories as a component of the ad valorem property tax, the most frequent form of tax relief 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 thus become 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, taxing 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. While business revenues are the only security backing an industrial revenue bond issue, 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.

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 a 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 the raw materials for manufacturing tax exemption, the job creation tax incentive exemption, the industrial investment tax incentive, and the 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.

4.2 Discrete Choices 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 within the state.

Decisions to Shut Down, Relocate, or Stay

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 the standard tool of discrete choice analysis: the multinomial logit. I assume that a firm decides either to shut down a plant permanently, to keep operating in the same state, or to relocate the plant to a new location outside the state. I choose to model the decision as an unordered choice 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

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

where β_{Stay} is normalized to zero for identification.[12] 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 (1989) 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 rates and effective corporate tax rates 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 plant is located.

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 distinct state; presence versus absence of the policy. That is to say, I first estimate a multinomial logit using all plant and state characteristics of interests

[12] The decision to stay includes relocation within the state.

as independent variables. Then, I pretend that all plants in the data set are located in states that did not have a corporate income tax exemption program. To do so, I go back to the raw data and code as 0 the dummy variable indicating the existence 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 a plant's shutting down and of relocating, which are the adjusted percentages for shutting down and relocating. I report these figures in Columns A and D respectively, in Table 4. Next, I pretend that all plants are in states that have a corporate income tax exemption and code the dummy variable for having a corporate income tax exemption as 1. After that, I calculate the means of the predicted probabilities for shutting down and for relocation in Columns B and E respectively, as presented in Table 4. The difference in those two sets of adjusted probabilities is the difference due to the policy change, holding other characteristics constant. The likelihood-ratio (LR) statistic, calculated by estimating the restricted (i.e., without the indicator for corporate income tax exemption) and unrestricted multinomial logit estimations, shows that corporate income tax exemptions do not significantly change the probability of a plant's shutting down or relocating.

In Table 4, I present adjusted probabilities from the multinomial logit estimation, which includes state and year fixed effects, the parameter estimates of which are reported in the Appendix (Column 2 of Table A6).[14] To the right of these adjusted probabilities, I report the LR test statistic for whether the coefficients on the incentive programs, corresponding to "Permanent Exit" and "Relocation" decisions, are jointly zero. The results in Table 4 suggest that most incentive programs change the probability of a plant's shutting down or relocating only marginally. I find that most of the incentive programs, with the exception of personal income tax exemptions and loan or loan guarantee programs, all slightly reduce the probability of a plant shutting down permanently. The finding of the relatively small effects of taxes on location choices is consistent with findings from previous studies, which used much smaller samples.

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[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).

[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.

A number of policy makers and researchers have suggested wage differences as a main factor that affects relocation decisions. To find out how big the impact of these incentives are, I compare these reductions in probability to such changes in the predicted value of the probability of a plant's shutting down if the state's average wage for production workers were hypothetically reduced, holding other factors constant. When the average wage of production workers decreases by about 10% from the mean value, I find that the predicted probability of shutting down and that of relocation decrease by .6 percentage point and .3 percentage point, respectively. This finding stands in contrast to previous research, which found a small effect for tax reduction, in comparison with the effects of lower wages. 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.

While the effects of tax and financial incentives on the probability of relocation are quite mixed, the magnitude of the effects seems to be relatively small for most programs. With the exception of accelerated depreciation, most programs do not change the probability of relocation by more than .3 percentage point. The LR test statistic suggests that the coefficients on the incentive programs are not significantly different from zero for most programs. However, considering that a 10% decrease in the wages of production workers would have resulted in a .3 percentage point decrease in the predicted probability of relocation, the magnitude of the change in probability created by accelerated depreciation is relatively significant.

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. As in the 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 $(t - 5)$. These categories are: *de novo* entrants, continuing plants, and relocated plants from another state. Relocated plants are defined as opening plants that previously operated in another location outside the state. I classify plants relocating within the state as continuing plants; therefore, the category of continuing plants includes relocated plants that previously operated in another location within the state as well as plants that operated in the same location as they did in the previous census year. To examine how individual development policy is 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 used in 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 in describing the relationship between the policy dummies and the probability that a plant fits into each category. In the previous section, I evaluated the effectiveness of the policy by looking *forward* in the time horizon from the decision of a firm (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*).[15]

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 5, 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 A7). The results in Table 5 suggest that most tax and financial incentive programs did not increase the percentage of new plants in the state. As was found in the previous section, no programs examined in this paper significantly increased the probability of a state seeing relatively more plant openings, either in terms of relocated plants or *de novo* entrants.

On the contrary, tax exemptions on land and capital and bond financing decreased the probability of attracting a de novo entrant or relocated plant. The LR test statistics suggest that coefficients on these two programs are significantly different from zero. The magnitude of changes in the probability of observing a new plant opening is relatively big, considering that a 10% reduction in the average wages of production workers in the state would have increased the same probability by less than .2 percentage point. However, given the fact that that both of the alternatives (i.e., de novo entrants or relocations) actually occur in the state, the negative effect of a policy variable does not always imply that a policy is not successful in keeping businesses in the state. Furthermore, the comparison of Columns C and F suggests that policies which are not successful in attracting businesses from other states are not necessarily less likely to encourage plant

[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. A caveat of this method is that, since it examines proportional changes in the composition of plants in the state, it may fail to capture changes in the total number of plants in the state. For example, a successful policy may increase the number of plants in all three alternatives (i.e., entrants, continuing

openings in the state. For example, although the effect may not be statistically significant, loan or loan guarantee programs decrease the probability of relocation from outside the state, but increase the probability of plant openings.

4.3 Some Caveats

The analyses in the previous section are based on the assumption that a firm's decision on where to relocate to occurs simultaneously with its decision on whether to relocate or shut down. However, such a decision may occur in a sequential manner, with a firm choosing a new location after deciding to shut down an old plant. In a different specification that incorporates such a possibility, I found similar results to those reported in the previous section.[16]

What may be more important in interpreting the results in this section is that these estimates are not derived from randomized experiments, and therefore, do not necessarily imply causal relations. A possible explanation for the negative correlation between relocation and policy variables is the existence of either policy lag or endogenous changes in policy. If state governments introduce incentives to encourage a depressed labor market, and the policies have a delayed impact, such legislative changes may be negatively correlated with entry and relocation rates in the short run.[17] Given that it is not clear how many years it takes a certain policy to affect a firm's decision on whether or where to relocate, the results in this paper should be interpreted with caution.

Finally, the finding of a relatively small role for relocations in explaining the geographic redistribution of employment suggests a new and more important perspective in terms of assessing the impact of the policy on employment growth. Given that in-state businesses play an important role in the growth of a state's economy, an evaluation of the effectiveness of state development policy will require a thorough examination of such effects on the growth of businesses in the state, as well as on the births and deaths of businesses within the state.[18] I have explored 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

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plants, and relocated plants). If the number of plants in three alternatives increases in the same portion, this specification, focusing on the proportional changes, may not capture such positive effect.

[16] I assumed 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 (no relocation), or to relocate the plant to a new location. In the second stage, conditional on a decision to relocate in the first stage, a firm decides whether to relocate within or outside the state.

[17] Such a policy may have a longer lag in affecting the decision to open a new plant than in delaying the decision to shut down an existing plant. If this is the case, the negative correlation is more likely to be observed in the second case of multinomial logit estimation for the opening plants.

[18] Holmes (1998) finds a big difference in manufacturing activity between states with and without right-to-work law.

affect establishment growth. Although some programs have had a positive, statistically significant impact on plant-level employment growth, the magnitude was small economically.[19]

5. Conclusion

I document the patterns of plant entry, exit, and relocation among U.S. manufacturing industries and examine the influence of development incentives given by individual states 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 process of geographic redistribution of manufacturing industries. This examination of relocated plants, entrants, and exiting plants in terms of the sizes of their workforce, reveals considerable differences between the size distribution of entering and exiting plants in growing states and declining states. I find that the differences are even more significant among relocated plants, suggesting that geographic redistribution in U.S. manufacturing 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 by plant startups and shutdowns. Moreover, growing states have not only a higher fraction of employment gains from plant openings but also a higher fraction of employment losses from plant closings. The higher turnover rates found in growing states suggest that creative destruction, reflected in the high number of turnovers, may play an important role in the growth of a state. This finding highlights the importance of the reallocation process in understanding the disparity of growth rates across states. Such a process has been ignored in previous studies focusing on net employment changes across states.

While plant relocations across states account for 10 percent of the plant turnover 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 development incentive programs have only marginally affected decisions concerning the relocation of existing plants. 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. While the conclusions from those previous studies were not robust in terms of changes in time frame and were subject to criticism due to their limited sample sizes, this study addresses those deficiencies.

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[19] A table reporting the impact of those policies on plant-level employment growth can be added upon revision, if necessary.

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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
Out-of-State Relocation Rate New Locale					
	0.029	0.032	0.029	0.031	0.026
Ratio of Out-of-State Relocation to Entry					
	0.120	0.108	0.133	0.128	0.109
Entrant Relative Size					
	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
Out-of-State Relocation Rate Old Locale					
	0.026	0.029	0.026	0.023	0.026
Ratio of Out-of-State Relocation to Exit					
	0.098	0.122	0.099	0.078	0.095
Exiting plant Relative Size					
	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

Note: Only multi-unit plants are included in the analysis except entry and exit rate for all plants.

Table 2: Transition Matrix of Relocations for the Nine Census Divisions

		Destination								
	Census division	[1] NE	[2] MA	[3] ENC	[4] WNC	[5] SA	[6] ESC	[7] WSC	[8] MT	[9] 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 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: Covariate Adjusted Percentage of Permanent Shut-downs and Relocation
(Marginal effect of individual program)

	Permanent Exit			Relocation			
	A	B	C	D	E	F	
Program	No	Yes	Diff. (B – A)	No	Yes	Diff. (E – D)	LR test* (*p*-value)
Corp. Income Tax Exemption	21.00%	20.72%	-0.28%	3.79%	3.72%	-0.07%	0.88 (0.645)
Personal Income Tax Exemption	20.59%	21.08%	0.49%	3.71%	3.80%	0.09%	2.92 (0.233)
Excise Tax Exemption	20.93%	20.57%	-0.37%	3.80%	3.62%	-0.18%	2.80 (0.246)
Capital (Land, Equipment & Machine)	21.13%	20.82%	-0.31%	3.78%	3.75%	-0.03%	0.93 (0.629)
Accelerated Depreciation	20.91%	20.80%	-0.11%	3.99%	3.61%	-0.39%	7.78 (0.021)
Tax Exemption on Inventories	21.30%	20.74%	-0.55%	3.83%	3.73%	-0.10%	3.42 (0.181)
Research and Development	21.05%	20.51%	-0.54%	3.72%	3.82%	0.10%	3.70 (0.157)
Bond Financing	21.08%	20.74%	-0.34%	3.65%	3.81%	0.16%	1.98 (0.371)
Loan or Loan Guarantee (for Building or Equipment)	20.66%	20.92%	0.26%	3.59%	3.83%	0.24%	3.32 (0.190)

Note: Number of observations=262,649.
*Likelihood-ratio test for the policy indicator variables appearing in the multinomial logit estimations. See Appendix Table A6 for parameter estimates.

Table 5: Covariate Adjusted Percentage of De Novo Entry and Relocation

(Marginal effect of individual program)

	De Novo Entry			Relocation			
	A	B	C	D	E	F	
Program	No	Yes	Diff. (B – A)	No	Yes	Diff. (E – D)	LR test* (*p*-value)
Corp. Income Tax Exemption	17.51%	17.51%	-0.01%	3.97%	3.97%	0.00%	1.71 (0.425)
Personal Income Tax Exemption	17.42%	17.57%	0.15%	3.92%	4.01%	0.09%	2.36 (0.671)
Excise Tax Exemption	17.59%	17.28%	-0.31%	3.84%	4.38%	0.54%	0.65 (0.724)
Capital (Land, Equipment & Machine)	18.19%	17.48%	-0.71%	4.24%	3.96%	-0.28%	20.24 (0.000)
Accelerated Depreciation	17.71%	17.43%	-0.28%	3.92%	3.99%	0.07%	4.56 (0.102)
Tax Exemption on Inventories	17.13%	17.56%	0.43%	3.88%	3.98%	0.10%	0.48 (0.975)
Research and Development	17.48%	17.53%	0.05%	3.93%	4.03%	0.10%	3.13 (0.209)
Bond Financing	18.00%	17.37%	-0.63%	3.99%	3.97%	-0.03%	24.66 (0.000)
Loan or Loan Guarantee (for Building or Equipment)	17.32%	17.56%	0.23%	4.01%	3.96%	-0.05%	1.12 (0.572)

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 A7 for parameter estimates.

Figure 1: Entry Rate and Exit Rate

(Means across years, 1972 – 1992)

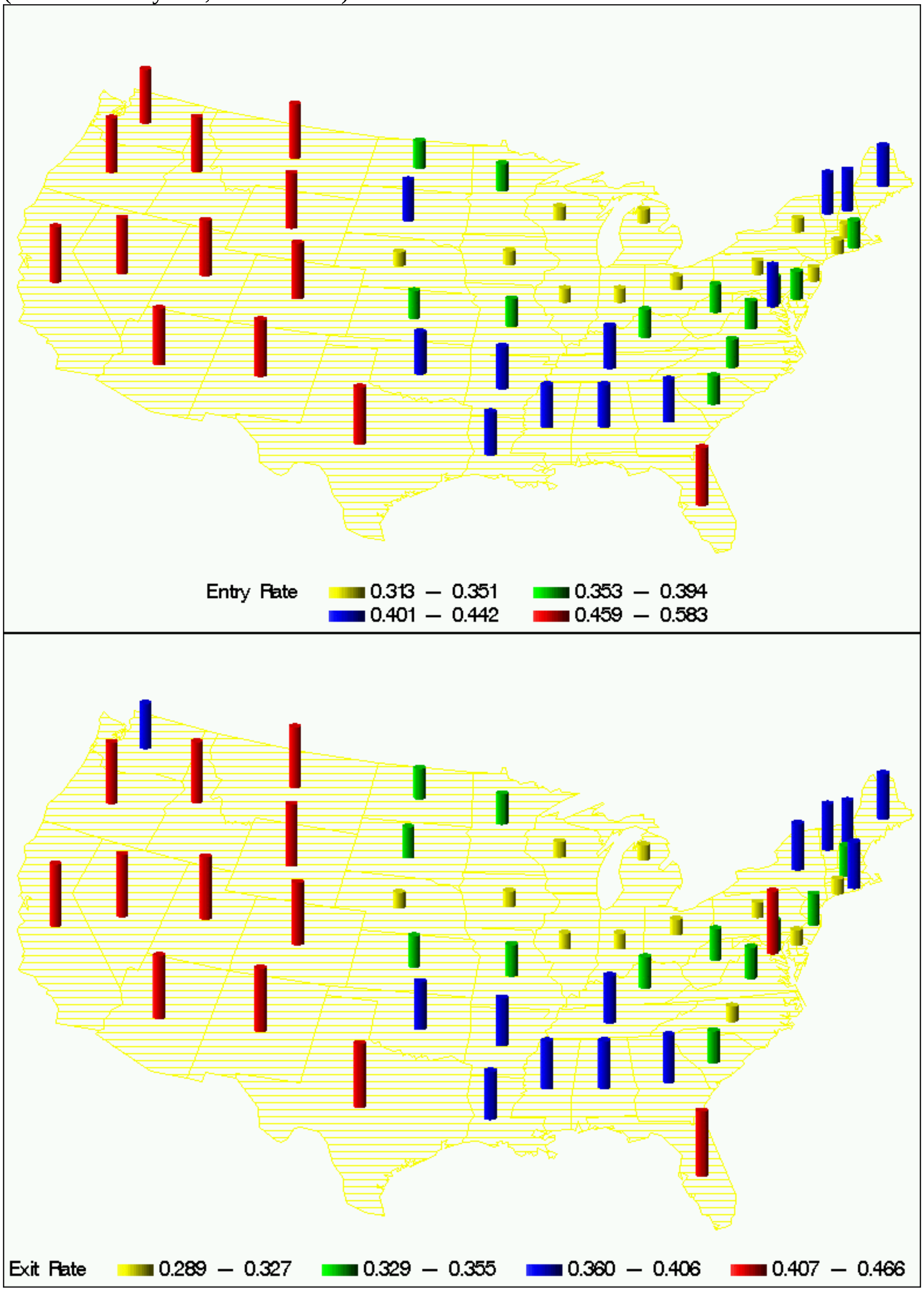


Figure 2: Relocation Rates – Ratios of Relocation to Entry / Exit

(Means across years, 1972 – 1992)

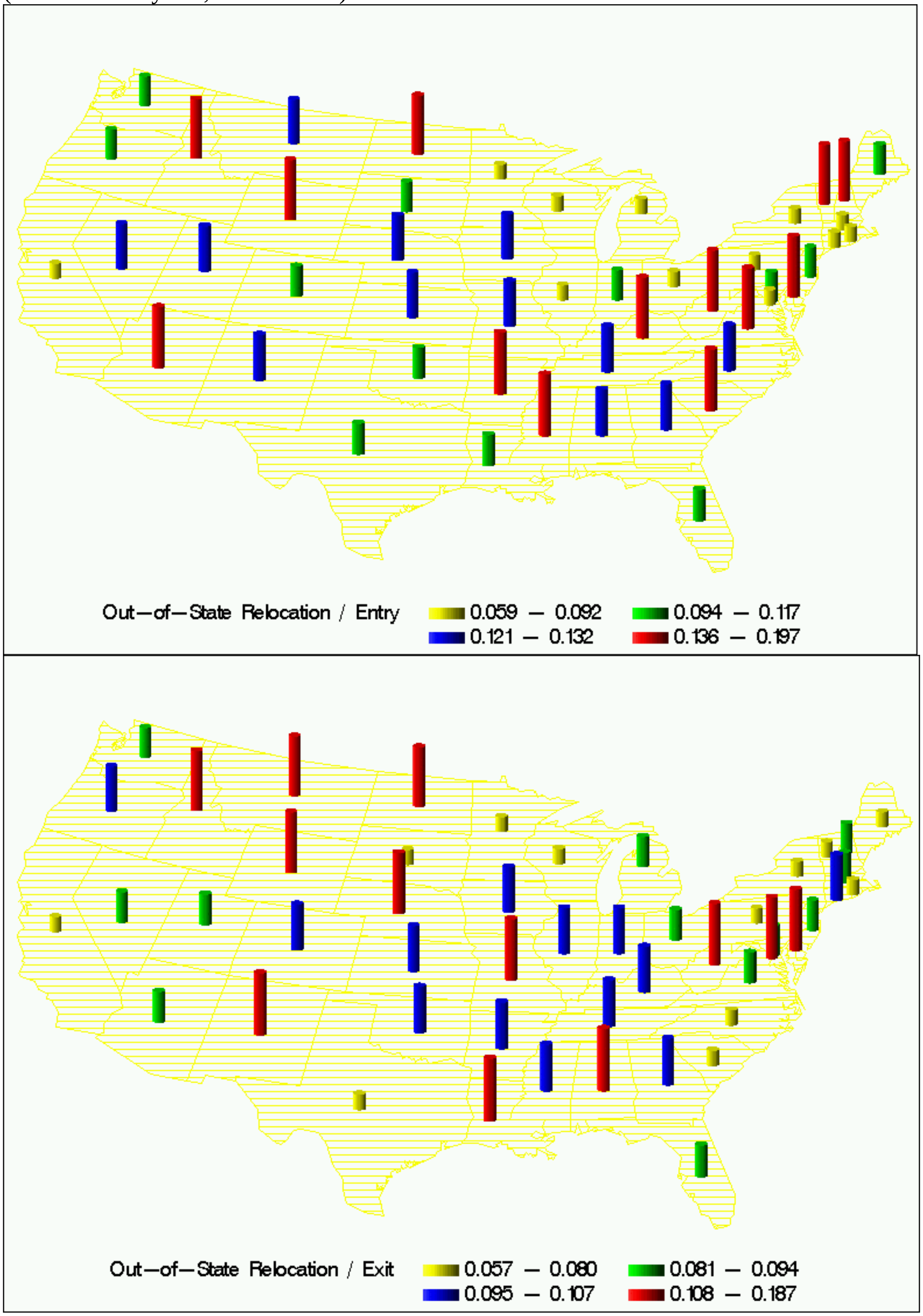


Figure 3A: Entry, Exit, and Relocation Rates: Growing States vs Declining States

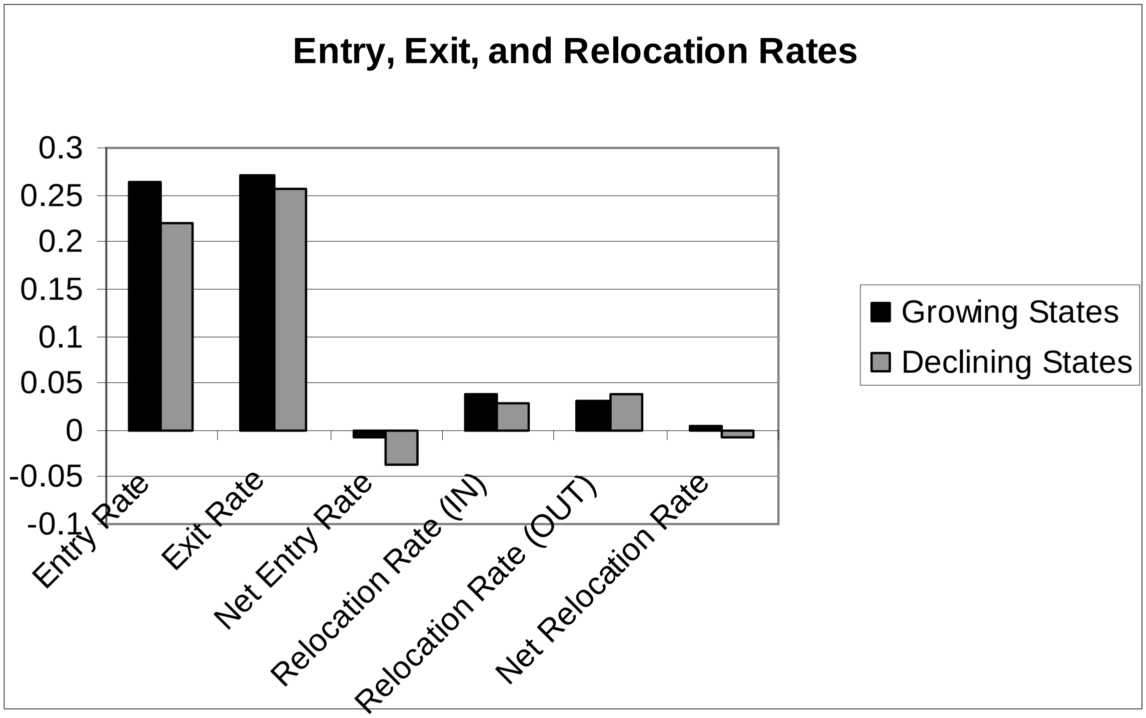


Figure 3B: Average Size of Entering and Exiting Plants: Growing States vs Declining States

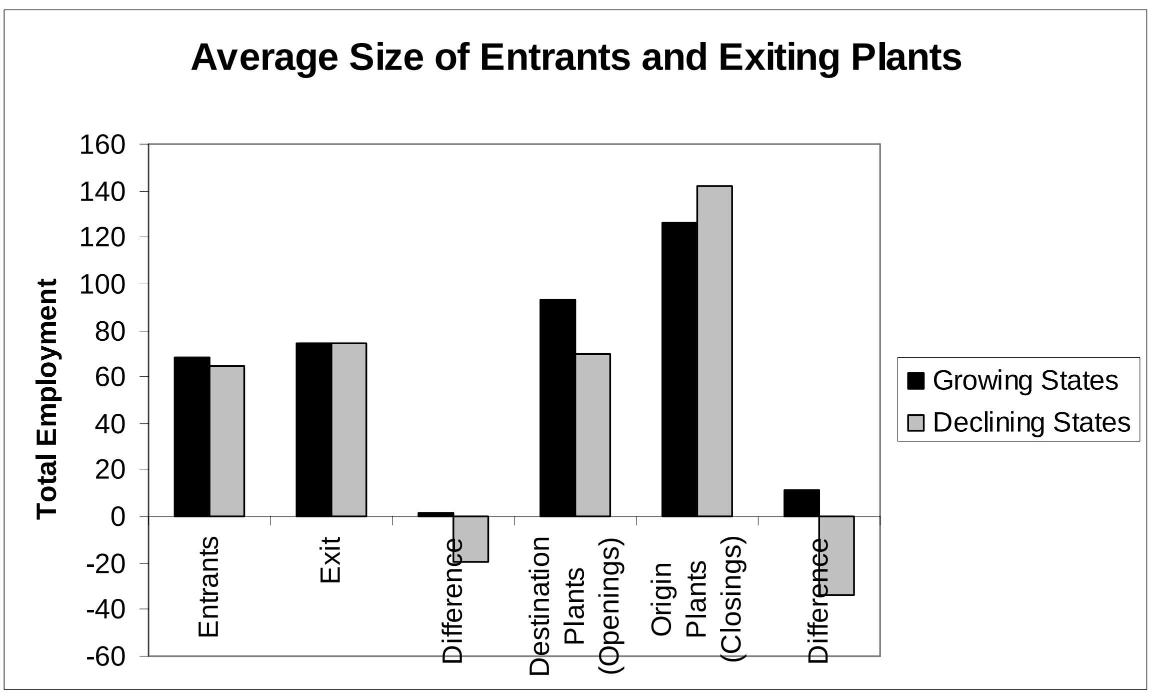
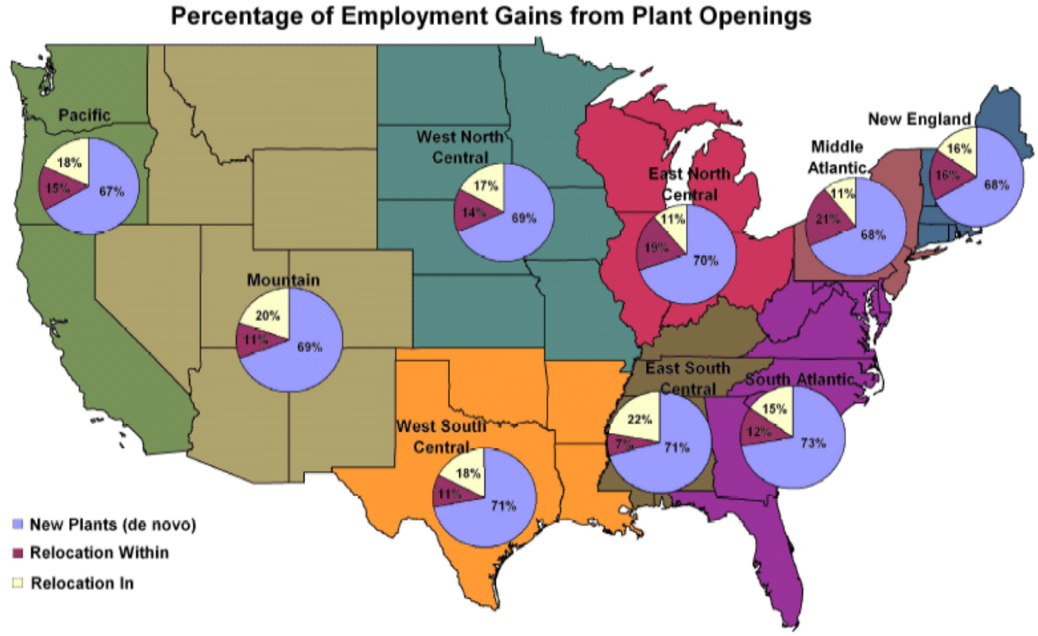
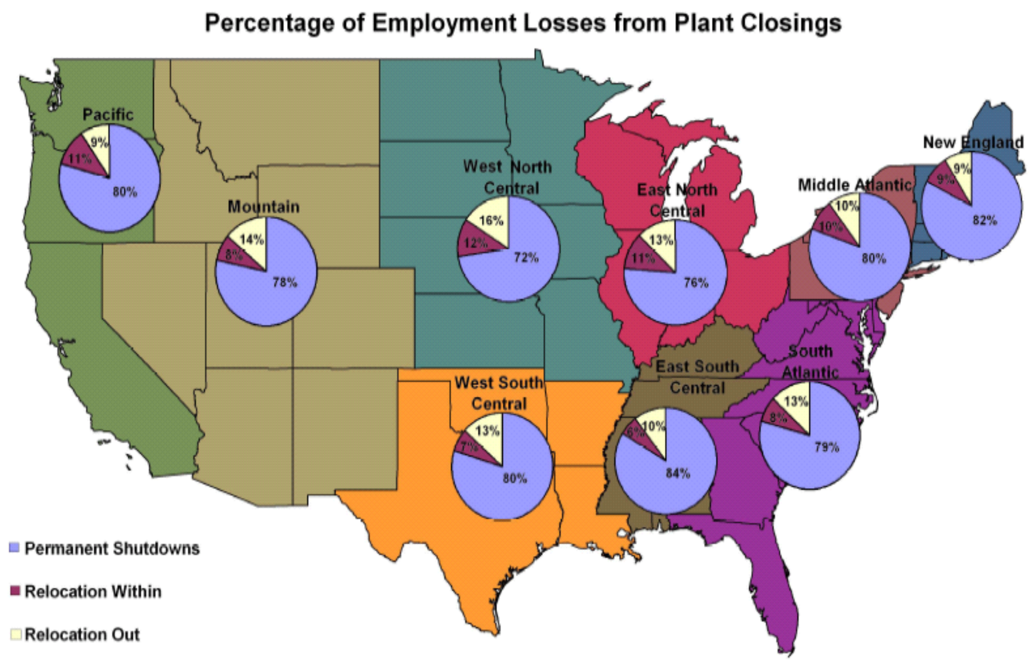


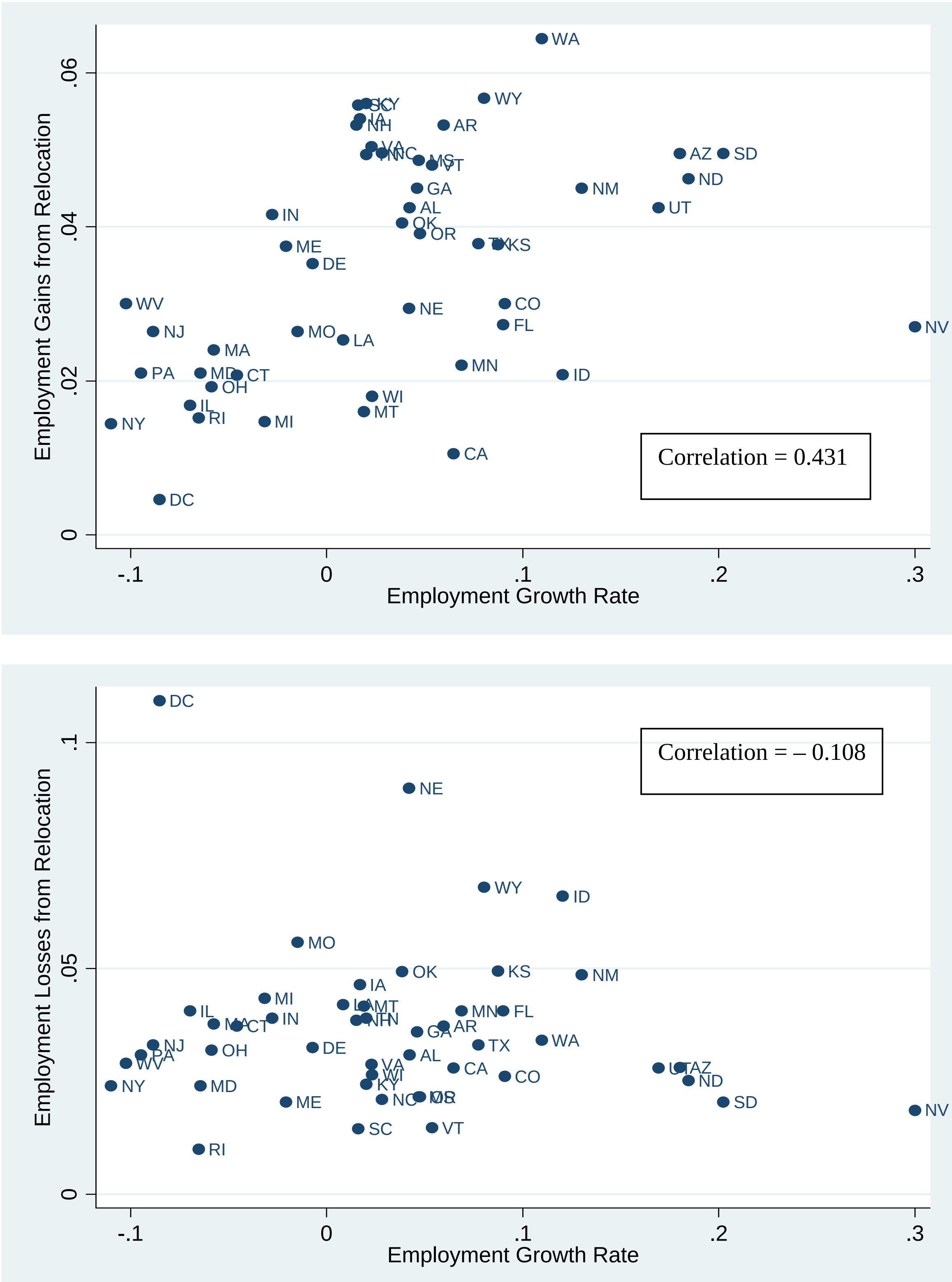
Figure 4: Components of Employment Changes due to Plant Openings and Closings





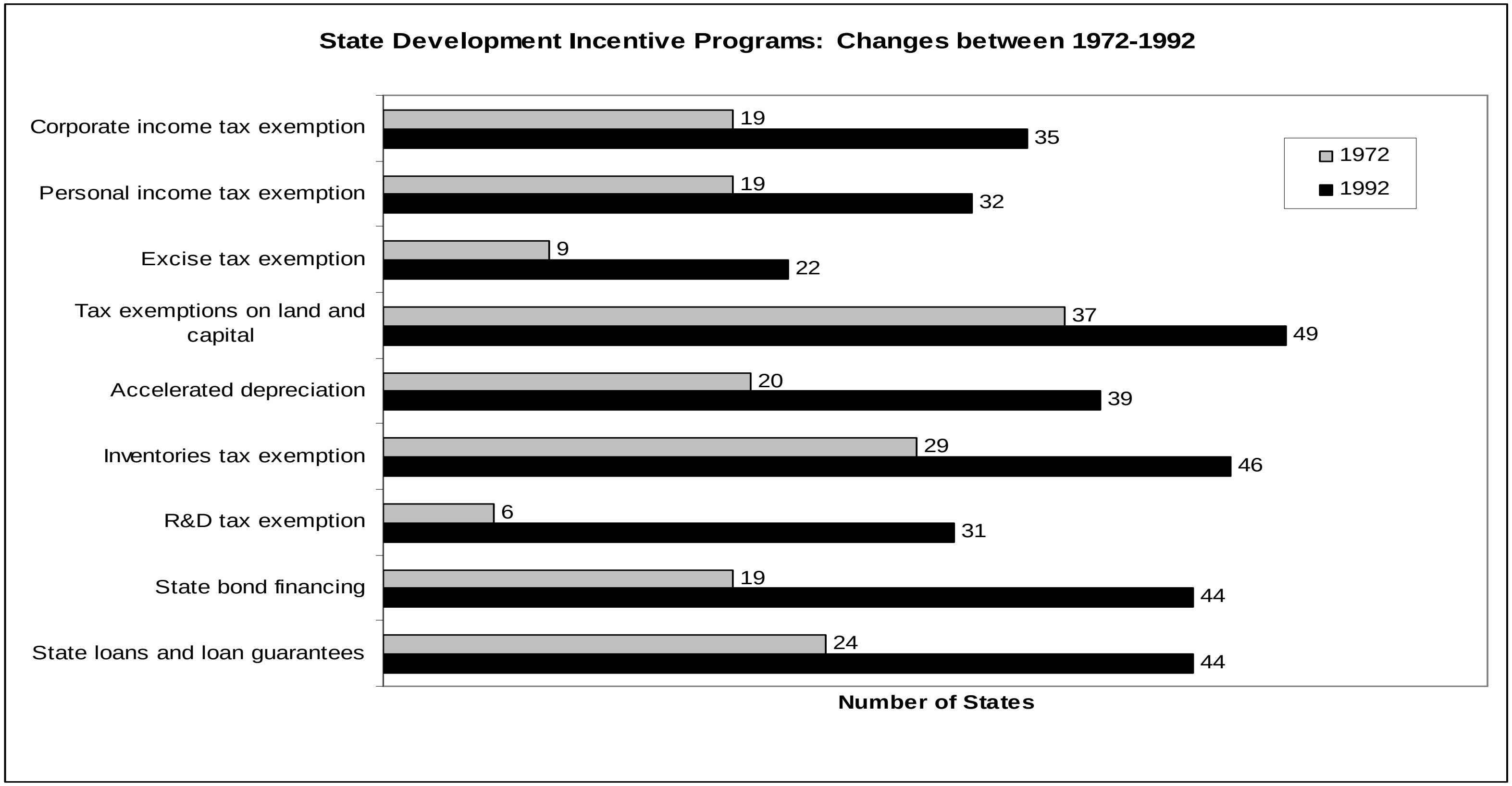
Notes: Averages of four five-year periods between a pair of census years are reported (multi-unit plants only). "Relocation Within" includes employment changes from plant relocations within the neighborhood of the plant (movement within 50 miles and within a state) to distinguish employment changes in *de novo* entrants (or permanent shutdowns) from relocated plants.

Figure 5: Shares of Employment Gains and Losses from Relocation vs. Employment Growth



Note: Means across years, 1972 – 1992.

Figure 6: State Development Incentive Programs



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

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Appendix Table A6. Multinomial Logit Estimation of Shut Down, Stay, and Relocation. (Parameters for Staying are normalized to zero)

	[1]		[2]	
Tax and Financial Incentives	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)
Corp. Income Tax Exemption	-0.046 (0.014)	-0.074 (0.027)	-0.021 (0.025)	-0.024 (0.048)
Personal Income Tax Exemption	0.036 (0.130)	0.056 (0.026)	0.035 (0.022)	0.034 (0.044)
Excise Tax Exemption	0.027 (0.144)	0.027 (0.029)	-0.028 (0.022)	-0.057 (0.046)
Capital (Land, Equipment & Machine)	-0.107 (0.091)	-0.117 (0.038)	-0.022 (0.023)	-0.013 (0.046)
Accelerated Depreciation	-0.037 (0.013)	-0.032 (0.025)	-0.014 (0.020)	-0.110 (0.040)
Tax Exemption on Inventories	-0.025 (0.015)	-0.052 (0.030)	-0.040 (0.023)	-0.037 (0.044)
Research and Development	0.031 (0.013)	0.021 (0.026)	-0.036 (0.020)	0.019 (0.040)
Bond Financing	0.001 (0.017)	0.053 (0.033)	-0.021 (0.022)	0.039 (0.043)
Loan or Loan Guarantee (for Building or Equipment)	0.009 (0.017)	-0.008 (0.034)	0.022 (0.023)	0.073 (0.044)
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Period fixed effects	No		Yes	

Note: Standard Errors in parentheses. Number of observations = 268,367.

Appendix Table A7. Multinomial Logit Estimation of De Novo Entrants, Continuing Plants, and Relocated Plants. (Parameters for Continuing plants are normalized to zero)

	[1]		[2]	
Tax and Financial Incentives	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)	$\beta_{Shut\ Down}$ (std. error)	$\beta_{Relocate}$ (std. error)
Corp. Income Tax Exemption	0.177 (0.024)	0.109 (0.028)	-0.002 (0.048)	-0.001 (0.053)
Personal Income Tax Exemption	0.014 (0.022)	-0.079 (0.026)	0.044 (0.045)	0.044 (0.051)
Excise Tax Exemption	-0.073 (0.024)	0.028 (0.030)	-0.015 (0.055)	0.138 (0.061)
Capital (Land, Equipment & Machine)	-0.501 (0.052)	-0.317 (0.054)	-0.205 (0.066)	-0.168 (0.069)
Accelerated Depreciation	-0.001 (0.024)	-0.000 (0.028)	-0.060 (0.040)	-0.009 (0.045)
Tax Exemption on Inventories	-0.171 (0.034)	-0.000 (0.039)	0.113 (0.066)	0.078 (0.072)
Research and Development	-0.096 (0.024)	-0.085 (0.028)	0.024 (0.042)	0.038 (0.045)
Bond Financing	-0.065 (0.031)	-0.081 (0.034)	-0.157 (0.045)	-0.079 (0.047)
Loan or Loan Guarantee (for Building or Equipment)	0.020 (0.033)	0.037 (0.037)	0.051 (0.049)	0.009 (0.051)
Other Plant level variables	Yes		Yes	
State fixed effects	No		Yes	
Period fixed effects	No		Yes	

Note: Standard Errors in parentheses. Number of observations = 273,873.