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## **Regional Business Climate and Interstate Manufacturing Relocation Decisions**

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# **Regional Business Climate and Interstate Manufacturing Relocation Decisions**

## Abstract

In this study we use the National Establishment Time Series (NETS) database to study relocation by manufacturers based on differences in the business climate between the origin and destination states. We model interstate relocations for manufacturers in aggregate and for three sub-groups characterized by their industry-level research and development (R&D) intensity. The analysis suggests that very few manufacturing firms relocate across state lines in any given year and the vast majority of those that do are small in size and move to adjoining states. Our results also reveal that interstate migration by manufacturing establishments varies with their R&D intensity. Whereas a number of factors considered in this study are statistically significant, marginal effects at the mean are infinitesimal. This implies that states attempting to encourage manufacturing firms to relocate from other states via traditional perspectives on business climate are unlikely to be successful.

## 1. INTRODUCTION

Encouraging businesses, particularly manufacturers, to relocate from one state to another remains a popular economic development policy at both the state and local levels (Feser, 2014; Lowe & Freyer, 2015; Warner & Zheng, 2013). To facilitate industrial recruitment, state and local governments pursue a “positive business climate” through fiscal austerity, tax cuts, and other “pro-business” policies such as right-to-work legislation. Christopherson and Clark (2007) and McCarthy (2015) define this set of policies as a neo-liberal or supply-side approach to

business climate. This perspective suggests that greater global competition is “flattening the world” and driving more firms, including manufacturers, into becoming price takers, where the road to profitability is through lower costs. Within the policy context, both the theoretical and empirical literatures seek to better understand the efficacy of neo-liberal business climate policies. This literature remains vibrant for two reasons: (1) the policy approach remains popular among elected officials despite strong counterfactual arguments and (2) as our data and research methods advance, the empirical results and corresponding policy insights become more subtle and refined.

From a policy perspective, the contemporary competition between the states began with the Mississippi Balance Agriculture with Industry (BAWI) Act of 1933. Building on export base theory and neoclassical firm location theory as it was understood at the time, Mississippi attracted northern manufacturers by promoting cheaper labor and land, lower taxes, and limited regulations. The BAWI became the foundation for how we think about business climate. Since then states actively engage in neo-liberal or supply-side economic development policies that attempt to create an attractive business climate defined by low taxes, cheap labor, and minimal regulations (Deller & Goetz, 2009; Eisinger, 1988; Lynch, 2004; Plaut & Pluta, 1983; Prillaman & Meier, 2014; Ross & Friedman, 1990; Shaffer, Deller, & Marcouiller, 2004)

While the conventional approach to the business climate is multi-faceted, taxes and public services are perhaps the most widely studied within the academic literature. The early contributions based on work by Due (1961) and Oakland (1978) concluded that taxes had no impact on firm location decision because taxes were inconsequential in the accounting of profits. Since Wasylenko’s (1980, 1981) challenge of those earlier studies for a lack of theoretical and empirical rigor, a new line of research has shifted the consensus. In a detailed review of the

expansive literature, Bartik (1985, 1991, 1992) concluded that taxes and other factors commonly associated with business climate do matter. Bartik's work, and that which followed, indicate that taxes are a cost to companies and a detriment to the business climate. But at the same time, taxes fund services, such as education, protective services, and transportation infrastructure that are vital to the production processes of firms and increasingly to the quality of life of the firm's employees.

Regional and local economic development policies designed to attract and retain businesses often target specific industries and sectors. Michael Porter's (1998, 2000, 2001, 2003) reintroduction of the notion of clusters, based on agglomeration externalities, into the popular economic growth and development lexicon moved policy makers and practitioners toward a more industrial focus and away from the "shoot anything that flies, claim anything that falls" approach outlined by Rubin (1988). Today high-technology industries and those characterized by intensive research and development (R&D) activities are a common focus for policy thinking. In addition to promoting innovation and regional competitive advantage, such industries are argued to provide high-paying jobs and contribute to regional growth (Clarke & Gaile, 1989; Jenkins, Jaynes, & Leicht, 2006). If manufacturing firms are sensitive to the neo-liberal business climate policies, it is important to understand how firms from different industries, such as "high tech" and "low tech", prioritize various tax and service characteristics when choosing their location.

Differences in priorities may stem from industries' various maturity levels, as suggested, for example, by the product life cycle theory (Duranton & Puga, 2001; Hong, 2014; Mack & Schaeffer, 1993; Rink & Swan, 1979; Wojan & Pulver, 1995). According to this framework, businesses in more mature industries, or industries less likely to invest in innovation, tend to seek

out lower cost alternatives while newer and more innovation-focused industries may place higher value on other factors, such as a skilled workforce. Hence, the efficacy of neo-liberal business climate policies targeted at business attraction critically depends on the understanding of how relocation determinants vary across industries.

It is important to separate the study of *relocation* decision factors from the study of location decisions more generally. As noted by Holl (2004), Hong (2014), Kronenberg (2013) and Manjón-Antolín & Arauzo-Carod (2011), many previous studies treat relocation, new firm formation, and new branch location decisions equally in broad investigations of location choices, thus leading to potentially incorrect policy inferences. Using the National Establishment Time Series (NETS) dataset, which is particularly well-suited for the study of establishment interstate relocations (Neumark, Zhang, & Wall, 2005), we exploit the preferences revealed by firms that relocate from state to another to investigate the factors behind interstate migration of manufacturers. By narrowing the analysis to the actual movements of between states we can more directly estimate how characteristics of the business climate determine firm relocation as measured by migration flows. This provides a more powerful test of the traditional business climate hypothesis compared to the previous location studies that explore whether or not a particular type of firm is present within a region.

In our analysis, we track manufacturing establishment moves across state lines annually from 2000 to 2011 and offer a stylized description and an empirical analysis using differences-between-states models. The models take into account important regional characteristics, such as concentration of manufacturing activity as a measure of agglomeration economies as well as tax and unionization rates, of both the origin and destination states. That is, the flow of firms between any two states is determined by the difference between the states across several key

measures of business climate. This approach captures state-to-state flows, and unlike studies that look at aggregate in- or out-migration, allows for a better understanding of migration behavior. To the best of our knowledge, we are the first to use a differences-between-states technique in a study of business interstate migration. In addition to the analysis of all manufacturing, we separately investigate how the impact of regional relocation determinants may vary with the level of research and development intensity within various industries.

Beyond these simple introductory comments, the study is composed of six additional sections. In the next section, we briefly review relevant theoretical and empirical literature explicitly focusing on relocations. In section three, we outline the theoretical modeling framework followed by the empirical model and estimation methods in section four. In section five, we describe the data and operationalization of variables used in the analysis. Section six outlines the empirical results. We close with a summary of our findings and a discussion of their policy implications with a focus on broader manufacturing relocation patterns.

## 2. LITERATURE REVIEW

A thorough review of the extensive firm location literature is beyond the scope of this analysis; instead we limit the discussion to the theoretical and empirical aspects of firm relocations specifically. The research to date has mostly been concerned with business location determinants where the research question is if a firm of a particular type (usually specific industry affiliation) is or is not present in a region (e.g. Fortenbery, Deller, & Amiel, 2013; Leatherman, Howard, & Kastens, 2002; Leatherman & Kastens, 2009). If the statistical modeling suggests, for example, that higher corporate taxes decrease the likelihood of a particular type of firms to be present in a location, inferences are drawn about business climate.

The literature that specifically investigates those drivers in relation to *relocation*, where a firm makes a locational choice, moving from one region (state) to another, is underdeveloped. Only recently, with availability of new data, researchers have been able to start analyzing the patterns and determinants of firm migration. Specifically, they study the behavior of firms that make the decision to move from one location to another within a revealed preference structure.

The discussion of business relocation behavior is usually organized within one of three frameworks: neo-classical, behavioral, and institutional (Pellenbarg, Wissen, & Dijk, 2002). Profit-maximization is the cornerstone of the neo-classical approach, which is the most widely adopted theoretical framework and most consistent with the neo-liberal or supply-side view of business climate. Here all firms are assumed to be rational decision makers with full information and the ability to fully process that information about the profitability prospects in each potential location. By monitoring differences between expected profits across space relative to the current site, a company decides to move if doing so maximizes profits. For manufacturing the “low-cost of doing business” is often more important for profit maximization than revenue streams.

The neo-classical framework applies particularly well to large companies, which are likely to adopt more sophisticated algorithms of new site selection (Greenhalgh, 2008) and to move long distances to escape locational mismatch (Kalnins & Chung, 2004), or to exploit an opportunity (Stam, 2007). Empirically, studies of neo-classical relocation determinants focus on labor and transportation costs, market size, agglomeration economies and other, mostly regional, characteristics. The evidence suggests that companies are attracted by agglomerations (Erickson & Wasylenko, 1980; Figueiredo, Guimarães, & Woodward, 2002; Giuliano, 1989; Strauss-Kahn & Vives, 2009), labor force availability (Erickson & Wasylenko, 1980; Giuliano, 1989; Schmitt,

Gleason, Pigozzi, & Marcus, 1987), and access to transportation networks (Holguin-Veras et al., 2005; Ozmen-Ertekin, Ozbay, & Holguin-Veras, 2007).

The institutional approach to business relocations contends that the existing institutions, such as governments, real estate brokerage services, and regional economic development organizations among others, play an important role in firm relocation. Like the neo-classical theory, the institutional approach is more applicable to large companies, those possessing negotiating power, because a decision to move is viewed as a result of negotiations with the community, mostly the local government, and suppliers, as well as other economic and social actors (Brouwer, Mariotti, & van Ommeren, 2004). At the same time, factors prominent within the institutional framework such as local policies and regulations, unionization rates, cultural norms (business-friendly cultural climate) and other regional characteristics are important for migration behavior of all firms regardless of their size. Although the empirical evidence is rather cursory, there are a few rigorous studies that look at the effects of business relocation determinants within the institutional approach (Guimaraes, Rolfe, & Woodward, 1998; Lee, 2008; Oukarfi & Baslé, 2009).<sup>1</sup>

The behavioral perspective on business relocations focuses predominantly on the firm itself. Within this framework, a company is an actor with bounded rationality that does not possess all the information about business prospects in various locations and has limited ability to process that incomplete information. Firm's characteristics, internal processes, levels of risk aversion, and unwillingness to accept uncertainty play an important role. The theory is particularly suited to study the relocation behavior of small firms, as well as short-distance moves. It can also explain why relocation is such a rare phenomenon dominated by short-distance moves (van Dijk & Pellenbarg, 2000).<sup>2</sup>



Research within the behavioral approach shows that risk and uncertainty decrease the likelihood of relocation (Pennings & Sleuwaegen, 2000). The behavioral perspective suggests that both objective and subjective relocation costs increase with distance. For example, a manufacturer relocating from Chicago to Milwaukee faces lower levels of uncertainty and associated costs compared with relocating from Chicago to Denver, Houston, or Atlanta. Relocation costs include those attributable to lower quality of information, the limited ability to process that information, and the potential loss of employees, in addition to the actual expense of a physical change of place. Companies considering a change of site, especially those investing heavily in their labor force, are less likely to move because employees may not change their residence in order to keep the job (Carter, 1999; Lawson & Angle, 1998; Otto & Dalbert, 2010). Like employees, companies are often ‘embedded’ in their locations for personal reasons, such as existing networks (Knoben & Oerlemans, 2008), or attachment of the owners or managers to a particular place (Halstead & Deller, 1997). This is especially true for smaller companies whose decision process is more likely to be dominated by one person (Greenhalgh, 2008). The value of staying in the home community is so high that in some circumstances entrepreneurs may be willing to face much higher costs of doing business (Figueiredo et al., 2002).

With respect to firm characteristics, the proclivity to move generally declines with firm age and size (Brouwer et al., 2004; Knoben & Oerlemans, 2008; Nguyen, Sano, Tran, & Doan, 2013; van Dijk & Pellenbarg, 2000), although this does not apply to international business migration and migration of headquarters (Pennings & Sleuwaegen, 2000; Strauss-Kahn & Vives, 2009). At the same time, expansion is one common reason for (short-distance) relocations (Brouwer et al., 2004; Knoben & Oerlemans, 2008; van Dijk & Pellenbarg, 2000). Firms may

simply outgrow their existing facility and relocate to larger premises most often within the same community.

This study draws insight from all three relocation frameworks described above. It focuses on interstate migration flows, which for our purposes are considered long-distance moves. Such relocations are usually motivated by regional factors (Weterings & Knoblen, 2013). The neo-classical and institutional perspectives therefore, provide the foundation for the inference but with influence from the behavioral approach. Empirically, our estimation strategy takes into account regional characteristics of both the origin and destination states. We use the differential between the origin and destination states on several key variables, controlling for neighboring state pairs, to more precisely measure the incentives to relocate. We analyze the full set of manufacturing relocations from 2000 to 2011 and then repeat the analysis separately for three subgroups of industries defined by their knowledge (i.e., R&D) intensity. We expect the non-uniform distribution of perceptions and abilities among companies that belong to industries with various levels of research intensity. The differences in perceptions and abilities, in turn, are likely to influence business migration propensity and relocation patterns well in line with the behavioral perspective

### 3. THEORETICAL FRAMEWORK

The research on business climate metrics and manufacturing migration seldom distinguishes between location and relocation (Holl 2004; Kronenberg 2013; Manjón-Antolín & Arauzo-Carod 2011). Often in the literature, location studies pool relocation and new start-up decisions preventing any unique insights that may come from their separate analysis. A more precise understanding of the factors that motivate relocation requires modeling the movement of

established firms from one location to another. We implement a state-to-state or interstate migration modeling approach in this study. Its advantage is the ability to directly compare the characteristics of the origin and destination states and to draw inferences based on the differential, which we believe to be a purer measure of relocation incentives. For instance, building on the neo-classical theory, the firm location literature often focuses on profit maximization through the selection of sites that offer the lowest cost. If conventional recruitment strategies are correct, the propensity for a firm to move should increase with the tax rate differential between the origin and destination states. We expect that low tax states are attractive to manufacturers only to the extent that taxes in the destination state are sufficiently lower than the taxes in the firm's origin state to more than offset the costs associated with the relocation itself. This intuition implies that, all else equal, firms in high-tax states have greater incentive to move to the lowest-tax state than do firms already in a state with moderately low taxes. Further, the empirical model based on differences approach allows us to include both taxes and expenditures with minimal concern for collinearity. Although such a 'differences' modeling technique has been used in population migration studies recently (Ali, Partridge, & Rickman, 2012; Betz & Partridge, 2013; Grassmueck, Goetz, & Shields, 2008), to the best of our knowledge, we are the first to apply this approach to the study of business relocations.

Consider a profit maximizing manufacturing firm  $i$  that is currently at location  $k$  and is considering relocation over a range of regions (states)  $k = 1, \dots, K$ .<sup>3</sup> The firm faces prices for inputs  $w_i^k$ , the firm's output  $p_i^k$ , a level of taxes  $t_i^k$  and corresponding level of public services  $G_i^k$  all at the current location  $k$ . Its profit function can be expressed as:

$$\pi_i^k(w_i^k, p_i^k, t_i^k, G_i^k). \quad (1)$$

In a potential destination region (state)  $k^D$  this firm faces an alternative profit:

$$\pi_i^{k^D} \left( w_i^{k^D}, p_i^{k^D}, t_i^{k^D}, G_i^{k^D} \right). \quad (2)$$

The firm will decide to relocate if (1) the expected profits of moving to a new location (state), expressed as  $E(\pi_i^{k^D})$  exceed the expected profit from remaining at its current location,  $E(\pi_i^k)$  and (2) the difference between the expected profits in the destination state and expected profits in the current state are maximized. To simplify, assume that the market for the manufacturing firm's product is not affected by the firm's ultimate location, or  $p_i^{k^D} = p_i^k$ . The expected profit functions at the two locations can be expressed as:

$$E(\pi_i^k) = -\beta^k w_i^k - \alpha^k t_i^k + \gamma^k G_i^k + \epsilon_i^k \quad (3)$$

and

$$E(\pi_i^{k^D}) = -\beta^{k^D} w_i^{k^D} - \alpha^{k^D} t_i^{k^D} + \gamma^{k^D} G_i^{k^D} + \epsilon_i^{k^D} \quad (4)$$

where  $\epsilon_i^k, \epsilon_i^{k^D} \sim N(0, \sigma^2)$  and  $\beta^k, \beta^{k^D}, \alpha^k, \alpha^{k^D}, \gamma^k, \gamma^{k^D} > 0$ .

The firm will elect to move if:

$$M^{k,k^D} = E(\pi_i^{k^D}) - E(\pi_i^k) > 0 \quad (5)$$

If we follow the behavioral theory of relocation decisions, this decision criterion would determine the relocation decision for the firm, which is expected to exhibit a satisfier behavior.

In this case, and further simplifying the formal presentation of the theoretical framework by assuming that the parameters of the expected profit functions are the same across firms and

locations, or  $\beta^k = \beta^{k^D}$ ,  $\alpha^k = \alpha^{k^D}$  and  $\gamma^k = \gamma^{k^D}$ , we can rewrite the decision rule to stay at the current location or to move as:

$$M^{k,k^D} = -\beta^*(w^{k^D} - w^k) - \alpha^*(t^{k^D} - t^k) + \gamma^*(G^{k^D} - G^k) + \epsilon \quad (6)$$

where  $\epsilon = \epsilon^{k^D} - \epsilon^k$ . In the simplest sense the firm is comparing the costs ( $w, t$ ) of the two locations along with the benefits of the public services being offered ( $G$ ). This theoretical representation is valid even in an extreme case when the firm has reliable information about the economic prospects only in the destination state compared with its current location, where its knowledge about prospects in other states is not useful for selecting a destination, and from the behavioral approach due to uncertainty associated with bounded rationality or big distance.<sup>4</sup> In the case where the firm compares several destination states, we can rewrite the decision rule given in equation (5) as the firm moving to state  $D$  if the difference  $M^{k,k^D} = E(\pi_i^{k^D}) - E(\pi_i^k)$  is sufficiently large. Equation (6), however, stays the same implying that the destination choice is again a function of costs and benefits, which include governmental services.

Given the adapted neo-classical foundation, this framework provides a theoretical justification for promoting low-cost operations, as firms will prefer cheaper alternatives for a given level of public services. Indeed, within this framework the insights from behavioral and institutional theories of firm location help explain the observed dynamics of business moves (Brouwer et al., 2004; Nguyen et al., 2013; Pellenbarg et al., 2002). For example, firm characteristics, such as age, market power, knowledge intensity and others determine its ability to benefit from the environment via local knowledge spillovers. Such ability, in turn, is often related to greater productivity and innovation (Ibrahim, Fallah, & Reilly, 2009; Koo, 2005; Zachariadis, 2003), which are likely to contribute to cost reduction.

The ability to gather and process information about all potential locations and willingness to assume risk and accept certain levels of uncertainty further complicates the decision rule outlined above. Rather than assuming that the parameters of the expected profit functions are the same across all locations ( $\beta^k = \beta^{k^D}$ ,  $\alpha^k = \alpha^{k^D}$  and  $\gamma^k = \gamma^{k^D}$ ) it is likely that firms will discount the values at potential location  $k^D$ . Given the institutional and behavioral theories it is more likely that  $\beta^k > \beta^{k^D}$ ,  $\alpha^k > \alpha^{k^D}$  and  $\gamma^k > \gamma^{k^D}$  reducing the likelihood of a relocation. Intuitively, the variance around the expected profitability at a new location  $E(\pi_i^{k^D})$  is larger than where the firm is currently located  $E(\pi_i^k)$  again reducing the likelihood of a relocation. This is particularly true for more risk averse manufacturers and smaller firms that lack negotiating power.

In this framework we can also explore how a state's regulatory environment influences relocation decisions. In the traditional neo-liberal view of business climate, regulations are considered a cost that needs to be minimized. But regulations establish the "rules of the game" in terms of what is and is not acceptable practices. Within the behavioral approach the presence of these regulations introduces information and reduces risk and uncertainty. The lack of a coherent set of regulations creates a degree of risk and uncertainty because the "rules of the game" are unknown. Here we can see that a risk-minimizing manufacturer may elect to relocate to a state with a stronger regulatory environment. On the other hand, regulations are subject to what may be interpreted as random changes as the local or regional political environment changes. In addition, the costs of compliance and/or inconsistencies in enforcement can counteract the reductions in risk and uncertainty regulations provide.

#### 4. EMPIRICAL MODEL

The empirical representation can be expressed for our panel of data as:

$$M_{ij,t} = \sum_{l=1}^L \theta_l \Delta x_{l,ij,t} + N_{ij} + T_t + \varepsilon \quad (7)$$

where  $M_{ij,t}$  is the count or flow of firms from state  $i$  to state  $j$ ,  $\Delta x_{l,ij,t}$  is the difference between state  $i$  and state  $j$  across a set of  $l$  empirical variables in year  $t$ ,  $N$  is a dummy variable equal to one if states  $i$  and  $j$  are neighbors, and  $T$  is a time fixed effect. Because of the count nature of  $M_{ij,t}$ , a Poisson or negative binomial estimator is most appropriate. To allow for the presence of unobserved heterogeneity we elect to use the negative binomial estimator.<sup>5</sup> By design, the distribution of the dependent variable ( $M_{ij,t}$ ) is truncated at one. Specifically, we exploit the revealed preferences manifested by the sum of firms moving between any two states and thus only positive integers are within the space of the dependent variable.

There are 8,750 origin-destination state pairs with positive relocation counts over the study period. As demonstrated in Figure 1, there is just one firm moving between most origin - destination state pairs in any given year accounting for 51.1 percent of the observations. For example, in 2010 one manufacturer relocated from Alabama to Arizona. The second most common scenario of two relocations between any two states accounts for 19.8 percent of the observations. The largest relocation count is 62 firms that moved from New York to New Jersey in 2009. Overall, movement from New York to New Jersey accounts for the five largest relocation flows with 49 firms in 2004; 51 in 2001; 52 in both 2000 and 2003. But it is important to note that the relocation flows move in both directions. While the largest relocation flows are from New York to New Jersey, there are also manufacturers moving from New Jersey

to New York: 32 in 2011, 31 in 2004, 30 in both 2008 and 2009 and 29 in 2003. Given the distribution of relocations described in Figure 1, we use a truncated negative binomial estimator.

Treating manufacturing as one industry in a study of relocation determinants may lead to aggregation bias. We know from a theoretical perspective that, for example, within the product life cycle framework (Duranton & Puga, 2001; Hong, 2014; Mack & Schaeffer, 1993; Rink & Swan, 1979; Wojan & Pulver, 1995), firms in industries with different levels of “maturity” view the business climate through very different lenses. More mature industries are likely to seek lower production and operation costs while newer industries may place higher value on a different set of factors. Using data on French manufacturers Duranton and Puga (2001) report that relocation patterns are identifiable along the R&D continuum. As long as the level of innovation within an industry is related to its maturity, this finding is well in line with the product life cycle hypothesis. Thus, for this study we divide all manufacturing industries into three groups based on their spending on research and development. We then look at the relocation decisions of all manufacturers as a whole and across three classifications: low, medium, and high R&D intensity.

## 5. DATA AND VARIABLES

In addition to an explicit focus on interstate establishment moves and a novel modeling approach, our study contributes to the literature by employing perhaps the best data source for the study of interstate relocations. The NETS database was arguably the first data set that offered a full picture of business dynamics in the U.S. regions at the establishment-level. Its focus on relocations is the principal advantage over other existing data sources (Neumark et al., 2005). Despite its promise for the study of business migration, the database has been used in just a few



studies (e.g. Neumark et al. (2005); Neumark, Zhang, and Kolko (2006)), most likely due to the prohibitive cost of acquiring the nation-wide data set.

The National Establishment Time Series (NETS) is a database of U.S. establishments developed and annually updated by Dun & Bradstreet (D&B) in partnership with Walls & Associates. The NETS database is uniquely detailed providing location information for each establishment, which is an important advantage over other available data sources. The data include the location of each establishment at its start, as well as the year and address of any relocation during the life of a business making it possible to track relocation decisions and migration patterns. Neumark, Zhang, and Wall (2006) find that the information on interstate relocations of establishments contained in the NETS is particularly reliable. Neumark and co-authors (Neumark et al., 2005) describe the data gathering process in more detail. Although the data were originally intended to facilitate educated business decisions and marketing, not academic research, it is highly suitable for the latter purpose because a great effort is put into ensuring its accuracy and coverage of all businesses in the US, including nonprofits and public sector.

In a comparison of NETS to the ES-202 unemployment insurance filings by employers, which serve as the foundation for several geographically disaggregated business data products from the U.S. Census, Kunkle (2011) concludes that NETS provides several advantages over more traditional sources for tracking the growth and location of individual firms. The organization of NETS makes it easier to access raw data files that are far more information-rich than ES-202 data. Both Kunkle (2011) and Neumark et al. (2005) contend that there is no obvious “gold standard” for firm-level data because each dataset has its own strengths and weaknesses.

Using the NETS database we calculate interstate relocation flows, the dependent variable in the estimated models. As explanatory variables, our empirical specification includes several categories: (1) size and agglomeration metrics for manufacturing, (2) labor characteristics, (3) energy costs, (4) taxes, (5) government services, and (6) indicators of state business and political environment. The existing research commonly confirms the importance of agglomeration economies for location decisions with concentrations of firms in one industry attracting other companies within the same or complementary industries (Deller, 2009; Figueiredo et al., 2002; Shaffer, Deller, & Marcouiller, 2004; Strauss-Kahn & Vives, 2009). To account for potential agglomeration effects the models estimated in this study, we include measures of the concentration and size of manufacturing for each state. First, to measure the concentration we use the share of state total employment in manufacturing or the ratio of employment in manufacturing in state  $i$  to total employment in state  $i$ . In line with expansive literature, we expect that states with more intensive manufacturing would attract manufacturing firms from regions that are characterized by lower concentration of this sector (e.g. Asheim, Cooke, & Martin, 2006; Pitelis & Pseiridis, 2006; Shields, Barkley, & Emery, 2009; Sugden, Wei, & Wilson, 2006; Woodward & Guimarães, 2009). To capture the relative size of manufacturing sector in a state, we include the ratio of manufacturing GDP produced in state  $i$  to total US manufacturing GDP.

We include state-wide annual compensation within manufacturing in our specifications to control for labor costs faced by companies in the origin and destination states. After controlling for the effects of agglomeration, higher labor costs (compensation rates) are expected to deter manufacturers from relocating. Several studies find that labor unions generally deteriorate regional business activity (Bartik, 1985; Woodward & Rolfe, 1993) and higher rates of

unionization are associated with lower in-migration of firms (Conroy, Deller, & Tsvetkova, 2015; Lee, 2008). Still some researchers, such as Bellace (2014), argue that declining membership in labor unions has undermined the relationship between unionization and manufacturing location patterns identified by prior research that needs to be revisited.

The availability of labor with relevant skills undoubtedly factors into the migration decision of firms (Ozmen-Ertekin et al., 2007). We include the share of the adult population (age 25 and over) with at least a Bachelor's degree, but offer no universal hypothesis. In the context of manufacturing, the required skill levels of the workforce likely differ across industries. The manufacturing sector consists of the industries heavily reliant on the low-skill labor and industries that require highly trained and educated employees. We expect the effects of the education variables to vary across the models that focus on different levels of R&D intensity. In low R&D spending sectors, there may be little need for educated researchers and more generally skilled workers, thus an educated workforce would have little, if not a negative, effect. Firms in the sectors characterized by high R&D intensity are more likely to rely on highly trained workers, thus an educated workforce would attract more knowledge-intensive firms. In addition to education, unemployment captures the level of economic hardships in a state but it also may signal availability of (cheap) labor. We expect this variable to play a role for relocations of less knowledge-intensive establishments.

Energy costs, particularly the cost of electricity, often are a sizable component of the operations costs in manufacturing and, hence, should be an important consideration in relocation decisions (Carlton, 1983). In a policy context, some policy makers question alternative energy sources, such as wind and solar, because the associated higher costs may negatively impact the business climate. Though some studies find that energy costs are insignificant in the models of

location (Bartik, 1985; McConnell & Schwab, 1990), we include the state-wide average electricity rate as a measure of input costs that vary regionally.

Government taxation and service provision are crucial elements of regional business climate. High taxes, regardless of the services they fund, are usually unattractive to businesses. Though early reviews conclude that taxes have no impact on firm location decisions (see Due, 1961; Oakland, 1978), later analysis based on more rigorous theoretical and empirical modeling provides evidence that taxes matter for economic growth. Despite this fact, some commentators note that the effects of taxes “should be treated as an open rather than a settled question” (Newman & Sullivan, 1988, p.232). We provide further investigation of the impacts of taxes in the context of manufacturing firm relocations. The models estimated in this study include three types of taxes: corporate income taxes, personal income taxes, and property taxes. To control for the size of the state economy and the ability to pay for services, we adjust each type of tax revenue by total personal income.

Our modeling strategy allows for inclusion of both taxes and expenditures in the same specification. This feature of the model is valuable because just a few studies consider how tax revenues are used to fund public services, which may also impact business migration. Based on the current state of the literature one can conclude that taxes have a negative, although weak, effect on economic activity giving some credence to the notion that high taxes deteriorate business climate (see, for example Gale, Krupkin, and Rueben (2015)). Taxes, however, pay for public education, which is vital to the productivity of the workforce, and for the transportation infrastructure that is an important consideration in business relocation decisions (Holguin-Veras et al., 2005; Ozmen-Ertekin et al., 2007). We expect education expenditures to have a positive impact on migration as improvements in human capital can have utility to a variety of firms.

Human capital investments, such as public education, on-the-job training, and health care among others, influence the economic growth process by increasing the productive capacity of the labor force by augmenting skills, knowledge, health, or other productive attributes (Beaulieu & Mulkey, 1995; Clark, 1983; Goetz & Hu, 1996; Hanushek & Woessmann, 2015; Wilson & Briscoe, 2004).

Public capital and public infrastructure in particular are crucial for a variety of economic outcomes (Aschauer, 1989a, 1989b, 1989c; Holtz-Eakin, 1992; Tatom, 1991a, 1991b). Like Bergh and Henrekson (2011), Bartik (1991, 1992) and Barro (1991), we take the view that public capital is broader than simple physical infrastructure and includes “productive” public amenities such as protective services and environmental protection. We assume that there is a balance between the potentially negative effects of taxation, which can hinder business climate, and the positive effects of productive public goods and services, which are intended to promote the business climate. Thus, in addition to our tax variables, we have three broad measures of what we suggest are productive public goods: expenditures on higher education, expenditures on K-12 education, and expenditures on highways and transportation. We include two non-productive expenditure categories: welfare, including public expenditures on health care, and corrections, including police, jails, and prisons. As with the taxation variables, these measures are per \$1,000 of personal income.

Another set of variables focuses on the political environment in a state. As suggested by the institutional theory of business (re)locations, public institutions play an important role in the migration behavior of firms. Some research suggests that the Democratic Party may be perceived as less “business-friendly” (Grant, 1996; Klassen & Shackelford, 1998) potentially deterring immigrating companies. Democrats tend to favor higher funding for government services over

lower taxes, a stronger regulatory environment and pro-labor policies. We expect manufacturers to be less likely to be drawn to majority-Democratic states. We include the percent of state legislative seats that are held by Democrats to capture the effects of party politics. Because political conflict can add uncertainty to business climate and uncertainty is costly to relocating firms (Pennings & Sleuwaegen, 2000), we include the rate at which governors use their veto authority in the models. We expect businesses to be less likely to relocate to a state with higher levels of political conflict.

In addition to the variables described above, our models include the Beacon Hill Competitiveness Index. State and local media along with economic development practitioners tend to draw attention to the rankings that appear to make a region look particularly attractive. Rankings, such as Money Magazine's "Best Places to Live" or Forbes Magazine's "Best States for Business" or the various rankings offered by Site Selection Magazine, are widely used as a form of boosterism in promotion of favorable business climate to outsiders. While these types of rankings are widely dismissed in the academic literature (e.g. Artz, Duncan, Hall, and Orazam, 2016; Lane, Glennon, & McCabe, 1989) we include the Beacon Hill Competitiveness Index for completeness. The advantage of the Beacon Hill Index is that it is available over the period of analysis for this study and is relatively consistent in methodology from one year to the next.

We expect manufacturers to be attracted to states with higher values of the Index.

We also include a dummy variable to control for relocations between neighboring states. In a descriptive analysis of the NETS data focusing on Wisconsin, Conroy and Deller (2014) find that the vast majority of firms that relocate out of state move to an adjacent state. Often these moves are simply across the state line. Neumark, Zhang, and Wall (2006) provide comparable evidence for the state of California. This makes intuitive sense within the behavioral approach to

firm relocations: as a company moves farther from the current location, information and financial costs become higher, as well as the variance of error in the expected profit function. For these reasons we expect a higher proportion of manufacturing firms to relocate to nearby states. While we cannot say with any level of certainty, it is possible that at least a part of the firms moving to a neighboring state are located close to a state boarder and their relocation is a simple move “down the road” to a better facility that could be across the state line.

Finally, the factors that are considered in relocation decisions may differ across manufacturing firms. The product life cycle model (see Rink & Swan, 1979) implies that as manufacturing becomes more mature and less focused on innovation it seeks out lower cost alternatives (Duranton & Puga, 2001; Hong, 2014; Mack & Schaeffer, 1993; Wojan & Pulver, 1995). On the other hand, manufacturing companies in newer industries tend to be more focused on innovation and to benefit from Porterian or Jacobian externalities associated with diversification and agglomeration economies. It follows that the knowledge-intensity of industries at different stages of product life cycle is likely to differ. As outlined above these differences are likely to influence the demand for labor in terms of educational and skill sets.

Using R&D spending data from the National Science Foundation (2014) we group manufacturing firms into three subsets depending on their industrial affiliation: low, medium and high. The firms in “low” R&D spending group are deemed less innovative and less likely to benefit from agglomeration economies. Consequently, their relocation decisions are expected to be primarily motivated by cost differential. Firms within more innovation-focused industries are likely to be at a different point on the product life cycle continuum. Such companies (“medium” and “high” R&D spending groups in our study) should be attracted, for example, by

agglomeration economies and an educated workforce. Our grouping of industries based on R&D spending is provided in Table 1, whereas Table 2 contains descriptive statistics for the variables.<sup>6</sup>

## 5. EMPIRICAL RESULTS

To discuss the results, we follow the structure implied by the grouping of our variables and draw comparisons across research and development intensity throughout. For interpretation of the results presented in Table 3, one needs to keep in mind that the variables are measured relative to the value in the destination state:  $\Delta x_{ij} = x_i - x_j$ . This method implies that if the difference is positive, the variable takes on a higher value in the origin state  $i$  compared to the destination state  $j$ . The dependent variable is the count of firms moving from state  $i$  to state  $j$ . So, a positive coefficient combined with a positive value of  $\Delta x_{l,ij,t}$  implies more firms moved out of state  $i$  to state  $j$  in a given year. For example, if the coefficient on the tax rate is positive and significant and the tax rate in state  $i$  is higher than in state  $j$ , then the results indicate that more firms are moving from the high-tax state  $i$  to the low-tax state  $j$ . That is, a positive coefficient implies that low values of a variable (i.e. corporate taxes) are attractive to manufacturing firms and negative coefficients imply that a higher value of a variable (i.e. spending on higher education) is attractive.

The size of the manufacturing sector plays a role in relocation decisions. Manufacturers tend to exit states with a relatively high share of U.S. manufacturing GDP and go to those with a relatively low share. This result holds in the pooled model of all migration, but seems to be driven primarily by medium and higher research and development type companies. There is no significant effect among firms in industries with low R&D intensity. The observed results could



be driven by the single state of California, which is the largest manufacturer in the country, but usually loses firms to other states (Neumark, Zhang, & Wall, 2006). In terms of agglomeration effects, the share of state employment in manufacturing is weakly significant among high R&D manufacturers. The coefficient is negative suggesting migration is higher from states with a low share of employment in manufacturing to states with a relatively large share of employment in manufacturing.

This result is consistent with the product life cycle model and the prior findings within manufacturing context (Duranton & Puga, 2001; Hong, 2014; Mack & Schaeffer, 1993; Wojan & Pulver, 1995). It appears that more innovative firms, identified by higher spending on research and development within their respective industries, benefit more from the Porterian and/or Jacobian externalities associated with agglomeration economies. This makes intuitive sense as industries with low R&D spending, those farther along in their product life cycle, on average benefit less or do not benefit at all from the advantages of agglomeration economies and are looking simply to reduce costs as much as possible.

Estimation results suggest that the only labor consideration relevant to manufacturing migration is the rate of union membership. Neither the unemployment rate, nor the share of population with at least a bachelor's degree have any effect on manufacturers' relocation decisions, regardless of their research and development intensity. Union membership, however, has a strong positive effect on migration flows across low, medium, and high research and development groups, suggesting that firms leave highly unionized states in favor of those with lower union membership, a result that is consistent with the traditional neo-liberal view of business climate. Because so many of the manufacturers that relocate are small, it may be the case that these firms prefer not to face the pressure and costs to unionize if and when they grow

in size. The finding of no significance on labor costs coupled with this result on unionization suggests that manufacturers may be willing to pay higher wages to attract and retain workers but prefer to do so outside the structure of organized unions.

Energy costs have only a weakly positive effect on relocation. In the regression pooling all firms and in that for high R&D firms, the coefficient is positive but only weakly significant, suggesting that firms leave states with relatively high energy costs for destination states with lower electricity rates. Again, this result is consistent, although weakly from a statistical perspective, with the traditional neo-liberal or supply-side view of business climate.

The impact of taxes on manufacturing relocation varies both by the type of tax and R&D intensity but seems to have the most influence on companies in the knowledge-intensive manufacturing sector. First, corporate income taxes have positive and significant effect on the migration of high R&D firms only. Thus, at the highest levels of R&D spending, firms tend to leave states with high corporate income tax rates for destinations that have lower rates. In contrast, property taxes have a negative coefficient among high R&D manufacturing firms. The negative and significant coefficient indicates that firms tend to exit states with relatively low property taxes in favor of those with higher property taxes. This may signal the importance of the amenities funded by property taxes (i.e., local government provided services) to the owners and managers of firms in knowledge-intensive industries. Alternatively, manufacturers in knowledge-intensive manufacturing may be drawn to the states where amenities, which are funded by property taxes, are likely to attract highly-qualified specialists with valuable and specific to the industries sets of skills. Last, income taxes have a positive and significant effect on the migration of low R&D firms and in the whole sample. As expected, the results indicate that firms leave states with relatively high individual income taxes. Taken together, these results

could also be due to less capital intensive R&D firms preferring and prioritizing low corporate and personal income taxes, but not necessarily low property taxes because it's the "tax bundle" that results in the lowest possible price of public goods.

In general, spending on government services influences primarily low and medium R&D manufacturing firms. None of the expenditures influence the subset of high R&D firms. Spending on higher education does seem to attract firms, but it appears that relationship is driven primarily by migration among low R&D firms. The negative and strongly significant coefficient indicates that low R&D firms tend to flow from states with low spending on higher education to those that spend relatively more. Spending on K-12 education tends to correspond to more migration from states that spend more to those that spend less, but this result holds only for the subset of medium R&D manufacturing firms. The negative and strongly significant coefficient in the pooled model on welfare programs implies migration from states with low welfare spending to states with high welfare spending. While this is true for all firms generally, this result is not especially strong in any subset of manufacturers. Lastly, relatively low spending on highways and roads seems to be at least weakly attractive to low R&D manufacturers.

The last group of variables gives a sense of the state business and political environments and their effects on business relocation choices. First, despite its popularity as a recruitment device, the Beacon Hill Competitiveness Index appears to have no influence on manufacturing migration. This is consistent with other studies that find that rankings like this provide little insight into actual firm location decisions (Lane et al., 1989) or economic growth (Artz, Duncan, Hall, & Orazem, 2016). Similarly, despite the pro-business identity of the Republican Party, and the opposing image of the Democratic Party, the majority party of the state legislature has no influence on manufacturing migration. The rate of gubernatorial veto is also without influence.

Overwhelmingly, manufacturing firms move to neighboring states. This result is not surprising as information asymmetries increase with distance, thus short-distance moves are likely to be better informed and perceived as less uncertain. This makes such moves an attractive option compared with long-distance moves. In fact, the majority of our variables that characterize various aspects of the business climate have remarkably smaller impact on migration than does the simple coincidence of neighboring locations. Given the relatively small size of a typical manufacturer that relocates to another state, the cost of gathering and processing information, and the levels of uncertainty contained in any move, would be minimized by moving to a neighbor state when compared to longer moves.

To further explore the importance of adjacency, we report the results of an alternative specification in the appendix wherein each of the explanatory variables is interacted with the neighbors adjacency indicator variable. The results of this additional analysis are provided in appendix Table A1. In general, the results are substantively similar. The share of state employment in manufacturing is significant with the interaction suggesting that the flow of migration between neighboring states increases with the size of the state share of employment in the destination state, yet there is no effect on migration between non-neighboring states. Similarly, if two states are neighbors, migration increases as the energy price in the destination state falls relative to the origin state, but there is no effect if the states aren't neighbors. Interestingly, there are opposing effects of union membership rate and welfare spending between neighbors and non-neighbors.

In our study, the effects are evaluated on an annual or short-term basis. To test the sensitivity of our results to a longer-term perspective we proceed in two different ways. First, we imposed a lag structure such that migration flows are a function of policy differences from one or

more time periods before. We report the effects for the five-year lag in appendix Table A2.

Second, we aggregated flows over five-year periods  $t$  to  $t+5$  and regressed them on inter-state policy differences from year  $t$ . In general, the results were consistent, though weaker, compared with those reported in Table 3.

The coefficient estimates provided in Table 3 alone do not convey the magnitude of the economic effects of the explanatory variables on the count of firms that migrate between any two states. Marginal effects at the mean (MEM) give a better sense of how a change in any one of our policy variables would influence relocation decisions on average. For each specification the marginal effects at the mean are reported in Table 4. Despite the statistical significance of several variables in each model, MEM indicate that their economic significance is small if not trivial. The marginal effects of the policy variables are several orders of magnitude larger for high R&D manufacturers, but still quite small in terms of economic importance. For instance, the marginal effects at the mean of taxes imply that in order to increase the expected number of relocating firms by one states would need to implement massive tax cuts.

As previously discussed, a very small share (1-5% depending on the source) of manufacturers move each year. On average in our sample, fewer than three firms move between any two states in a given year. The rarity of manufacturing relocations may partly explain the extremely small marginal effects. More importantly, however, the small marginal effects combined with the infrequency of relocations have important policy implications. While it is the case that unionization, taxes, and some types of public spending have a statistical relationship to manufacturing interstate migration, the impact of any feasible policy change related to any business climate component considered in this study is likely to be negligible.

## 6. CONCLUSIONS AND DISCUSSION

With this study we contribute to the still underdeveloped literature that investigates business relocation determinants. Our focus on firm relocations, as opposed to the more general question of firm location decisions, is motivated by the continued prevalence of policies that aim to attract companies from elsewhere. Neo-liberal supply-side view of a positive business climate focuses on decreasing costs of conducting business by reducing taxes, cutting regulations and by the promotion of policies such as right-to-work. The neo-liberal policies persist despite the richness of the academic literature that calls these policies into question.

To help shed additional light on the (un)importance of regional factors behind business relocation choices we focus on the manufacturing establishments that changed the state of their location during the 2000-2011 time period as indicated in the National Establishment Time Series (NETS) database. To better capture the nature of these relocation decisions, we use a differencing modeling approach, which simultaneously takes into account multiple characteristics of both origin and destination states, and examines the impacts of these regional traits on all manufacturing firms' relocations, as well as separately for three subsets of industries defined by the level of research and development (R&D) spending.

Given the preferential treatment often offered by states and localities to companies in knowledge-intensive sectors, the results of our study are particularly relevant to the discussion of business climate in general. We find that divergent sets of determinants shape relocation decisions within the studied groups. On average, manufacturers that belong to more innovative industries, as proxied by spending on R&D, appear to be more likely to take into account regional characteristics, which may be welcome news for policy-makers. Such companies tend to leave states with a larger share of U.S. manufacturing output in favor of states with a lower

share. They are somewhat responsive to energy costs, avoid states with higher union membership rates and prefer to move out of states with higher corporate income taxes but are attracted to the states that levy more on property. This may point to the importance of amenities funded by property taxes to the firms in knowledge-intensive industries, although wider spending categories considered in this study do not influence their relocation choices. These results are rather expected if one takes into account the ability of such companies to draw labor from across the nation and relative unimportance of transportation infrastructure in their production process.

On the other side of the spectrum, manufacturing establishments in the industries characterized by the low intensity of spending on R&D prefer to relocate to the states with lower unionization rates and lower personal income taxes. Companies in the sectors with low knowledge intensity appear to be the most sensitive to what we refer to as productive public capital. They are drawn to the states that spend more on higher education and transportation infrastructure.

While we find some statistical evidence supporting relevance of the traditional notions of a positive business climate in manufacturing relocation decisions such as low costs of operation, the negligible marginal effects at the mean of the variables call into question the economic significance of the relationships between considered regional characteristics and relocation choices. On face value, many of our findings are consistent with Bartik's (1985, 1991, 1992) conclusion that taxes and other factors generally associated with business climate play a role in business location decisions. The magnitude of the marginal effects, however, is so small that earlier views of the tax policy ineffectiveness in determining location behavior of firms (Due, 1961; Oakland, 1978) seem to be closer to reality. Thus the neo-liberal supply-side, or low-cost,

approaches to promoting a positive business climate with the purpose of attracting companies from other states are not likely to be effective.

## ENDNOTES

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<sup>1</sup> This lack of a well-established rigorous empirical literature could be due to the difficulty to directly quantify many factors that are most relevant to the institutional perspective.

<sup>2</sup> This statement is applicable to headquarters to a lesser extent. Whereas relocation is a rare event for the majority of firms, headquarters appear to be more likely to move. Besides, the determinants of headquarter relocations seem to be different from other types of establishments (Strauss-Kahn & Vives, 2009).

<sup>3</sup> This derivation follows Grassmueck, Goetz, and Shields (2008).

<sup>4</sup> This assumption may be not too far-stretched given the prevalence of relocations between neighboring states. For the reasons described above or for other reasons, firms considering relocations plausibly may ignore all available options limiting the pool of destination candidates to the neighboring states.

<sup>5</sup> We used both estimators and found little differences in the final results. Thus for brevity we report only the more general negative binomial results.

<sup>6</sup> This grouping is consistent with the model developed by Duranton and Puga (2001).



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Figure 1: Frequency of Cross-State Mfg Relocations ( $M_{ij,t}$ ) 2000 – 2011

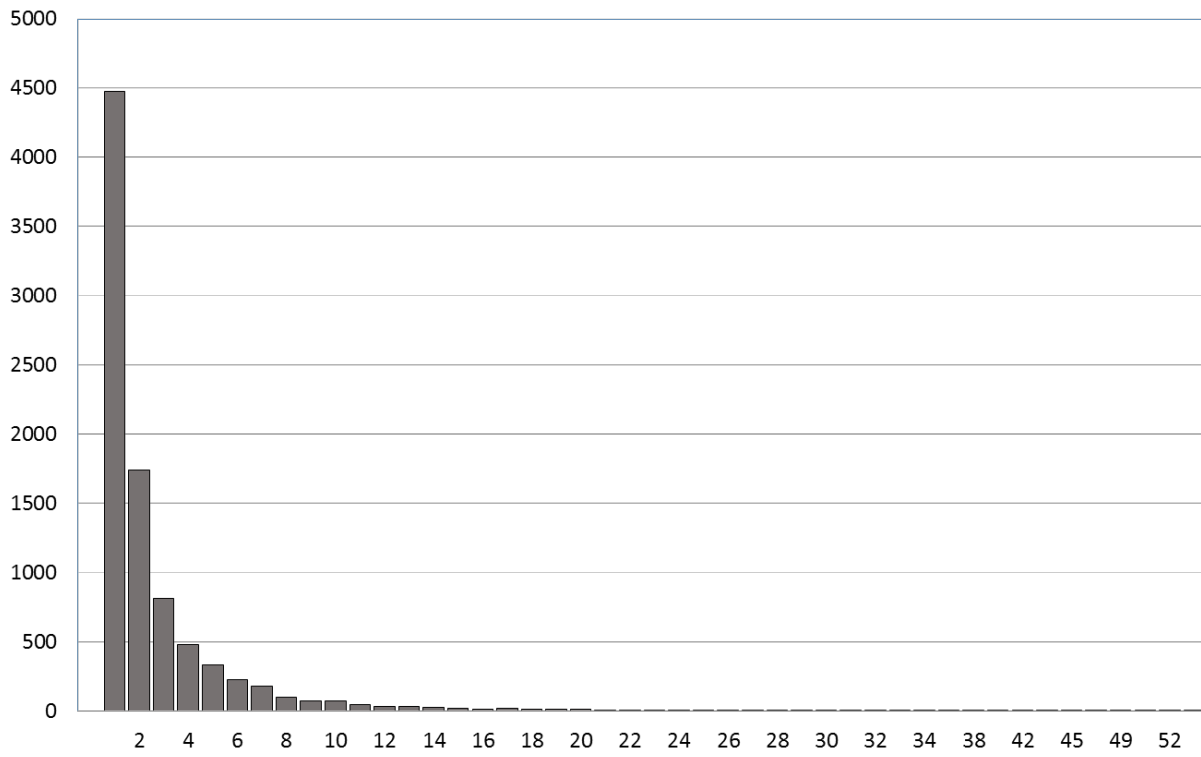


Table 1: Industry Groupings by Research and Development Activity

NAICS	Industry	Grouping
311	Food Manufacturing	Low
312	Beverage and Tobacco Product Manufacturing	Low
313	Textile Mills	Low
314	Textile Product Mills	Low
315	Apparel Manufacturing	Low
316	Leather and Allied Product Manufacturing	Low
321	Wood Product Manufacturing	Low
322	Paper Manufacturing	Low
323	Printing and Related Support Activities	Medium
324	Petroleum and Coal Products Manufacturing	Low
325	Chemical Manufacturing	High
326	Plastics and Rubber Products Manufacturing	Low
327	Nonmetallic Mineral Product Manufacturing	Low
331	Primary Metal Manufacturing	Low
332	Fabricated Metal Product Manufacturing	Low
333	Machinery Manufacturing	Medium
334	Computer and Electronic Product Manufacturing	High
335	Electrical Equipment, Appliance, and Component Manufacturing	High
336	Transportation Equipment Manufacturing	High
337	Furniture and Related Product Manufacturing	Medium
339	Miscellaneous Manufacturing	Medium



Table 2: Descriptive Data for  $M_{ijt}$  and  $\Delta X_{ijt}$ 

	Mean	Standard Deviation	Minimum	Maximum
Migration (Count or $M_{ijt}$ )	2.677	3.57	1.00	62.00
Migration Share	0.065	0.07	0.00	1.00
State's Share of US Manufacturing GDP	0.052	4.20	-13.37	13.37
Share of State Employment in Manufacturing	-0.072	3.99	-14.24	14.87
Compensation per Job in Manufacturing	0.637	12.08	-41.76	40.96
Union Membership Rate	0.481	7.88	-23.80	23.80
Unemployment Rate	-0.033	1.68	-8.80	8.50
Share of Population 25+ Years Old with at Least a Bachelor's Degree	0.398	6.24	-19.00	21.90
State Average Electricity Rate	0.372	9.26	-35.63	35.46
Corporate Income Tax per \$1000 Personal Income	0.076	2.96	-13.41	13.41
Individual Income Tax per \$1000 Personal Income	0.477	16.76	-49.06	49.06
Property Tax Per \$1000 of Personal Income	0.502	11.76	-50.38	50.38
Spend on Higher Education per \$1000 of Personal Income	-0.161	7.48	-23.30	23.68
Spend on K12 Education per \$1000 of Personal Income	0.133	9.60	-39.52	43.64
Welfare Programs per \$1000 of Personal Income	-0.002	12.05	-45.36	46.12
Highways/Roads per \$1000 of Personal Income	-0.067	5.06	-22.20	21.89
Corrections Per \$1000 of Personal Income	-0.002	1.97	-8.06	8.06
Beacon Hill Comp Index	0.040	1.22	-5.07	4.08
Share of State Legislature Held by Democrats	0.690	18.41	-78.79	78.79
Rate of Veto by Governor	0.108	11.32	-54.26	54.26
Neighbors	0.209	0.41	0.00	1.00
Number of Observations: 8,750				

Table 3: Empirical Modeling Results

	All Manufacturers	Low R&D Manufacturers	Medium R&D Manufacturers	High R&D Manufacturing
State's Share of US Manufacturing GDP	0.0113 ** (0.0066)	0.0049 (0.0093)	0.0223 ** (0.0096)	0.0211 ** (0.0101)
Share of State Employment in Manufacturing	-0.0123 (0.0097)	-0.0024 (0.0129)	-0.0172 (0.0130)	-0.0242 * (0.0142)
Compensation per Job in Manufacturing	-0.0014 (0.0036)	0.0058 (0.0051)	-0.0068 (0.0046)	-0.0011 (0.0053)
Union Membership Rate	0.0241 *** (0.0046)	0.0236 *** (0.0060)	0.0349 *** (0.0065)	0.0162 ** (0.0073)
Unemployment Rate	0.0154 (0.0190)	0.0200 (0.0252)	-0.0001 (0.0265)	0.0248 (0.0280)
Share of Population 25+ Years Old with at Least a Bachelor's Degree	-0.0052 (0.0089)	-0.0119 (0.0116)	-0.0021 (0.0112)	0.0063 (0.0135)
State Average Electricity Rate	0.0037 * (0.0034)	-0.0006 (0.0049)	0.0069 (0.0045)	0.0082 * (0.0047)
Corporate Income Tax per \$1000 Personal Income	0.0202 (0.0107)	0.0218 (0.0148)	0.0156 (0.0141)	0.0376 ** (0.0154)
Individual Income Tax per \$1000 Personal Income	0.0051 ** (0.0023)	0.0075 ** (0.0031)	0.0048 (0.0030)	0.0012 (0.0034)
Property Tax Per \$1000 of Personal Income	-0.0029 (0.0030)	-0.0031 (0.0037)	0.0003 (0.0039)	-0.0089 ** (0.0045)
Spend on Higher Education per \$1000 of Personal Income	-0.0103 ** (0.0051)	-0.0240 *** (0.0063)	-0.0018 (0.0075)	-0.0033 (0.0076)
Spend on K12 Education per \$1000 of Personal Income	0.0091 ** (0.0041)	0.0080 (0.0052)	0.0129 ** (0.0055)	0.0038 (0.0064)
Welfare Programs per \$1000 of Personal Income	-0.0087 *** (0.0033)	-0.0050 (0.0045)	-0.0071 (0.0044)	-0.0017 (0.0048)
Highways/Roads per \$1000 of Personal Income	0.0082 (0.0082)	0.0180 * (0.0104)	0.0032 (0.0109)	0.0002 (0.0118)
Corrections Per \$1000 of Personal Income	-0.0219 (0.0192)	-0.0329 (0.0246)	-0.0228 (0.0249)	-0.0356 (0.0300)
Beacon Hill Comp Index	0.0256 (0.0288)	0.0458 (0.0375)	0.0406 (0.0399)	-0.0105 (0.0434)
Share of State Legislature Held by Democrats	0.0008 (0.0017)	0.0006 (0.0024)	0.0018 (0.0023)	-0.0015 (0.0025)
Rate of Veto by Governor	0.0010 (0.0024)	0.0046 (0.0033)	0.0005 (0.0032)	-0.0007 (0.0035)
Neighbors	1.4308 *** (0.0509)	1.4736 *** (0.0651)	1.2230 *** (0.0695)	1.0212 *** (0.0750)
Intercept	-16.7405 *** (0.0434)	-17.3599 *** (0.1495)	-17.3583 *** (0.2778)	-17.8971 *** (0.2534)
N	8750	5034	4642	3870
Pseudo R <sup>2</sup>	0.0373	0.0594	0.0479	0.0357

Standard error in parentheses.

\*\*\*: Significant at 99.0%

\*\*: Significant at 95.0%

\*: Significant at 90.0%

Note: Each observation is a flow, a count of firms moving from one state to another. When all manufacturing firms are pooled together there are 8750 such observations.

In the subsequent analyses, for every state-to-state pair, each flow is disaggregated into the three R&amp;D categories. If migration occurred in all three R&amp;D categories for every state-to-state pair, the number of observations N would be consistent across all specifications. The number of observations varies across specifications because not all state-to-state pairs exhibit manufacturing migration in all three categories of R&amp;D.

Table 4. Marginal Effects at the Means

	All Manufacturers	Low R&D Manufacturers	Medium R&D Manufacturers	High R&D Manufacturing
State's Share of US Manufacturing GDP	1.16E-09 *	4E-10	1.37E-09 **	0.005417 **
	(0.0000)	(0.0000)	(0.0000)	(0.0026)
Share of State Employment in Manufacturing	-1.26E-09	-2E-10	-1.06E-09	-0.006224 *
	(0.0000)	(0.0000)	(0.0000)	(0.0037)
Compensation per Job in Manufacturing	-1.5E-10	5E-10	-4.2E-10	-0.000272
	(0.0000)	(0.0000)	(0.0000)	(0.0014)
Union Membership Rate	2.47E-09 ***	0.000000002 *	2.14E-09 ***	0.004167 **
	(0.0000)	(0.0000)	(0.0000)	(0.0019)
Unemployment Rate	1.58E-09	1.7E-09	-1E-11	0.006368
	(0.0000)	(0.0000)	(0.0000)	(0.0072)
Share of Population 25+ Years Old with at Least a Bachelor's Degree	-5.4E-10	-1E-09	-1.3E-10	0.001608
	(0.0000)	(0.0000)	(0.0000)	(0.0035)
State Average Electricity Rate	3.8E-10	-1E-10	4.3E-10	0.002098 *
	(0.0000)	(0.0000)	(0.0000)	(0.0012)
Corporate Income Tax per \$1000 Personal Income	2.08E-09 *	1.8E-09	9.6E-10	0.009668 **
	(0.0000)	(0.0000)	(0.0000)	(0.0040)
Individual Income Tax per \$1000 Personal Income	5.3E-10 **	6E-10	2.9E-10	0.000318
	(0.0000)	(0.0000)	(0.0000)	(0.0009)
Property Tax Per \$1000 of Personal Income	-3E-10	-3E-10	2E-11	-0.002295 **
	(0.0000)	(0.0000)	(0.0000)	(0.0012)
Spend on Higher Education per \$1000 of Personal Income	-1.06E-09 **	-2E-09 *	-1.1E-10	-0.000842
	(0.0000)	(0.0000)	(0.0000)	(0.0020)
Spend on K12 Education per \$1000 of Personal Income	9.4E-10 **	7E-10	7.9E-10 **	0.000975
	(0.0000)	(0.0000)	(0.0000)	(0.0017)
Welfare Programs per \$1000 of Personal Income	-9E-10 ***	-4E-10	-4.4E-10	-0.000434
	(0.0000)	(0.0000)	(0.0000)	(0.0012)
Highways/Roads per \$1000 of Personal Income	8.4E-10	1.5E-09	1.9E-10	0.000061
	(0.0000)	(0.0000)	(0.0000)	(0.0030)
Corrections Per \$1000 of Personal Income	-2.25E-09	-2.8E-09	-1.4E-09	-0.00917
	(0.0000)	(0.0000)	(0.0000)	(0.0077)
Beacon Hill Comp Index	2.64E-09	3.8E-09	2.49E-09	-0.002697
	(0.0000)	(0.0000)	(0.0000)	(0.0112)
Share of State Legislature Held by Democrats	8E-11	1E-10	1.1E-10	-0.000395
	(0.0000)	(0.0000)	(0.0000)	(0.0007)
Rate of Veto by Governor	1E-10	4E-10	3E-11	-0.000188
	(0.0000)	(0.0000)	(0.0000)	(0.0009)

Standard error in parentheses.

\*\*\*: Significant at 99.0%

\*\*: Significant at 95.0%

\*: Significant at 90.0%

Table A1: Alternative Specification with Neighbor Interactions

	All Manufacturers	Low R&D Manufacturers	Med R&D Manufacturers	High R&D Manufacturers
State's Share of US Manf GDP	0.0067 (0.0077)	0.0051 (0.0118)	0.0117 (0.0117)	0.0083 (0.0122)
State's Share of US Manf GDP*Neighbors	0.0207 (0.0153)	0.0086 (0.0194)	0.0093 (0.0224)	0.0409 * (0.0235)
Share of Emp in Manf	-0.0054 (0.0116)	0.0054 (0.0166)	-0.0081 (0.0164)	-0.0060 (0.0171)
Share of Emp in Manf*Neighbors	-0.0455 ** (0.0214)	-0.0352 (0.0274)	-0.0314 (0.0283)	-0.0675 ** (0.0325)
Compensation per Job in Manf	-0.0008 (0.0043)	0.0031 (0.0064)	-0.0072 (0.0058)	0.0038 * (0.0069)
Compensation per Job in Manf*Neighbors	-0.0077 (0.0084)	-0.0018 (0.0105)	-0.0016 (0.0100)	-0.0073 (0.0116)
Union Memb Rate	0.0251 *** (0.0052)	0.0274 *** (0.0072)	0.0348 *** (0.0078)	0.0146 * (0.0088)
Union Memb Rate*Neighbors	-0.0260 ** (0.0123)	-0.0372 ** (0.0161)	-0.0004 (0.0162)	0.0016 (0.0189)
Unemp Rate	0.0164 (0.0213)	0.0279 (0.0299)	0.0110 (0.0313)	0.0109 (0.0326)
Unemp Rate*Neighbors	-0.0377 (0.0451)	-0.0497 (0.0523)	-0.0808 (0.0582)	-0.0077 (0.0655)
Share of 25+ w at least a Bach's Deg	-0.0053 (0.0102)	-0.0096 (0.0143)	-0.0036 (0.0134)	0.0063 (0.0162)
Share of 25+ w at least a Bach's Deg*Neighbors	-0.0004 (0.0211)	-0.0046 (0.0248)	0.0092 (0.0258)	-0.0092 (0.0293)
State Avg electricity Rate	0.0017 (0.0040)	-0.0068 (0.0064)	0.0065 (0.0056)	0.0062 * (0.0059)
State Avg electricity Rate*Neighbors	0.0154 ** (0.0069)	0.0206 ** (0.0090)	0.0127 (0.0095)	0.0101 (0.0100)
Corp Inc Tax per \$1000 Persl Inc	0.0217 * (0.0127)	0.0249 (0.0192)	0.0162 (0.0175)	0.0347 (0.0187)
Corp Inc Tax per \$1000 Pers In*Neighbors	0.0038 (0.0234)	0.0083 (0.0289)	-0.0006 (0.0301)	0.0200 (0.0349)
Ind Inc Tax per \$1000 Pers Inc	0.0056 ** (0.0028)	0.0085 ** (0.0041)	0.0069 * (0.0040)	0.0016 (0.0042)
Ind Inc Tax per \$1000 Pers Inc*Neighbors	-0.0060 (0.0047)	-0.0071 (0.0060)	-0.0086 (0.0060)	-0.0016 (0.0070)
Prop Tax Per \$1000 of Pers Inc	-0.0035 (0.0037)	-0.0046 (0.0049)	0.0013 (0.0052)	-0.0107 (0.0058)
Prop Tax Per \$1000 of Pers Inc*Neighbors	0.0049 (0.0061)	0.0076 (0.0074)	0.0001 (0.0078)	0.0081 (0.0092)

Standard errors in parentheses.

\*\*\*: Significant at the 99.0% level.

\*\* : Significant at the 95.0% level.

\* : Significant at the 90.0% level.

Table A1 (cont): Alternative Specification with Neighbor Interactions

	All Manufacturers	Low R&D Manufacturers	Med R&D Manufacturers	High R&D Manufacturers
Spend on Higher Ed per \$1000 of Pers Inc	-0.0120 ** (0.0061)	-0.0268 *** (0.0082)	-0.0033 (0.0095)	-0.0041 (0.0093)
Neighbors*Spend on Higher Ed per \$1000 of Pers Inc	-0.0010 (0.0111)	-0.0053 (0.0134)	-0.0036 (0.0163)	-0.0042 (0.0172)
Spend on K12 Ed per \$1000 of Pers Inc	0.0114 ** (0.0049)	0.0118 * (0.0068)	0.0191 *** (0.0071)	0.0000 (0.0082)
Neighbors*Spend on K12 Ed per \$1000 of Pers Inc	-0.0043 (0.0085)	-0.0077 (0.0101)	-0.0154 (0.0112)	0.0150 (0.0129)
Welfare Prgms per \$1000 of Pers Inc	-0.0145 *** (0.0038)	-0.0122 ** (0.0053)	-0.0195 *** (0.0054)	-0.0026 (0.0058)
Neighbors*Welfare Prgms per \$1000 of Pers Inc	0.0260 *** (0.0073)	0.0242 *** (0.0090)	0.0349 *** (0.0093)	0.0088 (0.0107)
Highways/Roads per \$1000 of Persl Inc	0.0071 (0.0096)	0.0102 (0.0133)	0.0070 (0.0134)	-0.0022 (0.0143)
Neighbors*Highways/Roads per \$1000 of Pers Inc	-0.0020 (0.0179)	0.0067 (0.0215)	-0.0096 (0.0235)	0.0102 (0.0260)
Corrections Per \$1000 of Pers Inc	-0.0141 (0.0223)	-0.0264 (0.0305)	-0.0111 (0.0305)	-0.0146 (0.0352)
Neighbors*Corrections Per \$1000 of Pers Inc	-0.0102 (0.0425)	0.0153 (0.0507)	0.0019 (0.0554)	-0.0570 (0.0676)
Beacon Hill Comp Index	0.0207 (0.0330)	0.0606 (0.0477)	0.0008 (0.0468)	-0.0150 (0.0520)
Neighbors*Beacon Hill Comp Index	-0.0055 (0.0616)	-0.0470 (0.0744)	0.1123 (0.0846)	-0.0361 (0.0915)
Share of State Legis Dem	0.0009 (0.0020)	-0.0009 (0.0029)	0.0041 (0.0027)	-0.0037 (0.0031)
Neighbors*Share of State Legis Dem	0.0040 (0.0039)	0.0095 * (0.0049)	-0.0041 (0.0050)	0.0055 (0.0057)
Rate of Veto by Gov	0.0012 (0.0028)	0.0041 (0.0042)	0.0001 (0.0040)	0.0008 (0.0042)
Neighbors*Rate of Veto by Gov	-0.0021 (0.0052)	0.0003 (0.0070)	0.0012 (0.0067)	-0.0086 (0.0081)
Neighbors	1.4224 ** (0.0509)	1.4632 *** (0.0656)	1.2065 *** (0.0694)	0.9848 *** (0.0771)
Intercept	-18.9890 *** (0.0919)	-17.3981 *** (0.2768)	-23.3647 *** (0.1789)	-17.35129
N	8750	5034	4642	3870
Pseudo R2	0.0381	0.0612	0.0500	0.0377

Standard errors in parentheses.

\*\*\*: Significant at the 99.0% level.

\*\*: Significant at the 95.0% level.

\*: Significant at the 90.0% level.

Note: Each observation is a flow, a count of firms moving from one state to another. When all manufacturing firms are pooled together there are 8750 such observations. In the subsequent analyses, for every state-to-state pair, each flow is disaggregated into the three R&D categories. If migration occurred in all three R&D categories for every state-to-state pair, the number of observations N would be consistent across all specifications. The number of observations varies across specifications because not all state-to-state pairs exhibit manufacturing migration in all three categories of R&D.

Table A2: Specification imposes 5-year Lag Structure

	All Manufacturers	Low R&D Manufacturers	Med R&D Manufacturers	High R&D Manufacturers
State's Share of US Manf GDP (5 yr lag)	0.0107 (0.0098)	-0.0009 (0.0135)	0.0226 (0.0160)	0.0101 (0.0168)
Share of Emp in Manf (5 yr lag)	-0.0317 *** (0.0122)	-0.0066 (0.0169)	-0.0488 ** (0.0194)	-0.0195 (0.0225)
Compensation per Job in Manf (5 yr lag)	0.0029 (0.0050)	0.0055 (0.0071)	-0.0175 ** (0.0084)	-0.0046 (0.0094)
Union Memb Rate (5 yr lag)	0.0239 *** (0.0056)	0.0230 *** (0.0082)	0.0348 *** (0.0088)	0.0102 (0.0101)
Unemp Rate (5 yr lag)	-0.0316 (0.0325)	-0.0602 (0.0445)	0.0184 (0.0552)	-0.0780 (0.0620)
Share of 25+ w at least a Bach's Deg (5 yr lag)	0.0006 (0.0107)	0.0155 (0.0153)	0.0120 (0.0163)	-0.0068 (0.0196)
State Avg electricity Rate (5 yr lag)	0.0059 (0.0050)	0.0040 (0.0069)	0.0166 ** (0.0078)	0.0005 (0.0084)
Corp Inc Tax per \$1000 Persl Inc (5 yr lag)	0.0123 (0.0138)	0.0008 (0.0194)	0.0054 (0.0227)	0.0298 (0.0257)
Ind Inc Tax per \$1000 Pers Inc (5 yr lag)	0.0035 (0.0028)	-0.0033 (0.0036)	0.0073 * (0.0041)	0.0016 (0.0051)
Prop Tax Per \$1000 of Pers Inc (5 yr lag)	-0.0093 ** (0.0037)	-0.0149 *** (0.0051)	0.0013 (0.0056)	-0.0049 (0.0065)
Spend on Higher Ed per \$1000 of Pers Inc (5 yr lag)	-0.0006 (0.0070)	-0.0049 (0.0101)	0.0196 (0.0122)	0.0062 (0.0118)
Spend on K12 Ed per \$1000 of Pers Inc (5 yr lag)	-0.0003 (0.0054)	-0.0023 (0.0076)	-0.0041 (0.0089)	0.0000 (0.0101)
Welfare Prgrms per \$1000 of Pers Inc (5 yr lag)	-0.0002 (0.0042)	0.0087 (0.0060)	0.0019 (0.0070)	-0.0052 (0.0074)
Highways/Roads per \$1000 of Persl Inc (5 yr lag)	0.0116 (0.0110)	0.0139 (0.0154)	-0.0100 (0.0179)	-0.0100 (0.0196)
Corrections Per \$1000 of Pers Inc (5 yr lag)	-0.0161 (0.0271)	-0.0005 (0.0378)	-0.0186 (0.0390)	0.0145 (0.0523)
Beacon Hill Comp Index (5 yr lag)	-0.0595 * (0.0352)	-0.0726 (0.0530)	-0.0263 (0.0611)	-0.0064 (0.0641)
Share of State Legis Dem (5 yr lag)	-0.0013 (0.0020)	0.0019 (0.0027)	-0.0033 (0.0033)	0.0075 ** (0.0036)
Rate of Veto by Gov (5 yr lag)	-0.0003 (0.0030)	0.0046 (0.0043)	-0.0001 (0.0049)	0.0043 (0.0055)
Neighbors	0.9577 *** (0.0604)	0.9579 *** (0.0856)	0.6823 *** (0.0973)	0.6528 *** (0.0998)
Intercept	0.2840 *** (0.1014)	-0.2630 * (0.1533)	-0.3695 * (0.2084)	-0.2016 (0.1883)
N	3108	1408	1230	956
Pseudo R2	0.0272	0.0401	0.0288	0.0274

Standard errors in parentheses.

\*\*\*: Significant at the 99.0% level.

\*\*: Significant at the 95.0% level.

\*: Significant at the 90.0% level.

Note: Each observation is a flow, a count of firms moving from one state to another. When all manufacturing firms are pooled together there are 8750 such observations. In the subsequent analyses, for every state-to-state pair, each flow is disaggregated into the three R&D categories. If migration occurred in all three R&D categories for every state-to-state pair, the number of observations N would be consistent across all specifications. The number of observations varies across specifications because not all state-to-state pairs exhibit manufacturing migration in all three categories of R&D. Observations are also limited by the lag structure which excludes the first several years of data.