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# Firm Recruitment Competition among States

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# FIRM RECRUITMENT COMPETITION AMONG STATES

**BY**

**MICHAEL T. TASTO**

**A Dissertation Submitted in Partial Fulfillment**
**of the Requirements for the Degree**
**of**
**Doctor of Philosophy**
**in the**
**Andrew Young School of Policy Studies**
**of**
**Georgia State University**

**GEORGIA STATE UNIVERSITY**
**2007**

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## ACCEPTANCE

The dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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**ABSTRACT**

**FIRM RECRUITMENT COMPETITION AMONG STATES**

**By**

**Michael T. Tasto**

**December 2007**

**Committee Chair: Dr. Geoffrey K. Turnbull**

**Major Department: Economics**

Economic growth is a major concern for state governments. One method that states use to spur economic growth is recruiting firms to relocate or expand within their state. Headlines and press releases from high–profile recruitment cases suggest that states compete with each other to recruit firms. The primary question in this dissertation is whether states compete to recruit firms. A unique panel data set that captures a state's firm recruitment effort now provides the opportunity to answer this question. A variety of econometric methods (2SLS, MLE, and GS2SLS–GMM) isolate the spatial interdependence effect, and the empirical results show states do compete with each other to recruit firms. Another question answered in this dissertation is whether it matters how researchers measure a state's effort to recruit firms. The results reveal that it is important to capture only spending related to firm recruitment, as other measures provide fundamentally different results. In addition, this dissertation tests for the nature of rivalry between states and shows that states compete with other states that are economically or demographically similar. The results of competition are not only robust, but large in magnitude as well. States are very responsive to their rival's effort to recruit firms. Can

states stop spending on firm recruitment? If they do, the other states will capture their potential firms–thus the competition to recruit firms does not seem likely to end soon.

# CHAPTER 1: INTRODUCTION

When large firms relocate their headquarters or manufacturing facilities, it is usually front–page news. These firms realize the potential economic impact that they create in a local economy, and so, they require competing jurisdictions to offer incentive packages to consider their location. In recent news, Cabela's Inc. entertained competing offers from Ohio, Pennsylvania, and West Virginia to build its new distribution center and retail outlet. The estimated impact was 1,200 new jobs and $80 million in new investment. Cabela's accepted West Virginia's package, which among others, included $40 million in Tax Incremental Financing (TIF) and approximately $200,000 in worker training. The company located in the northern panhandle of West Virginia, conveniently situated between Ohio and Pennsylvania. DaimlerChrysler Corporation provides another recent and relevant example of interstate competition for firms. DaimlerChrysler planned to expand its Jeep manufacturing facility located in Ohio. The estimated impact from this expansion would create thousands of new jobs and $1.2 billion in new investment. When this news spread, Indiana and Michigan quickly prepared competing offers for DaimlerChrysler to consider. The firm decided to remain in Ohio, receiving an estimated $280 million incentive package to do so.

DaimlerChrysler's expansion in Ohio represents a significant case in this field because the legal questions raised here could place serious limitations on which incentives states have available to offer. In the case of *Charlotte Cuno v. DaimlerChrysler* (126 S. Ct. 1854, 2006) the plaintiffs, who were taxpayers in Ohio, argued that the $280 million package awarded to DaimlerChrysler by the state of Ohio violated the Article 1, Section 8, Clause 3 of the U.S. Constitution, commonly known as

the Commerce Clause (CC). The CC declares that states cannot interfere with businesses that cross state borders. The lower courts found that the state of Michigan did not have standing to press the issue because they could not prove damages; however, the residents of Ohio did have standing and could pursue a decision through the federal courts. The residents argued that allowing DaimlerChrysler a franchise tax credit unfairly depletes the state treasury of funds and places a disproportionate burden on themselves as taxpayers. Moreover, the credit violates the CC because it coerces businesses already subject to Ohio taxes to expand locally rather than out–of–state. The Sixth Circuit Court of Appeals ruled in favor of the plaintiffs asserting that Ohio's franchise tax credit was violating the CC, implying that there *are* limitations in what a state can offer as incentives when recruiting firms. Following this monumental decision, the U.S. Supreme Court agreed to hear the case on appeal. However, rather than addressing CC violation, the court ruled that the Ohio residents did not have standing and could not press this issue in court. The concurring opinion stated that simply because taxpayers pay taxes and are damaged by adverse tax incentives does not give them standing to challenge the policies of the state government in federal court. The Court overturned the lower courts ruling. Although this case ended without restrictions on states efforts to recruit firms, it shows how fierce the range of interests that are touched by such policies.

The decision for states to pursue recruitment strategies creates a dilemma between residents and politicians. The prominence of economic development programs in state government suggests that voters prefer active policy to spur economic development in their state. However, the *Cuno v. DaimlerChrysler* case indicates that some residents prefer these policies and initiatives to be fair or subject to certain limitations. The typical

political response to these equity issues relies upon input–output multipliers that show the expected benefits from the firm locating or expanding in the state outweighs the cost of the package, arguing that current residents will benefit through a stronger economy.

If there are popular concerns with inefficiency, the theoretical economic literature is split on this point, with support for the view that competition among states for firms may be efficiency enhancing (Black & Hoyt, 1989; Turnbull & Niho, 1986; King, McAfee, & Welling, 1993) and as well as inefficient (Biglaiser & Mezzetti, 1997). Implicitly assumed in these and related studies is that the jurisdictions compete with each other. However, the question of competition at the state level has yet to be addressed, until now.

Other evidence of interstate competition in the literature only suggests, through similar examples, that competition exists (Bartik, 1994; Schweke, Rist, & Dabson, 1994). The examples are anecdotal at best and it is not likely that examining only the cases that make front–page news fully explains interstate competition for firms. The lack of readily available data is why there are no empirical studies testing for firm recruitment competition. One important contribution of this dissertation is the creation of an innovative panel data set that explicitly records state recruitment efforts. The new data capture the ongoing effort expended by states to recruit firms, including effort for special high–profile cases as well as the invisible day–to–day efforts to recruit or retain lower–profile cases. State economic development departments actively target smaller firms that may bring in only 20–100 new jobs. A comprehensive dataset that accounts for this commonly "unobserved" effort provides a clearer picture of interstate competition for firms.

This dissertation is the first empirical study to test whether or not states compete to recruit firms, and if they do compete, to determine the nature of this rivalry. The nature of competition can occur in different ways, for example, states might identify their rivals in terms of a similarity they share in geography, demographics, or economic composition. The empirical study tests these alternative ways of measuring rivalry.

In addition, it is unclear how to best measure recruitment effort by states. The empirical study employs three alternative measures of state recruitment effort: firm recruitment spending, total economic development department spending, and the number of employees within the department of economic development. These measures of effort arguably capture different aspects of competition. Chapters four and five explain, in detail, these measures of recruitment effort. The empirical study examines whether the results are sensitive to which measure of effort is used.

In summary, the creation of this new data set represents a significant contribution. It allows for testing for the existence of competition and the nature of competition. For too long, researchers have assumed that such rivalry exists and the nature of how they compete based on limited examples highlighted by the press. These data finally provide the platform for rigorous economic analysis of firm recruitment competition among states.

At this point, it is useful to clarify the nature of interjurisdicional competition analyzed in this dissertation. The spatial econometrics literature identifies spatial lag and spatial error models. This dissertation estimates both types of spatial models. The spatial lag model estimates the spatial *interdependence* effect, essentially how one state reacts to the actions of other states and is analogous to a reaction function from the Nash

equilibrium of states' spending decision. Spatial interdependence identifies the magnitude by which states react to each other's observed spending in equilibrium. For example, if the estimated interdependence effect is 0.75, this means that when a neighboring state has higher recruitment spending, by $100, the home state reacts to this increase by increasing its equilibrium spending by $75. Thus, the estimate portrays how interdependent states are with respect to the amount of recruitment effort they exert. If the results reveal a significant spatial interdependence effect, this implies that states are competing against identifiable rivals to recruit firms. In contrast, the spatial error model estimates spatial *correlation*. This reflects a spatial pattern among the unobservables. If there is spatial correlation, this implies that the errors are correlated in a spatial pattern across observations. The structural equation of recruitment spending does not control for a state's terrain and is therefore unobserved in the error term. If competing states share common terrain, and terrain matters in identifying recruitment effort, then the error terms are spatially correlated between these competitors. Thus, spatial correlation captures common effort dimensions that cannot be controlled for in the structural equation, effects of states behavior that are not directly related to competition or rivalry. Allowing for these unobservables provides more efficient test statistics for the parameters of interest and ignoring spatial correlation can induce spurious estimates of spatial interdependence, even when none exists.

The dissertation is organized as follows. The next chapter reviews the literature surrounding this topic. It begins with early economic growth theories and how, over time, these theories have shaped government policy. Much of the subsequent research evaluates the effectiveness of these policies and studies the factors that affect firm

location decisions. The tax competition literature is quite extensive and is not discussed in detail here[1]. The type of competition relevant to this dissertation focuses on the interaction between state governments offering incentives to recruit/retain firms. The review concludes with a discussion regarding the few studies that are able to analyze this type of competition.

The third chapter presents the Edmiston–Turnbull (2007) tournament model of interjurisdictional firm recruitment competition as a view of how states might compete with each other. This model focuses on the recruitment policy interaction between states. It predicts how states modify their optimal amount of recruitment effort, given their competitor's effort. Viewed as a tournament, the analysis hinges upon whether states are competing with each other to win (successfully recruit a firm). It does not predict whether states win or lose, rather how one state reacts to other states increasing their effort to win. If such competition exists, then the model predicts that competing states react by increasing their effort to win. Finally, comparative static analysis is used to predict how a state's reaction function adjusts to changes in exogenous factors such as location advantage, incentive package, and risk.

Chapter four presents the empirical analysis that serves as the foundation for the remaining empirical chapters. The theoretical model of firm recruitment competition implies that if states compete, a factor leading to greater effort by one state elicits greater effort by competing states as well. The measure of effort tested in this chapter is firm recruitment spending and this is the most difficult measure of a state's firm recruitment effort to obtain. The analysis tests for the presence of spatial interdependence and allows for spatial correlation. Determining the type of spatial relationship among states requires

[1] See Wilson (1999) for a review of the tax competition literature.

that states be grouped into cohorts of competitors. A weight matrix organizes states into these cohorts according to their proportion of manufacturing employment. Ordinary least squares (OLS) tests the basic linear model explaining state recruitment effort. Two stage least squares (2SLS) controls for the endogenity of other states' spending, while maximum likelihood estimation (MLE) and GS2SLS with a generalized method of moments (GMM) estimator for the error allow for spatial interdependence and spatial correlation. The reaction function results reveal that states are competing with each other to recruit firms. The spatial interdependence effect is highly significant and economically meaningful. States that have a similar proportion of manufacturing employment react to a rival's increase in recruitment effort by increasing their own effort. The estimates also indicate that high growth rate states spend less recruitment effort, while more populated states spend more. In addition, states suffering from high unemployment are unable to increase recruitment effort to reduce unemployment.

The fifth chapter studies different empirical definitions of firm recruitment effort. The analysis employs two alternative dependent variables using the same empirical methodology from chapter four. The results in chapter four indicate that states compete with each other to recruit firms. If these results change, this implies that it matters how one defines recruitment effort. One alternative measure of effort is total economic development department spending. This variable captures all spending in the state for economic development, including firm recruitment spending. Perhaps, states that spend more in total economic development view their improved infrastructure and larger programs as a recruitment tool. If the results show states are competing to recruit firms, this indicates that total economic development department spending provides an

alternative measure of recruitment effort. The results, however, reveal that total economic development department spending is not an appropriate measure of recruitment effort. The interdependence effect is either insignificant or negative.

Another measure of recruitment effort is the number of full–time equivalent (FTE) employees in the department of economic development. These departments vary significantly in the number of FTEs. A state could view its staff as a cost–saving substitute for expensive recruitment programs that add substantial value to the firms it is recruiting. The logistics and bureaucratic red tape involved in relocating a firm can be quite overwhelming, so a state that has more staff in its department to assist these firms is an example of a state exerting more effort to recruit firms. However, the empirical question is whether the number of FTEs provides a good measure of a state's firm recruitment effort. The results indicate that the number of FTEs is not an appropriate measure of firm recruitment effort, because the interdependence effect is negative and significant across model specifications.

Chapter six is the final empirical chapter in this dissertation. It tests alternative specifications of the spatial weight matrix defining the nature of rivalry among states. Spatial econometrics typically refers to the cohorts of competitors as neighbors or rivals. The analysis then tests these neighbors to determine if there is a unique economic relationship among them. The method of forming these groups of neighbor's raises a particular issue in the theory of rivals because a neighbor can be defined in terms of geographic, economic, or demographic distance. And, the interdependence estimates rest upon the a priori assumption by the researcher. Thus, correctly identifying neighbors is

an important issue and this chapter tests whether the conclusions from the earlier chapters are sensitive to the definition of cohorts.

In chapters four and five, the models identify neighbors as states that have a similar proportion of manufacturing employment. This means states that are located far away from each other in geographic distance can be close neighbors if they have a similar proportion of manufacturing employment. Although the theoretical literature provides a rationale for choosing this specification of neighbors, chapter six tests alternative specifications, which is a common practice in this field. One specification of neighbors is the percentage of blacks in a state, which is one of the specifications that this chapter tests. Percent black population in a state defines demographically similar states as neighbors. The results assuming this specification of neighbors provides some evidence that states also compete with each other if they are demographically similar.

Another possible alternative in specifying a state's neighbor is to define a neighbor in terms of geographic contiguity. Here a state's neighbors are only those that share a physical border. The results indicate this is not how states compete for firm recruitment, when firm recruitment spending is the measure of a state's firm recruitment effort. On the other hand, the results do show that a state's effort is interdependent with other states when total economic development spending is the measure of a state's effort to recruit firms. In the context of the previous results for firm recruitment spending, the results here suggest that total economic development spending represents a passive approach to firm recruitment, providing a better business climate for firms to locate/expand naturally; rather than aggressively recruiting firms through firm recruitment spending.

The Hirshman–Herfindahl Index (HHI) of industry employment concentration is the last specification test for defining neighbors. This index provides a broader measure of a state's employment, rather than the proportion of employment in manufacturing used in earlier chapters. Perhaps states identify themselves with other states that are similarly situated in terms of their employment diversification. Here again, the results indicate states are interdependent in their firm recruitment effort, when firm recruitment spending is the measure of a state's effort to recruit firms. This provides additional evidence that states compete to recruit firms.

Chapter seven is the final chapter in this dissertation. This chapter revisits the main conclusions drawn from the empirical analysis and discusses the policy implications for state governments. This chapter concludes with a discussion detailing some of the paths for future research.

# CHAPTER 2: LITERATURE REVIEW

Policymakers intend to steer local and regional economic development in their direction, but they need to know how, if at all, proposed policies affect their economy. The theoretical literature focuses on why states appear to compete with each other in their effort to stimulate economic development. This chapter organizes the literature into three separate branches: the economic rationale for development incentives; empirical methods for evaluating the effectiveness of policy; and the political economy of these policies, in particular, whether policies are driven by interjurisdictional competition.

The economic rationale for using incentives to stimulate local economic development has its roots in both economic growth theory and firm location theory. The review begins summarizing the relevant aspects of this literature. The growth literature identifies potential factors driving economic growth, and this provides policymakers a rationale to implement active policies aimed towards influencing these factors. The firm location literature questions the effectiveness of this active policy, in part because the evidence suggests that economic incentives play only a minor role in determining where firms locate. These findings motivate an extensive amount of research testing the effectiveness of incentive policies. This chapter concludes by examining whether the choice to offer incentives to firms is strategically competitive government behavior. Phillips & Goss (1995), Wasylenko (1997), Fisher & Peters (1997), and Buss (2001) provide detailed reviews of the vast literature in local and regional economic development incentives.

## The Economic Rationale for Development Incentives

One important role for state and local governments is providing an environment where economic growth can occur naturally. Economic growth creates numerous positive effects through higher wages and lower unemployment for workers, increasing property values for residents, and the anticipation of re–election for politicians. Whether or not expected votes for politicians materialize is addressed later. Nonetheless, politicians behave as if they benefit from greater visibility of their efforts; it is no accident that new plant locations or headquarter relocations are often highlighted prominently in the press. Regardless of the politics involved, providing an environment for economic growth to occur in an economy is a challenge for politicians. Typical measures that signal an economy is growing are increases in income, employment, investment, gross product, and plant expansions, births, and relocations. Regional economists use these measures of growth to evaluate the growth in a local economy (Helms, 1985; Hodge, 1981; Mullen & Williams, 1991; O'hUallachain & Satterthwaite, 1990; McGuire, 1985; Papke, 1989).

The economic growth literature is a broader view of regional economic development and provides the essential concepts that motivate policy. This literature begins in the early 1900's when economic base models were developed to explain regional economic growth (Krieklas, 1992). These models separate economic activity in a region into basic and non–basic activities, defined as exporting industries and local consumption industries, respectively. According to Krieklas (1992), economic base models were plagued with a host of issues trying to explain regional growth. In particular, these models are primarily demand–oriented, they ignored important supply side factors

entirely (labor migration patterns, interregional capital flows, changes in production technology, and local tax laws), and are hard to measure.

In the late 1930's, Weimer and Hoyt (1939) popularized the location quotient as a measure of basic activity in a region. A location quotient analyzes the proportion of employment in a region for a particular industry, and then compares this proportion to the average proportion of employment in that industry for the nation. Employment in a region that is greater than the average proportion for the nation is the amount of basic activity. For example, if a region has 10% of its workforce in manufacturing, and the nation has only 5% of its total employment in manufacturing, this means that 50% of the employment in manufacturing for that region is basic (export–based) activity. A key point from this literature is that growth occurs when more of the local production is exported outside of the region, which brings "new" income into the economy and thereby creates additional demand for local consumption. Thus, the policy prescription here is that creating growth occurs from increasing the basic activity in that region. The manufacturing sector is historically the largest source for exporting product to outside regions; consequently, the conclusions drawn from economic base theory follow through to today's policy emphasis on recruiting manufacturing and related activities by state and local government officials.

Leontief (1951) developed input–output (I–O) models as an alternative method to analyze factors driving regional economic growth and obtain better estimates of basic activity. These models distinguish among different types of export activity, specifically the amount of economic impact that one firm might create in an economy versus another. For example, the amount of economic impact that a steel factory has on an economy

versus a mail–order firm might be quite substantial. However, economic base models only consider the importance of these two firms in terms of their export nature, not the magnitude of their economic impact that they have on the local economy. Over time, I–O models have been adapted to specific applications and are commonly used for economic impact studies or the effects of new or relocating industry on a particular economy (Edmiston, 2004). Regardless of the advancement in methodology (using I–O models), the empirical debate on economic base models continued into the 1990's. New variations of the economic base model, such as the marginal employment multiplier, now include separate demand and supply–side factors (McGregor, McVittie, Swales, & Yin, 2000).

Recognizing that export–based economic activity is important for growth in a region, the regional growth discussion develops into a cost–benefit analysis for state and local governments. Relocating or expanding firms present arguments to the economic development agency that detail the potential impact the firm will create for the local economy and ask the agency for incentives or benefits to choose their location. The implications for incorrectly estimating the potential impact a firm will have on an economy can be substantial, because the economic development agency evaluates the costs of their incentive package with the benefits from the firm's relocation/expansion. A useful result that I–O models generate is the employment multiplier, a common tool for evaluating the benefits from a firm relocation/expansion. Employment multipliers greater than unity imply that employment in a region will grow beyond the number of jobs created–directly related to the relocation or expansion. Edmiston (2004) estimates employment multipliers for large relocating /expanding firms in Georgia that have over 300 directly related jobs created. This study argues that most I–O analysis incorrectly

uses gross multipliers that overestimate the total employment effect for a local economy. Edmiston argues in favor of a net employment multiplier and estimates the effect to be about 0.30, considerably less than unity and gross multipliers. This means that if a new firm locates into a locale with 300 new jobs, total employment only increases by 90 jobs, or 210 jobs will leave as a result of the new plant relocation. These multipliers have very significant effects on the magnitude of incentive packages that state and local governments offer relocating/expanding firms. Regardless of the widely recognized weaknesses in I–O models, this framework underlies much of the governmental motivation and analysis of alternative economic development policies.

The macroeconomic perspective offers alternative insights into the factors determining growth. Viewing the economy from the national level, economic growth occurs through technological change (Romer, 1996), productivity (Baumol, 1986) and increasing returns to knowledge (Romer, 1986). These factors driving economic growth signal policymakers to increase the level of education for their workforce and create incentives that foster innovation and creation. Although this analysis is intended for nations and/or undeveloped countries, looking at the list of objectives and goals in state budgets, it seems clear that these macroeconomic policy proposals also affect the programs and initiatives that state policymakers support.

Another viewpoint emphasizes the role that the history of an economy plays in determining economic growth. Cumulative causation theorists attempt to explain why growth rates of economies will not converge over time and how the different paths that economies take is a result of their initial set of conditions determined in the past (Kaldor, 1970; Scott & Auerbach, 1995; Myrdal, 1957). This implies when a region gains a

particular growth advantage over other regions, this advantage will inspire more and more future growth, called the Verdoorn effect (similar to a multiplier) and result in diverging economies. Unfortunately, this implies that corrective action by policymakers will be ineffective. In a similar context, Carlino & Mills (1987) study economic growth for counties in the U.S. and suggest that the differentials in employment growth are likely due to preexisting differences in economic, demographic, and climatic conditions, rather than active policy decisions. Moreover, they conclude that growth patterns reflect changing preferences of the population in favor of a warmer climate, moving from the northern frost–belt states to the southern sun–belt states. The problem for politicians is that the factors determining economic growth identified here are outside their control.

Recent research examines economic growth theory at the firm level. Beginning around 1980, the firm location literature motivates an alternative regional perspective of economic growth. This perspective recognizes that while resource endowments attract resource–oriented firms and output markets attract market–oriented firms, process–oriented firms can be attracted to locales with lower regulatory costs or taxes. One lesson from this literature emphasizes the need for a better business climate by creating a more business–friendly location that allows firms to grow and develop naturally (Schmenner, 1982; Plaut & Pluta, 1983; Wayslenko, 1991). A popular method of creating a business–friendly environment is changing the taxes that businesses pay (Newman & Sullivan, 1988). In the last two decades of research, much of the literature is devoted to analyzing the effects of these tax policies.

Before discussing the effects of taxes, it is important to understand what differences in taxes intend to affect, which is the location decision of relocating firms.

Because locations are not homogeneous, understanding the reasons why a firm chooses one location rather than another is of utmost importance to the government officials that are trying to recruit firms into their jurisdiction. Depending upon which type of relocation (headquarters, research and development, back office, or manufacturing and distribution) certain local characteristics will be more important than others in determining the firm's location decision. Cohen (2000) summarizes those characteristics for each type of relocation. When politicians know why firms locate where they do, they can refine their economic development strategy to incorporate those factors that are important to the relocating business and target specific firms that are a good match. One caveat regarding the empirical firm location literature is that much of this research relies upon survey data from firms, and because the firm has an incentive to indicate the need for more incentives from government, some of the results may not be reliable.

In spite of data limitations, the firm location literature identifies key factors that affect a firm's location decision. Blair and Premus (1987) find that the general business climate, productivity of labor, transportation, and land availability are important factors. Heckman (1982) finds similar results; however, quality of life factors and construction and land costs are also significant. Haug (1991), DeVol (1999), and Fulton and Shigley (2001) find that proximity to educational/financial institutions and input suppliers are primary factors in the technology sector, but most of all is access to a highly skilled and trained workforce. Schmenner's (1982) survey of Fortune 500 companies finds similar results to the other studies, but also finds access to output markets is also an important factor. Another study finds that local labor market conditions are important in firm location decisions (Dumais, Ellison, & Glaeser, 1997). The list of factors could go on, but

the focus here is on factors that state and local government officials can affect. A common theme in these studies is that the quality of the workforce and the business climate are significant factors in firm's location decisions. State and local government officials try to affect these factors. Incentive packages commonly offer workforce training programs for relocating firms and locales often portray themselves as "business friendly" because of their lower regulatory costs (taxes).

The firm location literature argues that altering taxes to create a business–friendly environment is not effective, because taxes do not affect the firm's location decision. Schmenner (1982) identifies a two–step site selection process for firms, where tax differentials between locations only matter in the last stage, after the important and large cost decisions are made. Hanson (1993) and Schneider (1985) reiterate Schmenner's view, stating that tax differentials prove to be only tie–breakers, and have only a minor effect on the net return to new investment (Papke, 1995). Haider (1998) also agrees with Schmenner, stating that cost–minimizing firms are more concerned about the large ticket items such as labor and transportation and utilities, which can represent 30–40% and 35–45% of operating costs for manufacturing firms, respectively. Taxes only amount to 3–5% of operating costs for manufacturing firms or 4–6% for service industries, so state tax discounts are trivial (Bartik, 1995; Wiewel, 1999). However, Ady (1997) and Cohen (2000) point out that if one state's taxes are completely out of line (a large tax rate differential) with another state, they could be eliminated in the early stages of screening. Other research questions the relative importance of taxes, especially since states have neutralized the potential effects by adopting similar taxes (Wasylenko, 1997; Papke, 1995). This literature indicates that a better business climate can affect a firm's location

decision, but the empirical evidence suggests that altering taxes is not an effective method.

In summary, early economic growth theory provides a rationale for active government policy, because encouraging manufacturing and other export based activity to locate/expand inside a region could induce economic growth. More recent research utilizes I–O models and employment multipliers that allow government agencies to identify and target specific firms that are a good match in terms of the regions natural resources or firms that have a greater economic impact. On the other hand, the cumulative causation literature advocates for less government policy; arguing that only preexisting conditions in an economy matter for determining a regions future economic growth. However, in the 1980's new research from the firm location literature identifies factors that can influence a firm's location decision. If active government policy can influence these factors, then perhaps firms would locate/expand in that particular region. The empirical evidence indicates that government policy attempting to influence the firm location decision is ineffective. These finding motivate an extensive amount of literature testing the effectiveness of government policies and is discussed below.

## Empirical Tests Evaluating the Effectiveness of Incentive Policy

Offering incentive packages to attract or retain businesses appears to be a popular tool in the regional economic development agency's toolkit. The literature, discussed above, explains why manufacturing and other export–base activities are highly demanded. State and local governments recognize the potential for economic growth that these types of firms create by either relocating or expanding in their jurisdiction. Even

though recent research indicates that economic impact studies are not very accurate, government agencies still commonly use them to justify offering incentive packages to attract firms (Buss, 2001). On the supply side, mobile firms recognize the desired benefits that they create and expect potential locations to offer incentives. The important question here is whether incentives induce firms to locate in one particular location rather than where they would have located otherwise. The evidence presented earlier suggests that taxes are unable to affect the firm location decision. However, recent research reviewed in this section suggests otherwise. Therefore, active government policy to recruit or retain firms might spur economic growth in a region. The debate is not settled on whether firm–specific incentives or one–time deals are effective.

An alternative to offering direct tax incentive packages (subsidies/abatements) are "new wave" programs, which lower the production costs to firms by providing other methods of assistance and aid (Bartik, 1994). These new wave programs are viewed as cost–effective alternatives and include advice and technical assistance on modernization options, helping businesses learn how to export product, training workers for the firm, training entrepreneurs and small businesses in developing business plans, and helping businesses locate financing (Bartik, 1994). These types of programs have expanded in size and scope since the early 1990's. However, the total amount of spending on tax subsidies/abatements dwarfs the amount of spending on new wave programs. Buchholz (1999) argues state spending is in the tens of billions of dollars annually. Tax subsidies/abatements are forgone tax revenues, which do not appear in state budget documents or other readily available data sources. This is unfortunate, because as Buchholz (1999) points out, those incentives can represent a large share of some

incentive packages. The types of programs that Bartik identifies (and others similar in nature) do appear in state budget documents. This dissertation analyzes these types of programs and finds that the average state spending is $18 million annually. However, much of the literature focuses on tax rates rather than firm–specific tax incentives because of data availability.

This literature largely dismissed the notion that taxes mattered in location decisions before 1980 (Carlton, 1979), but overwhelming evidence since then provides stronger support that taxes do influence firm location decisions. For example, Bartik's (1991) seminal review of the literature from 1979 to 1991 analyzing the effect of taxes on economic activity provides this field's most conclusive evidence that taxes do play a role. In fact, his consensus estimate of the interregional elasticity of business activity with respect to taxes are [-0.1, -0.6] with an average of -0.3. Which implies a 10% reduction in taxes will create a growth in business activity of 1% to 6%. Business activity is defined to encompass the different measures of economic growth that previous studies use, which can be employment growth, per capita income growth, or new business births. Bartik's analysis of the empirical literature is one of the most comprehensive studies and provides evidence contrary to the suppositions made in the firm location literature. He argues that recent research techniques employ better methods and data to estimate the impact taxes have and survey methods are too unreliable. The surveys from the firm location literature ask for the most important factors in determining the firm's location, rather than the more important question, which is, would the firm have located elsewhere if taxes were lower.

Bartik's estimate is not free of criticism and he acknowledges that each study from his meta–analysis can be criticized for problems in methodology used or data

sources, but since there is a consensus among so many studies, most arguments against his estimate are unfounded. Depending upon different model specifications, the median elasticity of business activity with respect to taxes remains negative, but somewhat smaller in magnitude, as reported by Baritk they are [-0.15, -0.27, -0.35]. Bartik concludes that state and local taxes affect the business activity in a locale.

Bartik's interregional elasticity estimate varies over a broad range. Controlling for differences in studies, Phillips and Goss (1995) reexamine Bartik's review and find the elasticity is -0.35, reaching essentially the same conclusion as Bartik. When they control for public services and fixed effects the estimated elasticity is -1.14, which seems reasonable, because excluding a measure of public services biases the estimate to zero. This effect results from the positive correlation between taxes and public services–a state with higher taxes might offer additional public services. Wasylenko (1997) provides a list of studies where the elasticity estimates are small in magnitude or statistically insignificant. Nonetheless, it appears that most empirical researchers in this field believe the evidence supports the finding that taxes do affect the amount of business activity in a region.

Generally, this literature focuses on how taxes affect economic activity between metropolitan areas, states, or regions (interregional level) rather than within metropolitan areas, states or regions (intraregional level). Just as interesting, however, is looking at how taxes affect the amount of economic activity at the intraregional level. In fact, the estimates for the intraregional elasticity may provide insights, otherwise unnoticed, regarding the interregional elasticity estimate. Bartik (1991), Wayslenko (1997), and Buss (2001) argue that in a metropolitan market labor, energy, and transportation and

construction costs are approximately the same throughout, so it follows that if these major costs do not vary across the metropolitan area, fiscal incentives should play a greater role in the intraregional firm location decision. This implies that the expected magnitude of the intraregional elasticity is greater than the interregional elasticity. Bartik (1991) and McGuire (1985) conclude that the intra–regional elasticity is approximately -1.5, which indicates that firms view alternative locales in a metropolitan area as close substitutes. This elasticity estimate implies that if one county in a metropolitan area has taxes 10% lower than its surrounding counties, that county will have a 15% increase in business activity. Firms are extremely sensitive to taxes differentials at the local level, in contrast to the earlier conclusion that taxes do not matter. Thus, the interesting insight here is that at both levels of analysis, the point estimates make intuitive sense, because we would expect the intraregional effect to be larger in magnitude than the interregional effect. Both are negative.

The elasticity of business activity with respect to taxes is a broad measure of economic growth in an area. Lowering taxes that all firms pay is an expensive approach to increase economic growth in a region and may not be necessary, if firm–specific incentives can successfully alter the relocation/expansion decision of a firm. The use of these targeted incentives creates concerns of equity for those firms and residents not receiving the benefits, as evident in the *Charlotte Cuno v. DaimlerChrysler* case. However, the important economic question is whether these targeted incentives are effective; if so, they may be an efficient (lower cost) alternative than lower tax rates for all firms. Can firm–specific incentives alter the location decision? There are anecdotes and examples that indicate incentives are effective. Determining the effectiveness of

firm–specific incentives is not an easy matter to resolve, because both firms and politicians have an incentive to indicate that development would not occur otherwise. Levy (1992) provides the example of Illinois spending almost $200 million to help Sears, Inc. relocate 6,000 workers from inside Chicago to the suburbs as evidence that incentives are necessary, because Sears had competing offers from other locations. Likewise, BMW had many competing offers to consider when it was building a new manufacturing facility; had it not been for the $100 million incentive package they received from South Carolina, perhaps they would have located elsewhere (Schweke, Rist, & Dabson, 1994). More recent examples, discussed earlier, involving West Virginia acquiring Cabela's, and Ohio retaining DaimlerChrysler also provide evidence that politicians believe firm–specific incentives are a necessary tool to recruit or retain mobile firms, as an alternative to lowering taxes for all firms. A firm cannot admit, publicly, that the incentives it receives to locate/expand in a region are unnecessary. In order to receive future incentives and retain public support, the firm has to reassure the government and the public that they would not have located in the region otherwise. Similarly, government officials need to articulate that the use of incentives was the only possible way to attract this 'valuable' firm. This problem facing firms and policymakers suggests that survey data, from the firm location literature, is not likely a meaningful method in determining whether firm–specific incentives can alter a firm's location decision.

Fisher and Peters (1997) point out that there is very little systematic research analyzing these firm–specific incentive packages. Their survey of the relevant literature provides conflicting evidence regarding the effectiveness of targeted incentives. Fisher and Peters (1997) review the effectiveness of enterprise zones and cite studies by Dabney

(1991), Rubin and Wildner (1989), and Papke (1993). Their review indicates that the advantages of enterprise zone designation cannot overcome the inherent disadvantages already present in the location. In contrast, they assert that 76 percent of increased employment in an enterprise zone can be attributed to its designation. Therefore, it is unclear whether designating areas as enterprise zones is an effective incentive to lure firms. One of the main objectives in designating enterprise zones is to reduce unemployment in the area, and Papke (1994) finds that unemployment claims in these zones decrease by 19–25 percent. Ladd (1998) also studies enterprise zones, but finds that subsidizing capital brings in firms that are more capital intensive, which are less likely to hire the locally unemployed. One study that Buss (2001) reviews is an internal analysis of a sales tax deferral and exemption program by the Washington [State] Department of Revenue (1996). Because of this new program, expanding firms estimated that $3.2 billion in new investment and over 23,000 jobs would occur as a result. This program cost the state nearly $130 million. The internal study reveals that the effects attributable to the program are only 6,000 new jobs and approximately $100 million in new investment. The department surmised that this program is ineffective, because it did not have an influence firms. Fisher and Peters (1997) and Buss (2001) conclude that the current state of research regarding the effectiveness of incentives is inconclusive, because some studies find and others do not find evidence that incentive programs are effective. Courant's (1994) widely cited survey paper on the use of incentives also calls for further research into evaluating the costs and benefits from economic development incentives. He argues that improved measurements of actual costs and benefits can provide better policy recommendations, because the current analysis is insufficient.

Policymakers are concerned about the effectiveness of their incentive programs. In the late 1990's, the governor of Georgia requested a comprehensive evaluation of the state's tax incentive program. Ihlanfeldt and Sjoquist (2001) composed a list of policy recommendations and proposals to improve the program. Their analysis led to many changes in the incentive program and addressed other development objectives as well. To encourage other states to pursue these evaluation studies, Ihlanfeldt and Sjoquist (2001) include a discussion of useful lessons, which makes it easier for other analysts to analyze their states' incentive programs.

Because of conflicting evidence, there does not appear to be a consensus whether these incentive programs do or do not affect the location decision by firms. The fact that state and local governments use incentives suggests that they believe these incentives do matter to firms. Recent research by Bartik (2005) offers plausible explanations why targeted economic development incentives may be effective. However, he does not offer conclusive empirical evidence. He suggests that the public might perceive these incentives as a necessary cost to produce the social benefits that arise from a firm relocation/expansion. If incentives can influence the location decision of a firm, fiscally distressed or high unemployment areas can counteract the problems in their local economy. His other explanation hinges upon the increased mobility of firms. Because of lower transportation and communication costs, firms can effectively operate in many alternative locations, opening up close substitute locations. Agreeing with many others, Bartik (2005) argues that incentive programs need better measurement of costs and benefits to the locale; he finds that the actual costs are much larger than the modest benefits received in return. As an alternative method of program evaluation, Bartik

suggests creating experiments to observe differences in the effect incentives have on firms that receive treatment versus those that do not. The treatment is a more aggressive marketing strategy. More methods to evaluate these programs are necessary, because the effectiveness of economic development incentives remains an empirical question.

Bartik (1993) and Courant (1994) suggest yet another method to evaluate the effectiveness of targeted incentives. They suggest looking beyond the number of jobs created or the amount of new investment in a location and examine who benefits from the new jobs and investment. Bartik (1993, 1994) estimates that 60–90% of jobs created by employment programs end up going to new residents and other unintended beneficiaries in the long–run. These estimates are very important because they reveal that even if the economic impact analysis correctly predicts the number of jobs created, the current residents would not receive the intended gains. This can create serious political consequences, because politicians' primary objective in spending taxpayer dollars for economic development is to increase jobs for existing residents (Papke, 1995).

Other research suggests that racial disparities exist in job creation programs. Ihlanfeld and Sjoquist (1991) conclude that whites receive greater benefits from these programs than do blacks. When Boeing moved its headquarters to Chicago, it did not hire all new employees, most of the workers simply relocated with the company. This leads some to question whether Chicago received any benefit from Boeing's headquarter relocation (Bartik, 2005).

Buss (1999) argues that one objective from offering incentives to firms is the political payoff that politicians expect to receive. However, the uncertainty surrounding the effectiveness of incentive programs does not explain their frequent use by politicians.

As stated earlier, politicians behave as if they benefit from greater visibility of their efforts, and this explains why they typically are present for ribbon–cutting or groundbreaking ceremonies. Attending these ceremonies allows them to claim credit for the successful relocation/expansion.

A political review of the economic development literature by Wolman and Spitzley (1996) suggests that the motivation for more development is politically motivated. One study their review cites is Peterson (1981); this study provides possible explanations why politicians pursue economic development initiatives. Peterson argues that economic prosperity broadens the fiscal base of a locale and lowers the unit cost of public services, economic development is politically popular, and local officials care about their community. However, another study in Wolman and Spitzley's (1996) review argues that politicians are much less benevolent. Logan and Moloch (1987) suggest that politicians are part of the urban growth machine, only intent on increasing their personal land rents from more intensive use of the land through rapid development; and they demand campaign contributions from the developers and speculators who also gain from greater development. Wolman and Spitzley (1996) conclude that the role politicians play in a local economy is double–sided. On one side, the public expects politicians to 'do something' in the case of economic decline, and on the other side, politicians are likely credit–claiming figureheads seeking votes for reelection.

An interesting and unique study of voting behavior in counties from seven Midwest and Atlantic states by Turner (2003) reveals that governors actually lose votes in subsequent elections from counties where new firms located. The standard reasoning for spending on economic development is to increase employment and income. Turner's

analysis reveals that increases in employment and income did occur in these counties. This indicates that even when economic development policy is successful, the political payoff for politicians might not necessarily occur. He argues that because of the minor role that taxes and other incentives have on firm location decisions, targeted recruitment strategies for governors is neither beneficial in the long–term for the economy nor in the short–term for politics. These results do not refute the earlier claims that the using incentives are politically motivated; rather, they suggest politicians are misguided in expecting reelection from their successful recruitment.

This section of the literature review provides the clearest motivation for active government policy. The conclusions drawn from the literature indicate that taxes do matter in the location decision of firms at the interregional and intraregional level. Locations with lower taxes have increases in business activity. The relative importance of taxes is smaller at the interregional level, but they can be tiebreakers for otherwise indifferent firms. The empirical evidence for targeted (firm–specific) incentives is inconclusive, which possibly explains why politicians still offer these packages to attract firms.

A major problem identified in this literature is the need for better evaluations of firm–specific incentive programs. Although this dissertation does not test or evaluate these particular incentive programs, the data used in the empirical chapter examining competition has the potential for exactly the type of evaluation needed.

## The Political Economy of Incentive Policies

We now turn to the studies that test whether offering incentives is strategically competitive government behavior. Difficulty obtaining quality data to answer this question is the underlying issue; few studies have been able to clear this hurdle. Even though press headlines indicate that states are competing with each other for economic development, these high profile cases might be outliers and not representative of the how state governments truly interact.

Headquarters of Fortune 500 companies are increasingly mobile. Testa (2006) shows that their locations are now more dispersed throughout all major cities in the country since the 1970's. Increased mobility might be resulting from the lower transportation and communication costs discussed earlier, or states with right–to–work laws and other pro–business policies may be motivating firms to pick up and move (Holmes, 1998). Holmes' results show abrupt changes in the amount of manufacturing activity when crossing these state borders. The implication here is that when firms have increased mobility or are footloose, state and local governments have to try harder to keep the firms they have or to recruit firms from other states. Wolman and Spitzley (1996) point out that part of the pressure on politicians to offer incentive packages is competition with other locations. If it is the case that firms have increased mobility and that mobility elicits politicians to be more competitive, the empirical results (chapters four, five, and six) should indicate that states are competing to recruit firms.

If states are able to recruit firms this is a signal to policymakers that their short–term recruitment strategy is succeeding. What are the long–term consequences of these strategies? Rork (2005) reveals that there might be a price to pay. He uses a dynamic

partial adjustment model to link low corporate tax rates and labor–intensive manufacturing industries. Lowering corporate taxes is akin to offering statewide incentives for firms to relocate. Rork argues that labor–intensive manufacturing firms have greater mobility than their capital–intensive counterparts, because the cost of moving capital is much greater and prohibitive in some cases. Thus, the type of firm that is able to take advantage of lower regulatory cost states is more likely to be labor–intensive. Rork (2005) looks at the southern states from 1957–1992 and finds that southern states with lower corporate taxes attracted labor–intensive manufacturing firms. The price that these states pay for the short–term gain in employment is the long–term lack of capital investment required for future growth. In summary, the competitiveness by southern states to attract mobile firms through lower corporate taxes might only be a short–term problem for the northern states that are losing these firms.

Theoretical models of interjurisdictional competition provide the framework for understanding the competitive process between interacting governments. Surprisingly, some of the tax competition literature suggests that intergovernmental competition is wasteful in its attempt to acquire mobile nonresidential capital (Wilson, 1999). The literature argues that tax rates and expenditure levels are set suboptimally to inefficiently low levels. This finding is quite suspect though, because this is the government's analogue to Tiebout's 1956 argument for mobile households–intergovernmental competition is efficiency enhancing (Turnbull & Niho, 1986). It also opposes the efficiency argument in Coase's Theorem. Coase (1960) illustrates that if two local governments are competing with each other to acquire something of value, a firm for example, the location that places a higher value on acquiring the firm will end up offering

more to obtain the firm, and the allocation of this firm between the two locations is efficient.

The root question is whether governments compete with each other. This question is logically antecedent to whether such competition is efficient. It is not the objective of this review to focus on whether the results of intergovernmental competition are efficient; Wilson (1999) surveys the tax competition literature to that effect. However, before proceeding to the relevant empirical intergovernmental competition studies, two important studies that indicate intergovernmental competition can enhance efficiency are worth noting. Analyzing the use of firm–specific incentives, Black and Hoyt (1989) and King, McAfee, and Welling (1993) show that even though targeted firm recruitment is normally viewed as a negative–sum game, when two locales compete for one firm the result can be welfare improving.

Black and Hoyt (1989) model the competitive process between two large cities to recruit a firm. An auction model motivates the bidding between cities to recruit the firm; these bids are analogous to the incentive packages state and local governments offer firms. The socially efficient outcome arises when the firm locates in one of the cities and draws in a larger population (direct and indirect) to the city. This increase in population lowers the average cost of providing public services. Hence, the local government can afford to offer incentives when the marginal cost of providing public services is less than the tax revenue that the increased population generates. The firm is the decision maker and chooses to locate where its production costs are lowest. The model here, like the Edmiston–Turnbull (2007) model in the next chapter, allows for city–specific location advantages or disadvantages. The efficiency also hinges upon the firm revealing its

production costs to the cities. Firms are not likely to disclose this information publicly. However, if these costs are known (in general or on average), then the bidding for the firm results in an efficient location decision. One questionable assumption of this model is that increased population occurs because of the firm locating in one city. Thus, the benefits of lowering the average cost of public services that a city receives comes through agglomeration forces–but the empirically estimated employment multipliers, discussed earlier, raise doubts about the magnitude of that effect.

Another well–known study is King, McAfee, and Welling (1993), they present a dynamic model of intergovernmental competition for a large plant. Their model uses an auction in two periods to determine the winning bidder (jurisdiction). The plant may relocate in the second period, but at a cost. Under similar restrictions to Black and Hoyt, they also conclude that the plant allocation is efficient. They broaden the analysis by allowing the plant to reevaluate their location decision and move in the second period. Surplus is the difference between the actual and expected production costs for a given location. This surplus is known at the end of the first period and the plant evaluates this knowledge against the expected surplus from the second location in the second period. This is, however, after the local government chooses its optimal amount of investment in infrastructure. Looking into the local government's decision process, their analysis reveals that the optimal Nash equilibrium strategy for the competing local governments is to choose different levels of investment and the plant chooses to locate where investment is initially higher. This model is set up in a non–commitment framework where the plant's relocation costs are sufficiently small so that the threat of relocation is credible. Non–commitment seems reasonable because the plant is always free to leave, but

policymakers recognize this potential and do not offer the incentive package as an up–front lump sum. They require the plant to produce, over time, the results it anticipated or face 'claw–back' revisions from their awarded incentives. Large plants, by their nature have extremely high start–up costs, thus the irreversibility of development is likely nontrivial here and the authors recognize this feature of their two–period model. Their second proposition states that the probability of switching locations in the second period is less likely when the fixed costs of constructing the plant are high. Another peculiarity with their dynamic auction model deals with the time frame in the two periods. How long are the periods? Mobile firms have a clear incentive to negotiate short–term packages or even long–term packages and leave before the term expires, which is not directly addressed in this study.

These models of 'bidding for firms' show specific instances where the process of offering incentive packages to recruit firms into a locale can be efficiency enhancing. In such cases, competition among governments is not wasteful. Tiebout's central hypothesis is that because residents are mobile, local governments that value their residency (and the taxes they contribute) will compete with their neighbors to keep the residents they have and attract the ones they do not have. Moreover, this competition is efficient, because it forces the local government to align the marginal cost of providing public services with the marginal benefit residents receive. This logic follows through to non–residential capital as well, but the main difference in large incentive packages for nonresidential capital is that firms are singled out from the other businesses, while residents are not. Although this paper argues against judging based on anecdotes, a hypothetical residential relocation illustrates the commonality residential and nonresidential capital have, in the

case when they can be singled out. Suppose that the White House decided to relocate after its long tenure in Washington D.C. If this were to occur, it seems entirely plausible that many cities and states would offer large incentives to have the White House relocate to their city or state. The theoretical models discussed above, indicates that under a few assumptions, it is efficient for these cities and states to compete for the White House.

There are not many empirical studies analyzing competition among state and local governments for economic development. The problem is the lack of quality data. Occasionally, valuable data becomes available which can test these long–standing questions. This dissertation is the first study to employ data that analyzes competition at the state level to recruit firms. Previous studies, that also use unique datasets, find local governments are competing with each other at the municipal and county level. These studies are the closest related research to this dissertation and are discussed in detail below.

Anderson and Wassmer (1995) address the issue regarding the timing by municipalities to adopt specific economic development incentives (manufacturing property tax abatement). They examine 112 communities in the Detroit metropolitan area from 1973–1992, determining if one community's choice to offer an incentive induces other surrounding communities to offer the incentive as well. By estimating a hazard function, they find that there is positive duration dependence, which means that when one community elects to adopt an incentive, other communities adopt the incentive in response to the decision by the first community. This is similar to the finding of 'copycat' behavior found by Case, Hines, and Rosen (1993), where a state's spending behavior mimics its neighboring states by 70%. For example, a $100 increase in spending by a

neighboring state induces the home state to increase its spending by $70. However, allowing for higher–order spatial correlation in the estimation technique, McGarvey, Walker, and Turnbull (2007) do not find evidence of this copycat behavior. Anderson and Wassmer find that communities in the Detroit metropolitan area with a higher level of median household income or property tax price tend to prolong the time to adopt their neighbors' development incentives. This supports Fischel's (2001) argument that higher income communities avoid the negative effects associated with rapid economic development and therefore would not use incentives that increase the development pace.

Anderson and Wassmer (1995) conclude that municipal governments are strategically competitive. These incentives are more a mimicking response to competitors than proactive attempts to spur economic growth. They also surmise that the time delay in choosing to offer incentives is because of imperfect information regarding when a neighbor implements an incentive.

Another economic development incentives study looks at factors influencing a city's decision to adopt the use of Tax Incremental Financing (TIF). TIF sets aside the increase in assessed value of an area and uses the taxes that the increase in assessed value generate to finance projects or development within the area. Therefore, TIF creates an incentive for development, since the increase in taxes that firms pay in the future finances their current development. Man (1999) investigates cities in Indiana to determine if the decision to adopt a TIF program is strategic behavior by local governments. That is, do cities mimic their neighbors in deciding whether to offer TIF? Man's results for this intergovernmental reliance are positive and significant at the 5% level. This concurs with Anderson and Wassmer's (1995) conclusion that municipal governments are strategically

competitive. Man's study also identifies other important factors that determine whether a city adopts TIF. For example, greater fiscal distress or a higher concentration of service industries in a city increases the probability that they will adopt a TIF program.

Edmiston and Turnbull (2007) is the primary motivation for this dissertation. This paper examines the decision of counties in Georgia to offer incentives to relocating firms. The authors accessed a unique 1999 survey by the state of Georgia, which allows them to design a choice dummy variable for offering incentives. They develop a theoretical model of interjuisdictional competition that describes how county governments are interdependent in their efforts to recruit firms and test this model empirically. Their results indicate that county governments in Georgia are competitive; that is, one county's decision to offer an incentive is dependent upon whether its neighbors are offering incentives. Their paper envisions competition as reactionary or interdependent; this dissertation adopts the same viewpoint for competition occurring at the state level. Their results have a diminishing effect where the strength of competition declines as neighbors become more distant. Most states in the U.S. have a decentralized government structure so that counties overlap the cities that lie within. Edmiston and Turnbull's results here provide useful insights into how these overlapping governments are competing with each other for economic development on the same (county) level, which is one layer above the competition found by earlier studies at the municipal level. Virginia and New England states are unique in this regard; see Turnbull and Tasto (2008) for a more detailed discussion. Similar to Man (1999) and Anderson and Wassmer (1995), Edmiston and Turnbull (2007) find that higher income counties are slower to adopt the incentives that their neighbors offer. In addition, their results indicate that counties with higher

unemployment tend to respond more quickly to which incentives their competitors are offering.

Some researchers criticize dependent variables of the type used in Edmiston and Turnbull (2007). Wolman and Spitzley (1996) and Fisher and Peters (1997) point out that studies relying on count (choice) variables to evaluate incentive programs misrepresent the program's importance. They argue that what matters is not whether a jurisdiction has three incentive programs or ten, but how much it spends on the programs. However, Edmiston and Turnbull's (2007) study is not subject to the same criticism, because here it is not important whether a county simply offers an incentive, rather it is important if the decision to offer the incentive is driven by their reaction to neighboring counties.

This review concludes by looking at possibly the closest related study to the empirical analysis in this dissertation. De Bartolome and Spiegel (1995) take advantage of economic development spending data from a survey by National Association of State Development Agencies (NASDA) for 1992. This data captures aggregate department spending and the individual program spending within that department. This data is very similar to the measures of effort that the empirical chapters in this dissertation use to test for the presence of competition. However, they are different in important aspects. The data collected in this dissertation is actual spending, as reported in the state budget and collected over a continuous period of seven years, rather than collecting it by survey pertaining to only one year.

De Bartolome and Spiegel (1995) adapt the Ricardo–Viner model to examine the state government economic development expenditure decision, where states have the objective to maximizing the local net wage. The two–sector Ricardo–Viner model

assumes that capital is sector specific, but mobile across regions within the manufacturing sector and the alternate (non–manufacturing) sector. Labor is mobile between the sectors, so that wages adjust when new capital is recruited into the region through spending on economic development. They test the effect wages and the share of manufacturing employment has on the amount of per worker economic development spending. Predictions from their theoretical model match the empirical results they report. States spend less on development when the wage level is rising and their share of manufacturing employment is falling. This suggests that states competing for foreign and domestic direct investment interpret current total department spending policy initiatives to be successful when wages are rising, and so, spend less. The authors propose that successful recruitment draws more capital and labor into manufacturing sector; the increase in labor lowers the manufacturing sector wage level and raises the alternative sector wage until they are back to equality. They predict that the decrease in the manufacturing sector wage from the labor inflow will diminish as that sector becomes more dominant in the economy. When a state perceives its policy initiatives to be successful, it abstains from spending more on those initiatives.

The studies reviewed here suggest that competition among governments is occurring in lower–tier governments. De Bartolome and Spiegel (1995) use data similar to the data in this dissertation, but do not test whether states are competing with each other. The following chapter presents a theoretical model, which provides a rationale for how this competition might occur. Later chapters test for this competition empirically.

To summarize this literature review, early economic growth theory provides the economic rationale for offering incentives to relocating/expanding firms. The

manufacturing sector is historically known for its potential to create growth in a region. Consequently, the empirical literature focuses its analysis primarily on this sector. Firm location theory indicates that incentives need not affect firm location decisions. These claims sparked a flurry of empirical tests revealing taxes affect location decisions, but primarily as a tiebreaker between comparable locations. Many still worry that the costs of incentive packages outweigh the expected gains to the locale. However, the important conclusion from the empirical studies is that intergovernmental competition explains why politicians offer incentive packages to relocating/expanding firms. The few studies testing for strategic competition have all been made possible by unique datasets. This dissertation advances the field by providing a new and more comprehensive panel dataset designed to analyze interjurisdictional competition at the state level.

# CHAPTER 3: A THEORETICAL MODEL OF INTERJURISDICTIONAL FIRM RECRUITMENT COMPETITION

## Motivation and Intuition

Whether states compete with each other to recruit mobile firms is the motivation for this dissertation. The theoretical model developed in this chapter analyzes the process of how competition among states might occur and predicts their behavior under various circumstances. It is important, however, to note that the government interaction in this market is not analyzed on normative grounds. This dissertation determines the extent to which states compete with each other to recruit firms; the focus here is on whether interaction between state governments represents strategically competitive behavior.

Using major league baseball as an analogy, suppose two baseball organizations are competing with each other for the best baseball team. The objective of a team is winning the most games. How a team achieves those victories depends on many factors, some of which are measurable. The amount of effort that a team puts forth, to some extent, determines whether they win games. Measures of a team's effort could be the amount it spends on its players, total spending for the organization, or the number of personnel in the organization. The question this dissertation seeks to answer is whether teams (states) are competing with each other in terms of measured effort to win games (recruit firms into their state).

Consider the New York Yankees and the San Francisco Giants, where the Yankees and Giants are competing to win a game. Surely, one might argue that the probability of winning the game does depend on the effort that the team exerts. If the amount of spending on players matters in achieving victories, then we should observe the

Yankees and Giants competing to spend more on their team's players. Likewise, for states, if the amount of effort matters in determining whether a state successfully recruits a firm, then we should observe states competing with each other to exert more effort.

The Firm Recruitment Tournament (FRT) model developed here follows very closely the recruitment tournament model in Edmiston and Turnbull (2007). The FRT model extends their analysis to competition at the state level. A basic assumption of the model is that effort expended by a state determines, to some degree, the success of recruiting firms into the state. In addition, a state's inherent net location advantage or disadvantage also affects the probability of successful firm recruitment. An important implication of a rank–order FRT is that only the relative effort of competing states matters (Nalebuff & Stiglitz, 1983), which means, relative to other important factors in the firm location decision, the winning state may spend less "measured" effort to successfully recruit the firm.

Effort identifies the willingness and determination of competitors trying to achieve success. In baseball, players who run as fast as they can or hit the ball as hard as they can are examples of players exerting all the effort they have available. Putting forth all the effort a player has available does not guarantee success. Rather, a player might recognize they are inferior in some aspect, when compared to others, and this inspires them to try harder (more effort). This dissertation identifies alternative measures of effort by states to recruit firms. If states are competing with each other, then when one state tries harder (more effort) competition implies that the competing state tries harder (more effort). Measures of state's recruitment effort are similar to the baseball analogy, where spending on specific programs in the department of economic development (explicitly

tied to firm recruitment) is analogous to a team spending on its players. The other two measures of effort are total department spending and the number of employees in the department of economic development. All three measures of effort are measurable and if these matter in determining successful recruitment, we should observe competition occurring in terms of these measures. A measured response would be observing an increase in total economic development spending by one state, which then elicits an increase in total economic development spending by the other state.

## Model

In the Edmiston–Turnbull model, the state's effort to recruit/retain mobile firms is denoted by $e_i$. Net location advantages or disadvantages necessarily alter the amount of effort required to successfully recruit firms into the state. This is captured by the parameter $\alpha$ where $\alpha > 0$ indicates a net location advantage and $\alpha < 0$ is a net location disadvantage to the recruiting state. Thus, effective effort of state $i$ is $e_i + \alpha + \varepsilon$, where $\varepsilon$ represents other relevant firm location factors not related to the behavior of competing states and is uniformly distributed on $[\varepsilon_l, \varepsilon_u]$ with mean zero.[2] A firm will locate in state $i$ if $e_i + \alpha + \varepsilon > e_j$. This occurs with probability that $\varepsilon > e_j - e_i - \alpha$ or

$$P_i = \frac{\varepsilon_u - e_j + e_i + \alpha}{(\varepsilon_u - \varepsilon_l)} \tag{1}$$

If a state is successful in recruitment, it will assume costs and benefits from recruiting the firm into the state. This gross benefit $R_i$ captures the net multiplier effects plus any additional indirect effects that benefit the state (Black & Hoyt, 1989). The costs

[2] Epsilon represents those unobservable factors that might be relevant to competition among states to recruit firms. Effort and alpha are observables, thus the analysis centers around these factors in this chapter and the empirical chapters that follow.

that they incur (the awarded offer package to the firm) is an increasing strictly convex function of their effort $A(e_i)$. An additional cost to states is the cost of simply identifying target firms and preparing the offer package, which is incurred regardless if firm recruitment is successful. These costs are denoted by the increasing convex function $c(e_i)$. Combining these costs and benefits with the probability of being successful, the expected returns from recruitment efforts to state *i* and state *j* are

$$V_i = P_i\left[R_i - A(e_i)\right] - c(e_i) \tag{2}$$

$$V_j = (1 - P_i)\left[R_j - A(e_j)\right] - c(e_j) \tag{3}$$

The typical approach to evaluate tournament properties is to analyze the effects in the neighborhood of the interior symmetric Nash equilibrium. Differentiating the expected returns for firm recruitment effort ($V$) with respect to effort ($e$) yields the first order conditions and the Nash equilibrium satisfies the marginal conditions for states firm recruitment effort:

$$G = \frac{dV_i}{de_i} = \frac{[R_i - A(e_i)]}{\varepsilon_u - \varepsilon_l} - P_i A'(e_i) - c'(e_i) = 0 \tag{4}$$

$$H = \frac{dV_j}{de_j} = \frac{[R_j - A(e_j)]}{\varepsilon_u - \varepsilon_l} - \left(1 - P_i\right)A'(e_j) - c'(e_j) = 0 \tag{5}$$

The second order conditions for maximizing (2) and (3) hold for $A'(e) > 0$, $A''(e) > 0$, and $c''(e) > 0$, so that

$$\frac{d^2V_i}{de_i^{\,2}} = \frac{-A'(e_i)}{\varepsilon_u - \varepsilon_l} - \left[\left(\frac{A'(e_i)}{\varepsilon_u - \varepsilon_l}\right) + P_i A''(e_i)\right] - c''(e_i) < 0 \tag{6}$$

$$\frac{d^2V_j}{de_j^{\,2}} = \frac{-A'(e_j)}{\varepsilon_u - \varepsilon_l} - \left[\left(\frac{A'(e_j)}{\varepsilon_u - \varepsilon_l}\right) + (1 - P_i)A''(e_j)\right] - c''(e_j) < 0 \tag{7}$$

Using the equilibrium conditions for a unique maximum, where the FOC's, (4) and (5), = 0 and the SOC's, (6) and (7), $\neq$ 0, the implicit function theorem (IFT) can be applied to (4) and (5) separately. Equations (4) and (5) identify state *i* and *j*'s reaction functions, from (4) $e_i = \phi(e_j)$ and from (5) $e_j = \psi(e_i)$. Applying the IFT to (4) and (5) separately we have each jurisdiction's best response to a change in the effort of its rival, so that

$$\phi' = \frac{de_i}{de_j} = -\frac{\left(\frac{dG}{de_j}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{A'(e_i)}{-(\varepsilon_u - \varepsilon_l)\frac{d^2V_i}{de_i^{\,2}}} > 0 \tag{8}$$

$$\psi' = \frac{de_j}{de_i} = -\frac{\left(\frac{dH}{de_i}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{A'(e_j)}{-(\varepsilon_u - \varepsilon_l)\frac{d^2V_j}{de_j^{\,2}}} > 0\,. \tag{9}$$

## Comparative Statics

Using (4), (5), (6), and (7), there exists Nash equilibria $e_i$* and $e_j$* so that the fundamental equation of comparative statics, $F(e_i, e_j) = 0$, holds and the Nash equilibrium comparative statics can be derived in the usual way. Nash equilibrium comparative statics reflect the direct effect of changes in the parameters, but also the optimal response to a change in effort by its competitors. The empirical chapters, that follow, control for competing states' recruitment effort, so the results analyze the effects from changes in only the parameters. This implies that the empirical chapters are examining the reaction functions themselves ($\phi$ and $\psi$). Therefore, the focus here is on

the properties of these reaction functions. The relevant comparative static results are discussed below.

The reaction functions, (4) and (5), reveal that the optimal response to an increase in effort by a competitor is to increase its own effort in (8) and (9). As such, states are strategic complements with respect to their effort to recruit firms. This implies that when a competing state increases its effort on firm recruitment the other competing state will respond, in kind, and increase its effort. These results, although somewhat rudimentary to a tournament model, imply whether or not competition among states for firm recruitment exists. In terms of the baseball analogy, if the Yankees observe the Giants spending more money on players' salaries, they respond by increasing the salaries of their players–to be competitive and possibly win more or the same number of games.

The net location advantage parameter, α, indicates whether a state has an advantage (α > 0) or disadvantage (α < 0) relative to a rival state. Access to seaports or transportation networks is an example of a location advantage, while mountainous terrain is an example of a location disadvantage. Moreover, attractive locations make it easier for firms to recruit good employees, while unattractive locations make it harder to recruit good employees, and this is why great locations are an advantage for states trying to recruit firms. This parameter affects the probability of successfully recruiting firms independent of their effort. Differentiating (4) and (5) with respect to α yields:

$$\frac{d\phi}{d\alpha} = -\frac{\left(\frac{dG}{d\alpha}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{A'(e_i)}{(\varepsilon_u - \varepsilon_l)\frac{d^2V_i}{de_i^2}} < 0 \tag{10}$$

$$\frac{d\psi}{d\alpha} = -\frac{\left(\frac{dH}{d\alpha}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{-A'(e_j)}{(\varepsilon_u - \varepsilon_l)\frac{d^2V_j}{de_j^2}} > 0 \tag{11}$$

The location advantage comparative statics show that states with net advantages over their competitors exert less recruitment effort. In baseball, this is similar to home–field advantage, where the home team can expend less effort and still win. The signs are reversed, because an advantage for state *i* is a disadvantage for state *j*.

In most tournaments, winners receive awards, trophies, prizes, etc. However, for the FRT the prize for winning is the economic impact that relocating firms create within the state's boundaries. When the expected economic impact of a firm is greater, states expend greater effort recruiting the firm. Differentiating (4) with respect to $R_i$ and (5) with respect to $R_j$, where $d\phi/d R_j = 0$ and $d\psi/d R_i = 0$, which yields:

$$\frac{d\phi}{dR_i} = -\frac{\left(\frac{dG}{dR_i}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{1}{-(\varepsilon_u - \varepsilon_l)\frac{d^2V_i}{de_i^2}} > 0 \tag{12}$$

$$\frac{d\psi}{dR_j} = -\frac{\left(\frac{dH}{dR_j}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{1}{-(\varepsilon_u - \varepsilon_l)\frac{d^2V_j}{de_j^2}} > 0 \tag{13}$$

The parameter *R* captures gross benefit to the state and the comparative static predicts that states will spend more effort to be successful when the rewards are higher. For example, given two firms that are "up for grabs" and the expected gross benefit to the

state is \$1 million versus \$500 million, the model predicts that states will spend more effort to recruit the firm with \$500 million gross benefit.

The value of the award package (worker training, site preparation, tax abatements, and other incentives) that states offer to firms it is attempting to recruit is summed into the function $A$. The state spends $A$ only if the state successfully recruits the firm. An important distinction between $A$ and $e$ is that the award package is only awarded if the firm locates in the state, which is why tax benefits are not included in the empirical measure of effort in the later chapters. To find the comparative static, parameterize the function by introducing a shift parameter, $\theta$, so that $A(e) = A(e;\theta)$. Differentiate the reaction functions (4) and (5) with respect to the increasing strictly convex function $A(e;\theta)$, where $d\phi/d\,A_j = 0$ and $d\,\psi\,/d\,A_i = 0$. Assuming $\mathrm{d}A/\mathrm{d}\theta > 0$, this means that at each and every level of effort the award package is higher. For the SOC's to hold this implies that $\mathrm{d}A/\mathrm{d}e > 0$ so that $\mathrm{d}^2A/\mathrm{d}e\mathrm{d}\theta > 0$, which means that the marginal increase in the award package is higher for each and every level of effort. The subscripts for $A_i$ and $A_j$ denote the first and second derivatives.

$$\frac{d\phi}{d\theta} = -\frac{\left(\frac{dG}{d\theta}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{1}{-\frac{d^2V_i}{de_i^2}}\left(\frac{-A_{i\theta}}{(\varepsilon_u - \varepsilon_l)} - P_i[A_{ie_i\theta}]\right) < 0 \tag{14}$$

$$\frac{d\psi}{d\theta} = -\frac{\left(\frac{dH}{d\theta}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{1}{-\frac{d^2V_j}{de_j^2}}\left(\frac{-A_{j\theta}}{(\varepsilon_u - \varepsilon_l)} - (1-P_i)[A_{je_j\theta}]\right) < 0 \tag{15}$$

The model predicts states offering award packages that are more valuable to firms spend less effort. The subtle difference here is that the award package details what a firm

receives if it locates or expands in the state, while recruitment effort represents how hard the state tries to have the firm accept the award package.

The FRT model also includes package preparation costs, $c$, that states face regardless of whether they are successful. State economic development agencies spend a tremendous amount of time meeting with representatives from the firm, touring the state to find ideal locations, and evaluating the needs of the firm. To enter the FRT, a state must incur these types of costs to prepare an offer. To find the comparative static, parameterize the function by introducing a shift parameter, $\gamma$, so that $c(e) = c(e;\gamma)$. Differentiate the reaction functions (4) and (5) with respect to the increasing convex function $c(e;\gamma)$, where $d\phi/d\,c_j = 0$ and $d\,\psi\,/d\,c_i = 0$. Assuming $dc/d\gamma > 0$, this means that at each and every level of effort the preparation costs is higher. For the SOC's to hold this implies that $dc/de > 0$ so that $d^2c/dedy > 0$, which means that the marginal increase in the preparation costs is higher for each and every level of effort. The subscripts for $c_i$ and $c_j$ denote the second derivatives.

$$\frac{d\phi}{d\gamma} = -\frac{\left(\frac{dG}{d\gamma}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{c_{ie_i\gamma}}{-\frac{d^2V_i}{de_i^2}} < 0 \tag{16}$$

$$\frac{d\psi}{d\gamma} = -\frac{\left(\frac{dH}{d\gamma}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{c_{je_j\gamma}}{-\frac{d^2V_j}{de_j^2}} < 0 \tag{17}$$

The comparative static results predict that states with large up–front costs spend less recruitment effort, because the marginal cost of effort is increasing. On the other

hand, a state that spends less in package preparation costs exerts greater recruitment effort.

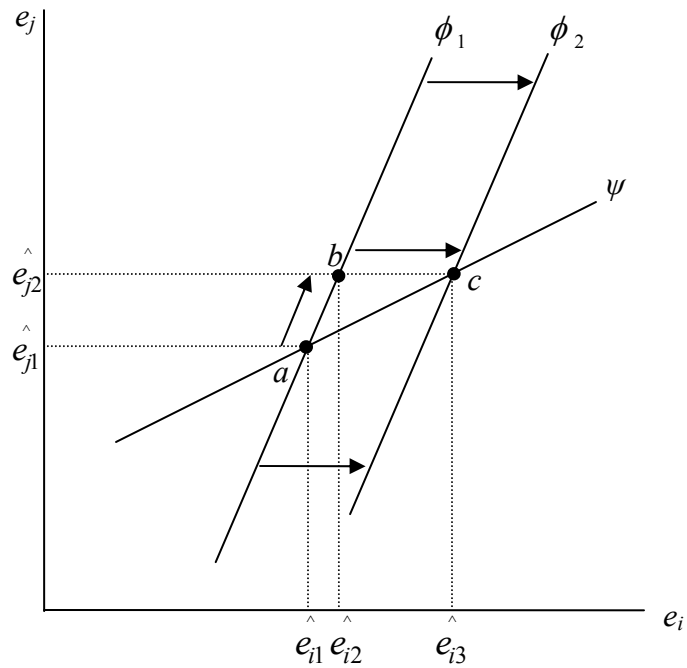
To consider the effect of an increase in risk of recruitment success, simply implement a mean–preserving increase in the spread of risk. This is only an increase in the riskiness of being successful. In the FRT model, a greater level of riskiness means that the factors affecting the firm location decision, outside the control of the state, have a larger role in the final decision made by the firm. This procedure retains the same expected value, but entails greater variance in the possible outcomes. First, parameterize the spread of the distribution in the reaction functions (4) and (5) by introducing a shift parameter, $\delta$, so that the maximum spread is now $(\varepsilon_u - \varepsilon_l)\delta$. Differentiate the reaction functions (4) and (5) in symmetric equilibrium ( $e_i^* = e_j^*$, $\alpha = 0$ ) with respect to $\delta$ and evaluate at $\delta = 1$.

$$\frac{d\phi}{d\delta} = -\frac{\left(\frac{dG}{d\delta}\right)}{\left(\frac{dG}{de_i}\right)} = \frac{1}{\frac{d^2V_i}{de_i^2}}\left(\frac{[R_i - A(e_i)]}{(\varepsilon_u - \varepsilon_l)}\right) < 0 \tag{18}$$

$$\frac{d\psi}{d\delta} = -\frac{\left(\frac{dH}{d\delta}\right)}{\left(\frac{dH}{de_j}\right)} = \frac{1}{\frac{d^2V_j}{de_j^2}}\left(\frac{[R_j - A(e_j)]}{(\varepsilon_u - \varepsilon_l)}\right) < 0 \tag{19}$$

States spend less effort recruiting when the riskiness of successfully recruiting firms increases. Risk neutrality is assumed throughout, so the effort response to the increase in risk does not affect risk aversion. The increase in risk of potential outcomes lowers the marginal probability of successfully recruiting firms and states react to this lower marginal productivity of effort by decreasing their effort.

Figure 1: Interjurisdictional Competition




Illustrating graphically, Figure 1 shows a comparative static result for the reaction functions. The reaction functions are strategic complements in firm recruitment effort and have positive slopes. If there is an increase in population for $state_i$, two separate effects will occur. Assuming $d\phi/dPopulation > 0$ the total effect of an increase in population for $state_i$ is the distance $\hat{e}_{i3} - \hat{e}_{i1}$ and the equilibrium shifts from *a* to *c*. The amount of effort for $state_j$ increases as a result. Moving from *a* to *b* represents the isolated interdependence effect between $state_i$ and $state_j$, which shows that when $state_i$ increases its effort the optimal response for $state_j$ is to increase its effort as well. This partial effect is measured by $\hat{e}_{i2} - \hat{e}_{i1}$ and will vary depending upon the magnitude of interdependence between competing states. Moving from *b* to *c* is the direct effect of an increase in population.

## Conclusion

The Edmiston–Turnbull model portrays a situation by which competition among states for mobile firms might occur. An important aspect of this model (and competition) is the measure of effort. The empirical chapters test alternative measures of effort to determine which best approximates *e* in this model. Different measures include spending on recruitment programs, total economic development department spending, and the number of employees working in the department of economic development.

Another important discovery from the FRT model is that the nature of rivalry between states matters. The FRT analysis compares two states and assumes they are competitors. The nature of this rivalry, if it exists, is an empirical question. This dissertation is the first study that tests for firm recruitment competition at the state level, which is logically antecedent to the nature of competition. Therefore, a later chapter tests the nature of what it means to be rivals or if it even matters how rivalry is measured. Regardless of how ultimately defined empirically, the FRT model implies a spatial relationship among state's recruitment policies. The theory therefore dictates that empirical models allow for such spatial interdependence.

# CHAPTER 4: EMPIRICAL ANALYSIS OF RECRUITMENT SPENDING

## Introduction

Large firm relocations and expansions are prime targets for state economic development departments. One of the main objectives in these departments is to spur economic growth in their state economy. Offering firms incentives to expand their current operations within the state or recruit new firms from other states is one way to meet this objective. Many states consider using incentives a necessary tool in their economic development toolkit. Browsing through economic development department budgets reveals that states advocate a wide range of incentives and spend millions of dollars every year trying to spur new economic growth. The question addressed in this chapter is whether spending on firm recruitment (a measure of firm recruitment effort, *e*, in the theoretical chapter) is strategically related or independent of what a state's neighbor is spending. Specifically, do states compete to recruit firms?

In their effort to recruit firms, states are trying innovative approaches, such as implementing new programs, strategic marketing initiatives, multi–tiered levels of assistance, and other practices. It is also quite common for states to put together large incentive packages (awarded offer package, *A,* in the theoretical chapter) for relocating/expanding firms.

This chapter utilizes a unique dataset to test empirically whether states are competing with each other to recruit firms. State budget documents record spending for firm recruitment programs and one measure of effort to recruit firms is how much states spend on these programs. This spending data comprise 23 of the 31 eastern states in the U.S. from 1997 through 2003. Similar to the previous literature on this topic, the analysis

here looks at whether the decision to increase firm recruitment spending represents strategically competitive behavior. Recall from the Edmiston–Turnbull (2007) Firm Recruitment Tournament (FRT) model explained in the previous chapter, the model of competition analyzes the amount of effort that states put forth to recruit firms. In this chapter, the measure of effort is the amount of spending in various state firm recruitment programs–not the awarded offer firm's accept. Applying the intuition of the FRT model, if one state tries harder to recruit firms (increasing its spending on recruitment programs) then the rival state also tries harder (increased spending).[3] Envisioning competition as interdependence between states' recruitment spending, the appropriate testing framework must take into consideration how rivals or neighbors affect each other. The spatial model is an appropriate model to handle this issue empirically. The FRT model suggests that if states compete with other states then they are spatially interdependent in their effort to recruit firms and the spatial model tests for exactly this type of spatial interdependence.

The next section describes the data used in the empirical analysis. Firm recruitment spending programs change in name and functionality over time and across states, this section discusses these issues and the method for collecting the data. The subsequent section proposes an empirical model that explicitly tests for spatial interdependence in firm recruitment effort among states. The spatial model used here also allows for spatial correlation. A detailed discussion regarding the results from the empirical estimation follows. The final section presents the conclusions.

[3] The measure of effort in this chapter is firm recruitment spending, to reemphasize the model of competition employed in this dissertation, it is important to note that simply because states do not compete with each other on spending to recruit firms does not imply that they do not try to recruit firms in other ways. This chapter only takes one measure of effort and tests whether states do compete on these terms, exclusive of other efforts by states to recruit firms.

## Data

### *State Recruitment Spending*

The measure of firm recruitment effort in this chapter is state spending on firm recruitment programs in the state that are for either recruiting new firms or retaining the firms it has. The careful effort needed to put together this data probably explains why a similar exercise has not been done previously. De Bartolome and Spiegel (1995) use similarly defined economic development data, but cannot isolate spending on irrelevant programs. The data collected here isolates actual firm recruitment spending, as reported in the state budget, over a continuous period of seven years, rather than collecting it by survey pertaining to only one year. This expanded state firm recruitment spending panel dataset represents one major contribution of this dissertation. Computing the necessary information requires meticulous examination of the relevant budget documents from each state and this data is obtained manually.

This new dataset provides the literature with a new avenue for empirical tests and an opportunity to fill holes in the existing literature. Fisher and Peters (1997) succinctly summarize the current data problem:

> "Research that relies, in one form or another, on simple program counting measures may seriously misrepresent a state's or city's commitment to economic development and the generosity of the incentives provided… The number of programs offered by a state or city is clearly close to useless as a summary measure of the state or local economic development effort."

Likewise, Wolman and Spitzley (1996) share similar sentiments with regards to the data problems:

"…these measures are very poor operationalizations of the concept or extent of economic development activity. The dichotomous variable simply gives an indication of whether a technique has been employed but says nothing about the extent to which it has been employed."

The initial problem in obtaining this data is acquiring the budget documents themselves. Many states have the current budgets available online through their state budget agency's website and some have archives of those budgets. Typically, though, not all relevant budget documents are that easily accessible. They must be obtained directly through the budget agency, the governor's office, or the state library. Going through the state library is the method of last resort, because normally there are page fees associated with obtaining copies. The relevant firm recruitment spending data is generally housed within the state's department of economic development (or quasi–public equivalent). Bradshaw and Blakely (1999) recognize the many complications involved in using this type of data, pointing out that each state organizes its spending differently, and some aspects of spending cannot be untangled from the program it is in. The authors use data similar to this dissertation, from sixteen states in 1992, to determine if states are acclimating to new "third–wave" economic development initiatives, which is providing leadership, information, and acting as a broker between other state agencies. However, they elected to survey economic development officials instead of examining the budget documents themselves.

The best method for recording recruitment spending data from budget documents is to use actual numbers from previous years–sometimes this trend is available in a current year's proposed budget. When this is not available, actual appropriations passed

by the legislature and signed by the governor are used, but this is rarely necessary. While this is not the best measure, since actual spending and the amount of appropriations sometimes differ, it is the best measure available in the budget documents.

Firm recruitment spending data is the most difficult variable to collect. Generally, this spending is a subset of total economic development spending and the difficulty arises when determining what is firm recruitment spending and what is not. The variation in names of programs and their specific function differs within each state over the time of the panel, because of different administrations or different objectives from the governor, and across states as well. An analysis of department spending and the (sometimes) appended narrative does not, typically, provide sufficient information to break apart different types of spending. Obtaining rough estimates is a lengthy process in and of itself, but narrowing the spending down with precision requires knowledge that is only available from someone within the department itself. Thus, just as Bradshaw and Blakely (1999) experience in gathering their data, telephone interviews are required with a knowledgeable representative who knows which programs have specific firm recruitment spending attached to their objective. Typically, after locating a knowledgeable representative, they are extremely helpful and generous with their time; however, finding that individual through the chain–of–command is not a clear–cut task.

Some of the different state programs responsible for recruiting businesses and industry are: business expansion and retention, quick–action closing funds, business recruitment and expansion, targeted marketing, industrial job training, industrial job skills, business development, and cluster initiatives, to name a few. These are programs that states have in place to target and recruit firms into the state and retain the ones it has.

The literature provides a more comprehensive list of broader programs that states use and summarized in *Table* 1.[4]

The first wave is associated with the typical 'smokestack chasing' policies attracting large plants thought loan subsidies, tax exemptions, and marketing trips to firm headquarters. The second wave focuses on encouraging in–state businesses to expand and remain in the state. This includes developing business incubators and providing technical and regulatory assistance to new businesses. The emergence of a third wave does not indicate the end of the first and second waves. However, it brings them together and shifts the focus onto supportive policy that creates a better economic environment for all businesses to succeed and grow. Bradshaw and Blakely (1999) suggest that the main roles of the third wave economic development policy are to provide leadership, information, and act as the broker between other state agencies. *Table* 1 follows Bartik's (1991) classification system rather than Eisinger's (1988) method that categorizes programs into supply–side or demand–side, which is quite similar. Eisinger's supply–side and demand–side categories coincide with first and second wave, respectively. Not all of the initiatives in the three waves consist of recruitment, expansion, or retention efforts by states. The initiatives listed in this table are also not typical program names in state budgets, listed above. Each state requires careful, independent analysis to determine if a particular program represents firm recruitment spending. As explained above, the programs included in this data are typical of the second wave state initiatives in *Table* 1. However, as Bradshaw and Blakely (1999) point out, perhaps state initiatives are transforming into the third wave. Already, cluster initiatives appear as line–item spending

[4] This table is the culmination of already published tables and lists that separate state initiatives into three categories from Bartik (1991), Bradshaw & Blakely (1999), Eisenger (1988), and Fosler (1988).

in state budgets. This spending is included in the data here, because cluster initiatives are similar to small business incubators, where both programs aim towards recruiting one firm with the hope that agglomeration forces bring in many others.

Table 1: Broad Incentive Program Initiatives

| Traditional | New–Wave | Third–Wave |
|---|---|---|
| *Marketing Area As Branch Plant Location* | *Capital Market Programs* | *Policy Objectives* |
| Industrial development advertising | Government-financed loan or equity programs | Greater accountability from firms |
| Marketing trips to corporate headquarters | Government support for privately financed loan or equity programs | Strategic planning for economic development |
| Provision of site information to prospects | Venture capital financing | More assistance for women and minorities |
| Tax Incremental Financing | Product development assistance | Cluster initiatives |
| | | Private/public partnerships |
| *Financial Incentives* | *Information/Education for Small Business* | Incentive program evaluation |
| Industrial revenue bonds | Small business ombudsman/information office | Technical assistance to new enterprises |
| Property tax abatements | Community college classes in starting a business | Operating foreign offices |
| Provision of land at below-market prices | Small business development centers | Loan guarantee funds |
| Direct state loans | Entrepreneurial training programs | |
| Loans to businesses in blighted/distressed areas | Small business incubators | |
| | | |
| *Nonfinancial Incentives to Branch Plants* | *Research and High Technology* | |
| Customized industrial training | Centers of excellence in business-related research at public universities | |
| Expedited provision of site-specific infrastructure | Research-oriented industrial parks | |
| Help with regulatory problems | Applied research grants | |
| Land and site development | Technology transfer programs and industrial extension services | |
| | Business innovation fund | |
| | Research & development tax credits | |
| | | |
| | *Export Assistance* | |
| | Information/training in how to export | |
| | Trade missions | |
| | Export financing | |

Note: Author's culmination of tables and lists from: Bartik (1991), Bradshaw & Blakely (1999), Eisenger (1988), and Fosler (1988).

On the surface, some of the programs in state budgets may not appear to be spending on firm recruitment–but analyzing the detailed narratives, objectives, or goals of these programs provides evidence to the contrary. To illustrate the complexity of this data, two similarly named firm recruitment programs in different states can have completely different objectives. For example, looking at only the names, job–training programs in Tennessee and New York may appear to be identical and thus recorded as recruitment spending. However, with closer analysis, the Jobs Now program in New York has specific objectives to train workers for companies relocating to New York and spend part of its budget on actually recruiting them into New York (all of these activities are recruitment efforts). On the other hand, Tennessee's Workforce Development program is a social welfare program to help uneducated workers receive their high school diploma and other certificates.

What do states actually do? Where does all the money spent on these programs go? When states spend money for strategic marketing they are paying for advertising in specific industry magazines, sending representatives to industry conventions, directly visiting firms, creating and printing brochures, and/or airing television commercials in other states. States use these marketing efforts to influence the decision makers or prospective clients (relocating firms) and inform them that their state is 'open for business' or a great place for businesses to grow and prosper. A typical program that states use to recruit firms is the promise by the state to help train workers for the relocating firm. The state does not actually train the workers; they pay for expert training at a learning facility. Business expansion and recruitment programs also help states recruit new firms or retain the ones they have. The money spent here pays for attendance

and representation at trade shows, international trade events, assistance to locally expanding businesses, direct mailings, and visits to headquarters by agency representatives. States also have programs in place to help provide business plans, assistance selecting ideal sites, and preparing sites for development by the relocating firm. The tax dollars spent on these types of recruitment programs are not in the state treasury waiting for firms to relocate to the state and collect their share; rather these are active programs buying services that firms value, which creates an incentive for the firm to choose its state rather than another. This spending represents a state's effort to recruit firms.

The firm recruitment spending observations extend from 1997 through 2003. The dataset covers 23 of the 31 eastern states. These states are: Alabama, Arkansas, Connecticut, Florida, Georgia, Indiana, Iowa, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, and Virginia. The eight states missing from the contiguous eastern U.S. are: Delaware, Illinois, Maryland, Michigan, Mississippi, North Carolina, West Virginia, and Wisconsin. These states are omitted, because either the budget documents are unobtainable or spending recorded in them is not clearly defined. These missing observations do not represent a systematic or strategic lapse in the data. The budget documents do exist and they can be separated into the categories tested in this dissertation. Obtaining this data, however, is beyond the scope of this dissertation only because of the time cost involved in piecing together the relevant information. The western states are omitted primarily because of the additional

time required to obtain their data. Nonetheless, focusing only the eastern half of the U.S. offers a sufficiently broad regional perspective.

### *Explanatory Variables*

The empirical model tested here builds on Edmiston and Turnbull's (2007) empirical model of interjurisdictional competition for economic development among Georgia counties. This paper extends their analysis to the state level. Edmiston and Turnbull suggest controlling for: 1) public demand pressures, 2) amount of fiscal distress, 3) ideology of the public, 4) existing industrial base, and 5) demographic differences between states. To a large extent, the empirical literature testing for competition and the effectiveness of incentives suggest using similar controls in the estimating equation (Man, 1999; Wolman & Spitzley 1996; Rork, 2005). Using panel data, some measures are slightly different. Variable names and definitions are provided in *Table* 2.

Table 2: Variable Names and Definitions

| Variable Name | Variable Definition |
|---|---|
| Pop Growth | State Population Growth Rate |
| Tot Wage | Total State Wages |
| PCT Unemp | Percent of State Population that is Unemployed |
| GSP | Gross State Product |
| Own Source | State Own Source Revenue |
| AID | Intergovernmental Aid Transfers from the Federal Government |
| SCITR | State Corporate Income Tax Rate |
| Gov Dummy | = 1 if the Governor is Republican, 0 Otherwise |
| Prop Manuf | Proportion of Manufacturing Employment to Total State Non-Farm Employment |
| Population | State Population |
| PCT Black | Percent of State Population that is Black |
| PCT Poverty | Percent of State Population that is Under the Poverty Line |
| All 3 Dem | = 1 if All Three Chambers in a State Government are Democrat, = 0 Otherwise |
| All 3 Rep | = 1 if All Three Chambers in a State Government are Republican, = 0 Otherwise |
| Elect Yr | = 1 if Election Year, = 0 Otherwise |
| PCT HS | Percent of State Population that has a High School Degree |
| PCT Coll | Percent of State Population that has a College Degree |
| PCT Urban | Percent of State Employment in Metropolitan Areas |

Population and demographic variables are from the *Census of Population*. Own source revenue and intergovernmental aid transfers are from the *Census of Governments.* The employment, unemployment, and wage variables are from the *Bureau of Labor Statistics* and gross state product is from the *Bureau of Economic Analysis.* The governor dummy variable is available from different sources, but *Dictionary by LaborLawTalk.com* provides an easy search tool to check the political history of governors in various states. The *Statistical Abstract of the United* States reports the other political variables used in this dissertation. The *Tax Foundation* reports the state corporate income tax rates. Finally, all monetary values are deflated to the base–year

2000. The *Bureau of Labor Statistics* provides a region–specific deflator for the Northeast, South, Midwest and West regions and each state is deflated according to the appropriate regional deflator. *Table* 3 reports the descriptive statistics for the variables used in this study.

Table 3: Descriptive Statistics (1997- 2003)

| Variables | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| Recruitment Spending* | $18 | $20 | $0.3 | $95 |
| Pop Growth | 0.80% | 0.50% | -0.10% | 2.50% |
| Tot Wage* | $136,000 | $114,000 | $10,600 | $539,000 |
| PCT Unemp | 4.40% | 1.00% | 2.30% | 6.70% |
| GSP* | $207,965 | $170,124 | $16,235 | $786,614 |
| Own Source* | $15,537 | $11,908 | $1,570 | $56,227 |
| AID* | $6,991 | $7,380 | $781 | $44,352 |
| SCITR | 7.60% | 2.00% | 2.80% | 12.00% |
| Gov Dummy | 0.59 | 0.49 | 0.00 | 1.00 |
| Prop Manuf | 0.14 | 0.04 | 0.05 | 0.23 |
| Population | 6,138,839 | 4,629,425 | 597,239 | 19,212,425 |
| PCT Black | 12.80% | 9.40% | 0.00% | 33.00% |
| PCT Poverty | 11.30% | 3.10% | 4.50% | 19.80% |
| All 3 Dem | 0.15 | 0.35 | 0.00 | 1.00 |
| All 3 Rep | 0.17 | 0.38 | 0.00 | 1.00 |
| Elect Yr | 0.29 | 0.45 | 0.00 | 1.00 |
| PCT HS | 83.90% | 4.00% | 75.40% | 92.60% |
| PCT Coll | 24.90% | 5.20% | 2.50% | 37.60% |
| PCT Urban | 69.60% | 20.10% | 15.30% | 96.80% |

* Dollars ($) are in millions and deflated to year 2000.

Firm recruitment spending is the primary variable of interest. The descriptive statistics reveal that average annual spending to recruit firms is only $18 million. In 1998, New York recorded the highest spending at $95 million and in 2003 Vermont recorded the lowest spending in the sample at $313,000. The proportion of manufacturing employment (Prop Manuf) is another important variable is this dissertation. The descriptive statistics show considerable variation for this variable in this sample. In 1997,

Indiana had 23% of its employment in the manufacturing sector but by 2003, manufacturing employment had fallen to 20%, a 15% decline in this sector. In 2003, Florida had the lowest proportion of manufacturing employment, 5.4%, which is not surprising, given its prominent tourism industry and retirement communities.

The percentage change in population (Population), total wages (Tot Wage), percent urban employment in the state (PCT Urban), and unemployment rate (PCT Unemp) measure the public demand pressures for firm recruitment spending. Successful development can have the effect of curtailing future development, and this can occur when current landowners receive a benefit by restricting the supply of land available to develop, thereby driving up the prices of their property (Brueckner, 1995). Brueckner argues that less populated cities in large urban systems are amenities to current landowners, because the amenity of the restricted supply of development is already capitalized into the land rent. This creates an incentive for landowners in developed areas to lobby local politicians for growth controls that limit future growth or development. Brueckner's argument suggests these variables are negatively correlated with firm recruitment spending, except for the unemployment rate, because greater unemployment might induce increased spending on recruitment to counteract a high level of unemployment.

Education might also affect the public demand for firm recruitment spending. Two measures for the level of education in a state are the percent with high school degrees (PCT HS) and the percent with college degrees (PCT College). It seems that states with more educated labor forces likely have a location advantage, ceteris paribus.

The FRT model predicts that states with a location advantage, $\alpha > 0$, spend less on firm recruitment effort. This suggests that the effect is negative for the education measures.

Gross state product (GSP), state corporate income tax rate (SCITR), own source revenue (Own Source) and the amount of intergovernmental aid (AID) are included to control for fiscal distress.[5] Man (1999) finds fiscally distressed municipalities in Indiana are more likely to adopt development incentives. In addition, Wolman and Spitzley (1996) point out that local governments are more likely to increase their economic development activities if they are fiscally distressed. Higher levels of GSP indicate that a state enjoys a higher level of economic well–being and therefore has less pressure to pursue greater recruitment efforts. This implies a negative relationship between GSP and firm recruitment effort. At the same time, states that have higher tax rates might feel pressured to compensate businesses for relocating into their high–tax jurisdiction. If this compensation effect is at work, the effect on SCITR is expected to be positive. A higher SCITR state seems likely to be a location disadvantage. In the FRT model, states with a location disadvantage, $\alpha < 0$, spend more firm recruitment effort, which implies the relationship is positive.

Own source revenue measures the size of government and also the fiscal distress in a state, where states with declining own source revenue is a sign of potential fiscal problems in a state. Boarnet and Glazer (2002) suggest that voters look to their neighboring jurisdictions to determine how their government measures up. If voters perceive their government as successful, compared to others, they increase their demand

[5] GSP plays a double role in the regression analysis, as a measure of fiscal distress and the size of the state economy. States that have decreasing GSP could be under greater pressure to recruit firms, as the state's local economy is experiencing economic decline. A state with declining GSP could present fiscal problems for the state government. As a measure of the state economy, larger states have higher levels of GSP.

for public spending. Similar to the yardstick competition Boarnet and Glazer describe, larger state governments may be a reflection of successful firm recruitment. Thus, this suggests that the effect of own source revenue for firm recruitment effort is positive. Another measure of fiscal distress is intergovernmental aid.[6] Receiving large transfers from the federal government is one indication that a state is struggling financially or evidence of a centralized revenue system. Perhaps, distressed states view increased firm recruitment effort as a way to strengthen their financial standing. Thus, the expected relationship between intergovernmental aid and firm recruitment effort is positive.

Whether the elected governor is a Republican or Democrat (Gov Dummy) measures the ideology of the public. The governor dummy variable equals one if Republican, and zero otherwise. The other dichotomous political–ideology variables indicate whether all three chambers (House, Senate, and Executive) are Republican (All 3 Rep), or all three are Democrat (All 3 Dem), and whether the year is an election year (Elect Yr). A priori, there are no assumptions about the expected sign for these variables.

The economic growth literature discussed in chapter two provides a rationale for why the manufacturing sector is a likely source of regional economic growth in an economy. The empirical analysis uses the proportion of manufacturing employment to total employment (Prop Manuf) in a state as a measure of the industrial base or employment concentration a state has in the manufacturing sector. The relationship between firm recruitment effort and the proportion of manufacturing employment might be positive or negative. For example, a state that has a large manufacturing base (high proportion of manufacturing employment) need not increase its recruitment spending to

[6] In the empirical analysis that follows, there are population and size of government controls in the regressions. Whereas, without these controls, arguments can be made that the amount of aid a state receives is dependent upon various size measures relevant to the state.

attract firms. It may already have location advantages or localization economies of scale that act as a natural draw for manufacturing related activities. This supports a negative relationship, which coincides with the theory developed in chapter three. The FRT model indicates that locations with net advantages can expend less firm recruitment effort and still succeed in drawing firms into their jurisdiction. On the other hand, De Bartolome and Spiegel (1995) suggest that states attempt to maximize their net local wage. They argue that the net wage and share of manufacturing employment are likely to be an increasing function of development expenditures. This implies that the partial effect of firm recruitment spending with respect to the proportion of manufacturing employment is positive. A state's objective to create a diverse economy provides another rationale for a positive relationship. Greater diversification lessens the effect of sector specific shocks. Thus, states with high proportions of manufacturing employment may seek to increase their firm recruitment effort to help diversify their employment concentration among non–manufacturing sectors.

The demographic variables are population (Population), percent black (PCT Black), and percent poverty (PCT Poverty) are easily available from the U.S. Census. Controlling for demographic differences between states might explain why some states exert greater firm recruitment effort than do others. Wolman and Spitzley (1996) suggest that larger states engage in more economic development activity, implying the relationship between population and firm recruitment effort is positive. It is uncertain how percent black affects a state's firm recruitment effort, however, this measure is included as a point of comparison to the earlier study by Case, Hines, and Rosen (1993) and many other subsequent studies that use this demographic variable. According to

Fischel (2001), the relationship between poverty and firm recruitment effort is positive. He argues that higher income states are less interested in industrial growth, because of the negative externalities that industrial firms create. This implies that poorer states or states with higher unemployment spend more effort recruiting firms. Both Man (1999) and Anderson and Wassmer (1995) find evidence supporting Fischel's hypothesis, while Edmiston and Turnbull (2007) do not. Finally, year dummies control for time fixed effects.

## Empirical Model

Because this is the first model that tests for competition among states using firm recruitment spending, many questions regarding the empirical form of the underlying model are unanswered. The model used here extends Edmiston and Turnbull's (2007) analysis of Georgia counties to the state level. The initial task is to evaluate a model that tests whether a linear relationship exists between firm recruitment spending and the explanatory variables discussed in the previous section. Ordinary least squares (OLS) tests for this linear relationship. The OLS model enforces the assumptions of no spatial interdependence or spatial correlation. Under these assumptions, we have the following model to estimate:

$$Y = XB + u \tag{20}$$

where $Y$ is an $nT$ x 1 dependent variable vector, measuring the amount of recruitment spending by each state's economic development department. The number of states is $n$ and the number of years is $T$. The matrix $X$ is an $nT$ x $k$ matrix of exogenous variables described in the previous section.

The OLS estimates of (20) provide a benchmark for the spatial model that follows. After testing different specifications for robustness, the next step tests whether there is a spatial component to the model, unaccounted for in (20).

Recall from the FRT model in chapter three that this dissertation views competition occurring as interdependence between states' efforts to recruit firms, which implies a spatial relationship. Spatial interdependence enters the empirical model in the conditional mean of each state's reaction function. Edmiston and Turnbull (2007) derive these reaction functions

$$y_{it} = \lambda \sum_{j \neq i} W_{ij} y_{jt} + XB + u \tag{21}$$

where, $W$, is a spatial weight matrix that defines the nature of rivalry between states.

In matrix form, the reaction functions are $Y_i = f(Y_j, X)$. Allowing for spatial interdependence and correlation in (20) yields

$$\underset{nT\,x\,1}{Y} = \lambda \underset{nT\,x\,nT}{W} \underset{nT\,x\,1}{Y} + \underset{nT\,x\,k}{XB} + \underset{nT\,x\,1}{u}; \qquad \underset{nT\,x\,1}{u} = \rho \underset{nT\,x\,nT}{W} \underset{nT\,x\,1}{u} + \underset{nT\,x\,1}{\varepsilon}, \tag{22}$$

where $\varepsilon$ is a vector of innovations assumed to be i.i.d. The known weighting matrix, $W$, has zeros across the diagonals and the row and column sums are standardized to equal one. The coefficient of spatial interdependence, $\lambda$, measures the interdependence between firm recruitment efforts of neighboring states. Likewise, $\rho$ is the coefficient of spatial correlation, which measures the correlation between unobserved or unmeasured characteristics. Rearrange (22) to find:

$$Y = XB(I - \lambda W)^{-1} + u(I - \lambda W)^{-1}; \qquad u = (I - \rho W)^{-1} \varepsilon, \tag{23}$$

Substituting for $u$, spatial interdependence and correlation are now in the structural model for $Y$, assuming first–order processes:

$$Y = XB(I - \lambda W)^{-1} + \varepsilon(I - \rho W)^{-1}(I - \lambda W)^{-1}. \tag{24}$$

The expected value of $Y$ is

$$E(Y|X,W) = XB(I - \lambda W)^{-1} \tag{25}$$

and the variance of $Y$ is

$$Var\,Y = \sigma_{\varepsilon}^{2}[(I - \lambda W)^{-1}(I - \rho W)^{-1}(I - \rho W')^{-1}(I - \lambda W')^{-1}]. \tag{26}$$

From (22), it is clear that other states' spending, $Y_j$, is endogenous in the model. This is purged using a set of instrumental variables, suggested by Kelejian and Prucha (1998), which approximate the ideal instruments. Since, the dependent variable is a function of the exogenous variables and the beta coefficients are nonzero, multiplying $X$ and $X_2$ ($X_2$ is a subset of $X$) by the weight matrix creates transformations of the X's to identify the endogenous spending ($Y_j$) on the right–hand side (RHS). These instruments are valid as long as one of the beta coefficients on the $X$'s are nonzero. They are the $p$ linearly independent columns of $H = (X, WX, WX_2)$ and $H$ overidentifies endogenenous states' spending ($Y_j$).

The 2SLS estimation only considers the endogeneity of $Y_j$ on the RHS of (22). After creating the matrix of instruments, $Y$ is regressed on the set of instrumental variables to get an estimated value $\hat{Y}$. The second stage regression of $Y$ on the explanatory variables and the estimated value $\hat{Y}$ produce the parameters estimates. These are the 2SLS estimates. However, the standard errors calculated here assume that $\rho = 0$ (no spatial correlation), meaning $E[u_i u_j']_{\forall i \neq j} = 0$. If $\rho \neq 0$, the 2SLS estimates are consistent but inefficient because $E[u_i u_j']_{\forall i \neq j} = \Omega$, where $\Omega$ is not diagonal:

$$\Omega = \sigma_{\varepsilon}^{2}[(I - \rho W)^{-1}(I - \rho W')^{-1}]. \tag{27}$$

If there is spatial correlation in (22), we need a consistent estimate of the unknown spatial correlation parameter ($\hat{\rho}$) and the variance–covariance matrix ($\hat{\sigma}_{\varepsilon}^{2}$) from (27). Inconsistent estimates of the variance–covariance matrix can yield invalid test statistics for the *B* parameters and the spatial interdependence parameter *λ*. Kelejian and Prucha (1998) suggest a generalized method of moments (GMM) estimator to find a consistent estimate of $\hat{\rho}$ and $\hat{\sigma}_{\varepsilon}^{2}$. This method allows for a general error structure assuming only that ε is i.i.d. The GMM estimator is based on the moment condition E*(H'u)* = 0 and the *p* sample moments that are averaged over *n* and *T*; algebraically this is $\sum_{i=1}^{n}\sum_{t=1}^{T} H'_{ti}\, u_{ti} / nT$.

Kelejian and Prucha (1998) suggest estimating the parameters of interest, *B* and *λ*, using a three–step procedure. The first step estimates (22) by 2SLS (described above). In the second step, obtain the residuals from the first step and estimate the unknown spatial correlation parameter *ρ* and variance–covariance matrix $\sigma_{\varepsilon}^{2}$ using GMM. In the third step reestimate (22) by 2SLS, after a GLS type transformation that utilizes the consistent and efficient variance–covariance matrix $\hat{\sigma}_{\varepsilon}^{2}$ and accounts for spatial correlation. Therefore, the GS2SLS–GMM estimator used here is

$$\hat{\delta} = [\hat{Z}^{*}(\hat{\rho})'\hat{Z}^{*}(\hat{\rho})]^{-1}\hat{Z}^{*}(\hat{\rho})'Y^{*}(\hat{\rho}), \tag{28}$$

where

$$\hat{\delta} = \begin{pmatrix} \hat{B}' \\ \hat{\lambda} \end{pmatrix}, \quad Z = (X, WY), \quad \hat{Z}^{*}(\hat{\rho}) = P_H Z^{*}(\hat{\rho}), \quad P_H = H(H'H)^{-1}H', \tag{29}$$

$$Z^{*}(\hat{\rho}) = (Z - \hat{\rho}WZ), \quad Y^{*}(\hat{\rho}) = (Y - \hat{\rho}WY)$$

and $\hat{\rho}$ is a consistent estimator for $\rho$ obtained by GMM. Unfortunately, Kelejian and Prucha (1998) do not provide an analytic expression for the variance–covariance matrix of $\rho$. With this unknown, it is not possible to provide a test statistic for the spatial correlation estimate. Discussed in the proposal for this dissertation one way to find a test statistic for this parameter is to bootstrap the standard errors or perform a Monte Carlo simulation, and that is not performed here, because it is outside the scope of this dissertation.

Typically, researchers assume that the error process in spatial models follows a Cliff and Ord (1981) type first–order process and estimate (24). McGarvey, Walker, and Turnbull (2007), however, remain agnostic about the error structure and allow an even more general error process to occur. To make a point of comparison between alternative methods, this dissertation estimates (24) using maximum likelihood estimation (MLE). The statistical software, Matlab, provides the code to estimate this spatial model. This code is in the spatial statistics toolbox and authored by James P. LeSage. The MLE technique assumes that the error term is normally distributed and this is a potentially important distinction between the GS2SLS–GMM technique described above. To estimate (26) MLE jointly maximizes the log likelihood function for the spatial interdependence and correlation parameters $\rho$ and $\lambda$

$$\begin{aligned} L = C &- \frac{nT}{2}\ln\left(\sigma^2\right) + \ln\left(\left|I_n - \lambda W\right|\right) + \ln\left(\left|I_n - \rho W\right|\right) \\ &- \frac{1}{2}\sigma^2\left(\left(\left(I_n - \lambda W\right)Y - XB\right)'\left(I_n - \rho W\right)'\left(I_n - \rho W\right)\left(\left(I_n - \lambda W\right)Y - XB\right)\right) \end{aligned} \tag{30}$$

where $nT$ is $n$ observations times $T$ years and $C$ is a constant term.

Defining states as neighbors or rivals in (21) and (22) requires the use of a spatial weighting matrix. This weight matrix conveniently allows alternative interpretations to define the nature of rivalry among neighbors. One way to define neighbors is in terms of geographic distance, while another way is in terms of economic distance. The weights in *W* are formulated such that they are a declining function of distance from neighbors. In this chapter, the weight matrix specification is the proportion of manufacturing employment (Prop Manuf) in a state, which defines the neighboring relationship. This implies states that have similar proportions of employment in manufacturing are close neighbors of one another. Following Case, Hines, and Rosen (1993)[7] method for constructing the weight matrix, the elements of weight matrix *W* is defined as:

$$\begin{aligned} &w_{ii} = 0 \text{ and} \\ &w_{ij} = 1 / |\overline{\text{Prop Manuf}}_i - \overline{\text{Prop Manuf}}_j| / S_i; \\ &S_i = \sum 1 / |\overline{\text{Prop Manuf}}_i - \overline{\text{Prop Manuf}}_j| \end{aligned} \tag{31}$$

where $\overline{\text{Prop Manuf}}$ is the sample period mean. As stated earlier, these weights are row and column standardized to equal one.

## Discussion of Empirical Methodology

The main topic of interest in this dissertation is the spatial interdependence effect measuring a state's effort to recruit firms and unobserved spatial correlation. These two aspects are quite appealing, because they identify whether states are competing to recruit firms. The spatial interdependence parameter, $\lambda$, measures the interaction of observed effort between rival states to recruit firms. The measure of effort in this chapter is firm recruitment spending and because other states' effort is observable, it enters (22) as a

[7] Their study uses the percent black to define neighbors.

control variable. The second spatial component is spatial correlation, which occurs if there is an unobserved/unmeasured spatial characteristic in the error term that is spatially correlated with other errors. It is important to allow for spatial correlation in the empirical model, because excluding this parameter, when $\rho \neq 0$, leads to invalid test statistics for the parameter estimates; it is essentially a nuisance parameter. A nuisance parameter needs to be controlled for, because ignoring spatial correlation (when present) can also lead to spurious interdependence estimates.

The OLS model in (20) provides a test for the linear relationship between a state's effort to recruit firms and the explanatory variables. However, advanced methodology allows for a spatial relationship, as suggested in the FRT. This methodology uses 2SLS, MLE, and GS2SLS–GMM. These techniques discriminately analyze the spatial component between states recruitment efforts and the explanatory variables. Differences between these models have important consequences for statistical inference. If there is no spatial interdependence in the conditional mean or spatial correlation in the error structure, OLS is the best linear unbiased estimator. In the case where spatial correlation does exist, OLS is no longer efficient; however, the estimates will be unbiased. Furthermore, in the case where spatial interdependence and correlation exist, the OLS estimates are biased and inconsistent. Using the GMM correction for the error structure is efficient when there is spatial correlation; however, this procedure creates greater variance in the parameter estimates, and consequently if there is no spatial correlation, the GMM estimates are not efficient. MLE provides upper bounds on the parameter estimates, but this is under the assumption that the errors are normal.

This dissertation follows Kelejian and Prucha's (1998) methodology for estimating a spatial interdependence/correlation model using GS2SLS with a GMM estimator for the error structure. Hernandez–Murillo (2003) applies Kelejian and Prucha's GS2SLS–GMM method to panel data analyzing the strategic interaction of state tax policies. Their application is useful, as panel data is also used here. McGarvey, Walker, and Turnbull (2007) also adopt the Hernandez–Murillo approach, but do not estimate $\rho$.

The GS2SLS–GMM model estimates the unknown parameters ($B'$, $\lambda$, and $\rho$) in (22). In the second step of Kelejian and Prucha's (1998) three–step procedure, they propose consistent estimates for $\rho$ and ε using GMM, with the weak assumption that ε is independent and identically distributed. However, the important distinction between the GS2SLS–GMM model and the MLE model, also estimated here, is that maximum likelihood assumes the error term is normally distributed.

Kelejian and Prucha (1999) point out that in spatial models with a non–symmetric weight matrix, the maximum likelihood method is computationally burdensome, because computing the eigenvalues of the $nT$ x $nT$ weight matrix is complex. The properties of the maximum likelihood estimates are known to be consistent and asymptotically normally distributed (Mardia & Marshall, 1984). For finite sample sizes, however, this may not be an appropriate assumption. Das, Kelejian and Prucha, (2003) and Kelejian and Prucha (1999) find that in finite sample sizes (49–400), the maximum likelihood estimator can be inefficient relative to the 2SLS estimator (recall, the 2SLS estimator does not estimate the error parameter). In addition, Kelejian and Prucha (1999) find they can only estimate the egienvalues accurately (at a moderate sample size of 400) when they use a symmetric

weight matrix. This could present issues for the MLE model tested here, as the weight matrix (proportion of manufacturing employment) is not symmetric. These studies suggest the preferred method to estimate the error term is GS2SLS–GMM.

A particular issue worth noting deals with formulating the weight matrix. The method of assigning weights in (31) shows that states with small differences in the proportion of manufacturing employment have larger weights. This means that they are close neighbors of one another. Unfortunately, this process establishes a weight for every state in the sample, so that all states are neighbors of one another (with differing magnitudes), and this creates a problem for spatial models. A weight matrix needs to be sufficiently sparse to identify spatial interdependence and correlation. Establishing a cut–off point takes care of this issue. Although selecting this cut–off is not random, analyzing the raw data in the weight matrix suggests an ideal number to mark the cut–off. Before assigning the actual weight, dividing by $S_i$ in (31), the quotient produces a value greater than zero, without an upward bound. For example, in the proportion manufacturing weight matrix, Kentucky and Iowa have a very similar average proportion of manufacturing employment and represents the largest value in the sample at 5,314. On the other hand, Florida and Indiana have the lowest value, 6.7, suggesting they are not close neighbors. The average value for the weight matrix is 124 and the median is 26. The cut–off used for this weight matrix is 35, slightly above the median value. Selecting this value implies that states with a lower value are not neighbors in a meaningful sense. This method allows the weight matrix to be sufficiently sparse to identify spatial interdependence and correlation among neighbors, if it exists.

## Empirical Results

These are the first results that empirically test for competition among states to recruit firms. The results indicate that states are competing with each other. This effect is very large in magnitude and significance. The empirical test for competition analyzes whether states are spatially interdependent in their effort to recruit firms. As the FRT model suggests, competing states are strategic complements in firm recruitment effort.

*Table* 4 reports the empirical results from estimating the model using OLS, 2SLS, MLE, and GS2SLS–GMM. The preferred methodology is the GS2SLS–GMM method, which also agrees with Das, Kelejian and Prucha (2003) and Kelejian and Prucha (1999). A comparison of the 2SLS and GS2SLS–GMM method reveals that allowing for spatial correlation in the error produces smaller standard errors for many variables, increasing the precision of these estimates, resulting in higher levels of statistical significance. Moreover, if $\rho \neq 0$, the 2SLS estimates are inefficient and the test statistics can be invalid, so it seems reasonable to allow for spatial correlation to occur. In comparison to MLE, the GS2SLS–GMM method results in higher levels of significance for almost all parameters, with a notable exception to the spatial interdependence effect, $\lambda$. The MLE method finds that the relationship between firm recruitment spending and seven explanatory variables change their signs, from concave to convex (PCT Unemp, Population, and PCT Urban) or convex to concave (GSP, Gov dummy, PCT Poverty, PCT HS); however, some of these variables are insignificant. Both models assume a first–order error process, but MLE's assumption that the error term is normally distributed seems overly restrictive compared to GMM's only assumption that ε is i.i.d. In addition, the sample size here is 161 (23 states multiplied by 7 years) and there are

concerns about MLE's performance in finite samples with a non–symmetric weight matrix.

The discussion below focuses primarily on the results from the 7th and 8th columns of *Table 4*, representing the GS2SLS–GMM estimates. The OLS method produces biased parameter estimates, since it omits the positive and significant parameter estimates on, $\lambda$, in the 3rd, 5th, and 7th column of *Table* 4.

Table 4: Recruitment Spending Regression Results

| | OLS | | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|---|---|
| Y=Rec. Spend. | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| Constant | 158.65 | 2.84 | 96.30 | 1.48 | 73.20 | 1.59 | 99.29 | 1.60 |
| Pop Growth | -9.00 | -3.10 | -10.60 | -3.32 | -6.53 | -2.58 | -10.75 | -3.46 |
| Tot Wage | 3.83E-05 | 0.14 | 9.18E-04 | 2.04 | -2.75E-04 | -1.34 | 8.26E-04 | 1.94 |
| PCT Unemp | -7.41 | -3.23 | -9.17 | -3.58 | -1.47 | -0.73 | -8.89 | -3.61 |
| GSP | -9.17E-05 | -0.47 | -6.33E-04 | -2.12 | 2.38E-04 | 1.54 | -5.63E-04 | -1.99 |
| Own Source | -1.02 | -1.27 | -2.39 | -2.35 | -0.16 | -0.25 | -2.18 | -2.21 |
| AID | 1.23 | 2.42 | 0.83 | 1.47 | 0.71 | 2.06 | 0.80 | 1.49 |
| SCITR | 0.55 | 0.71 | 1.40 | 1.57 | 0.38 | 0.69 | 1.29 | 1.53 |
| Gov Dummy | 1.37 | 0.41 | -1.81 | -0.47 | 3.38 | 1.37 | -1.75 | -0.47 |
| Prop Manuf | -2.90 | -7.27 | -0.60 | -0.60 | -1.85 | -5.02 | -0.59 | -0.62 |
| Population | 5.58E-06 | 2.76 | 7.48E-06 | 3.25 | -4.59E-06 | -0.31 | 6.73E-06 | 3.09 |
| Pct Black | 0.37 | 2.01 | 0.64 | 2.85 | 0.03 | 0.22 | 0.60 | 2.80 |
| Poverty | -0.20 | -0.29 | -1.20 | -1.42 | 0.19 | 0.36 | -1.16 | -1.42 |
| d02 | -3.21 | -0.74 | -4.74 | -1.01 | -0.30 | -0.14 | -4.68 | -1.13 |
| d01 | -5.80 | -1.23 | -16.92 | -2.53 | 2.09 | 0.67 | -16.17 | -2.62 |
| d00 | -7.26 | -1.26 | -19.08 | -2.48 | 3.10 | 0.73 | -18.30 | -2.55 |
| d99 | -3.24 | -0.59 | -13.22 | -1.86 | 3.63 | 0.97 | -12.85 | -1.96 |
| d98 | -2.56 | -0.44 | -9.67 | -1.41 | 2.36 | 0.63 | -9.68 | -1.54 |
| d97 | -0.25 | -0.05 | -4.27 | -0.78 | 1.76 | 0.64 | -4.36 | -0.88 |
| All 3 Dem | -7.15 | -2.06 | -5.50 | -1.45 | -1.88 | -0.70 | -5.17 | -1.42 |
| All 3 Rep | -9.27 | -2.12 | -12.24 | -2.51 | -2.62 | -0.91 | -11.32 | -2.46 |
| Elect. Yr | -0.29 | -0.10 | -0.55 | -0.17 | 0.13 | 0.07 | -0.38 | -0.13 |
| PCT HS | -0.63 | -1.15 | -0.41 | -0.68 | -0.09 | -0.20 | -0.43 | -0.75 |
| PCT Coll | -0.72 | -1.74 | -0.50 | -1.10 | -1.11 | -3.71 | -0.55 | -1.27 |
| PCT Urban | -0.04 | -0.47 | 0.15 | 1.40 | -0.11 | -1.97 | 0.14 | 1.30 |
| λ | | | 0.85 | 2.58 | 0.33 | 3.33 | 0.86 | 2.72 |
| ρ | | | | | -0.85 | -10.87 | -0.10 | |
| # of obs | 161 | | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | 0.68 | | | | 0.80 (0.77) | | | |

* There is not an analytic expression for the variane-covariance matrix of ρ; therefore, the std. error and t-stat. cannot be calculated.

The highly significant GS2SLS–GMM estimate of spatial interdependence among states is not surprising, given the abundance of anecdotal evidence in the popular press. These are, however, the first empirical estimates of the degree to which it occurs. In the 7th column of *Table* 4, the estimate of $\lambda$ is 0.86. This implies that when a neighboring state increases its recruitment spending by $100, the home state reacts by increasing its spending by $86. A magnitude of this size is very large. In comparison to this estimate,

Edmiston and Turnbull (2007) estimate the marginal effect of spatial interdependence for counties in Georgia is 0.41. Interpreting this effect with their dependent variable means that a county is 41% more likely to offer incentives if its neighbors offer incentives. Rork and Wagner (2006) estimate the interdependence effect for state's cigarette tax rates, which range from 0.36 to 0.67. This means that if a neighboring state increases its cigarette tax by 10 cents, the home state reacts by increasing its tax by 3.6 to 6.7 cents.

The estimate for spatial correlation, $\rho$, in the 7th column of *Table* 4 shows that $\rho \neq 0$. This means there are some unobserved or unmeasured effects spatially correlated with firm recruitment effort. The significance of this parameter is not estimated, because as stated earlier, we do not have an analytic expression to estimate the variance–covariance matrix for this parameter. The MLE for $\rho$ also picks up this negative correlation. Other results from the GS2SLS–GMM method (7th and 8th column of *Table* 4) indicate that the explanatory variables have some interesting effects as well, and are discussed below.

The population growth variable (Pop Growth) is negative and strongly significant; it measures the percentage change in population over the years of the panel. This implies that states with high growth rates spend less effort to recruit firms. Perhaps a state's high rate of growth relative to other states suggests that their current recruitment policy is working. This supports Brueckner's (1995) argument that successful development can have the effect of slowing the pace of future development. The percent urban employment variable (PCT Urban) measures the degree of urbanization for states. The coefficient is positive suggesting that states that are more urbanized spend more effort recruiting firms; however, it is insignificant in the regression. The significant negative coefficient on percent unemployed (PCT Unemp) suggests that the public's desire to

decrease unemployment through increased recruitment effort is overridden by the dampening effect unemployment has on the state. This result contrasts with Edmiston and Turnbull (2007), where they find a significant positive effect. They suggest that counties with high unemployment might value the marginal increase in employment more than a county with low unemployment. Another measure to control for the public's demand for firm recruitment effort is total wages (Tot Wage). Total wages is nearly significant at the 5% level and positive, implying that states with higher wage levels are aggressively pursuing additional recruitment through increased firm recruitment effort. This means states that are succeeding at increasing the wage level of their workforce do not decrease their effort to recruit firms. An alternative rationale is that increased spending may also be a compensation effect, since firms relocating to higher wage states have greater labor costs–and so states must spend more to recruit firms from alternative locations. This result is contrary to the finding in De Bartolome and Spiegel (1995). They argue that a state's total economic development spending is decreasing in the state's wage level, because wage levels fall as more capital is recruited into the state.

Similar to the total wage variable, the level of education in a state might be a compensation effect, where states with less educated workforces spend more effort to recruit firms. The percent high school (PCT HS) and percent college (PCT College) variables are negative indicating that states view the education of their workforce as a location disadvantage; however, they are insignificant in the regression. Because of the unique correlation between these two variables, a joint hypothesis tests whether these variables are jointly significant in the regression. The F–statistic at the 10% significance level is 1.60, which cannot reject the null hypothesis that these education variables are

jointly significant. One of the typical missions for state economic development departments is to develop a high–technology industry (similar to Silicon Valley) in the state; however, these firms are naturally drawn to higher quality workforces (measured in education), thus states underperforming in workforce education spend more effort to recruit firms.

Gross state product (GSP), state corporate income tax rate (SCITR), and own source revenue (Own Source) control for fiscal distress in a state. The significantly negative effect for GSP implies that states with high levels in the production of goods and services need not overspend in its recruitment budget, since they may be content with their economic standing. Own source revenue is also significant and negative. This result implies that as the amount of own source revenue falls; states increase their effort to recruit firms, perhaps, with the hope of increasing their own–source revenues in the future. This result is contrary to the yardstick competition result that Boarnet and Glazer (2002) find. The SCITR variable is near the 10% level of significance, but its positive sign suggests that states view their higher regulatory costs as a location disadvantage. It seems reasonable that, ceteris paribus, states have to try harder (increasing their recruitment spending) to recruit firms into their state if they charge higher prices for locating there. Another measure of fiscal distress is intergovernmental aid. In this sample, intergovernmental aid is nearly significant at the 10% level and positive. This suggests that states receiving aid from the federal government view increased firm recruitment effort as a way to strengthen their financial position.

The political ideology variables tested here are, governor dummy (Gov Dummy), all three chambers Republican (All 3 Rep), all three chambers Democrat (All 3 Dem),

and election year (Elect Yr). The governor dummy and election year measures are not significant in the regression. The other two measures look at whether the government is in political agreement, or all three chambers affiliate with the same party. Both are negative and All 3 Rep is nearly significant at 1%. This means that when the government is in political agreement, the state spends less recruitment effort. One possible explanation for this result is when the government is not in political agreement, one party tries to one–up the other by recruiting firms through increased firm recruitment effort. These results offer some insight into the political process, because controlling for whether the governor is Republican or Democrat, it appears that recruitment effort only decreases when the house and senate match the governor's affiliation. In addition, contrary to intuition, politicians spend less on firm recruitment when they control all three chambers of government in a state.

The importance of a strong manufacturing base in a state stems from this sector's presumed association with creating economic growth. A state with a high proportion of manufacturing employment (Prop Manuf) may be a result of location advantages or localization economies of scale that it has over other states. The FRT model shows that states with location advantages can spend less recruitment effort and still be successful. The negative coefficient estimate for this variable, in the 8$^{th}$ column of *Table* 4, implies that states with a large proportion of manufacturing employment spend less effort, although the estimate is insignificant. This result also contrasts to De Bartolome and Spiegel's (1995) finding that total economic development spending rises as the proportion of manufacturing employment increases.

The demographic variables used here are percent black and percent below poverty. The percent black variable is highly significant and positive, while poverty is below the 10% significance level. Population is one measure of a state's size. This variable is positive and strongly significant which indicates, controlling for the growth rate of a state, larger states spend more recruitment effort. Other research is less conclusive regarding this effect. For example, Man (1999) cannot find a significant effect that population affects the probability of TIF adoption for Indiana cities. In addition, Edmiston and Turnbull (2007) also cannot find statistical significance for population affecting a county's use of incentives.

## Conclusion

Previous research looking into interjurisdictional competition for economic development provides the motivation for a closer analysis of fiscal policies and strategic interaction among state governments. The lack of high–quality data to explain the factors driving inter–regional competition for firms is why there exist only a few empirical studies. The chapter solves the data problem by creating a unique panel data set for 23 of the 31 eastern states. The lengthy and tedious process of analyzing state budget documents likely explains why a similar study has not been done previously. This chapter uses a GS2SLS–GMM spatial model, among others, to test whether states are spatially interdependent. It evaluates competition for firms as an interdependence effect between competing states and allows for the possibility of unobserved or unmeasured spatial correlation in the error structure. The results provide a strong indication that states are interdependent in their effort to recruit firms.

Only a few studies are able to empirically estimate a similar interdependence effect. Edmiston and Turnbull (2007) study the choice of incentives that are offered to relocating firms from county survey data in Georgia. Anderson and Wassmer (1995) examine the effect of offering new incentives to relocating firms in the Detroit Metropolitan Area. Man (1999) analyzes the various factors that affect tax incremental financing (TIF's) among cities in Indiana. Using a direct measure of recruitment effort, this paper takes advantage of a gap in the empirical literature by developing a panel data set to analyze competition among states to recruit firms. The data does not separate high profile cases from the day–to–day operations that involve recruiting smaller firms. Rather than making broad interpretations from the few cases in the press, the data used here allows for empirical tests of competition, providing an unbiased measure of a state's effort to recruit firms. These are the first results to empirically test for competition and the results indicate that states compete to recruit firms. This effect is very large in magnitude and significance, which implies the decision by states to recruit firms is strategically competitive behavior.

The individual explanatory variables also provide interesting insights. The percent growth variable implies that rapidly growing states spend less recruitment effort; while on the other hand, states with large populations spend more recruitment effort. Another result shows that states ridden with high unemployment and poverty do not aggressively recruit firms by increasing their effort. Furthermore, decreases in own source revenues and GSP imply fiscally distressed states spend more effort to recruit firms. A state that is more competitive might be able to strengthen its economic position. Finally, states

increase their recruitment effort to offset a location disadvantage they have in education and higher wages.

As a final note, the results here contrast the key results in the closely related study by De Bartolome and Spiegel (1995). However, their study uses total economic development department spending, not the carefully refined firm recruitment spending measure used in this chapter. This raises an important empirical question–does it matter how researchers measure effort? That is, does total economic development department spending fundamentally differ in what recruitment spending captures? This is the topic for the next chapter.

# CHAPTER 5: ALTERNATIVE MEASURES OF RECRUITMENT EFFORT

## Introduction

Every state government in the U.S. has a department of economic development (or quasi–public equivalent) that is responsible for creating an environment in their state where economic growth can occur. It is not always clear to these state governments, however, which programs in the department matter more in terms of spurring economic growth. Thus, states implement a wide variety of programs trying to achieve this objective. This objective presents an intriguing question regarding the motivation for this dissertation. The goal of this dissertation is to ascertain whether states are competing with each other to recruit firms into their state or retain the ones they have. Testing for this competition requires that the effort states expend to recruit firms is observable or that an empirical proxy exists. But, does it matter how this effort is measured? Perhaps, there are other measures of effort that better explain a state's effort to recruit firms.

One possible alternative measure of a state's firm recruitment effort is total economic development department spending. The rationale for this measure is that total department spending might better explain a state's objective to recruit firms, by providing firms the ideal location to relocate/expand. At the same time, total economic development spending might also explain a state's passive approach to recruit firms, rather than the active firm recruitment in direct firm recruitment spending. Another measure of firm recruitment effort is the number of full–time equivalent (FTE) employees in the department of economic development. Perhaps, states view their staff as an inexpensive substitute for spending on special programs and provide added value to firms. The logistics and bureaucratic red tape involved in relocating a firm (or assisting in an

expansion) can be quite overwhelming, so a state that has more staff in its department to assist these firms might provide a better measure of the effort to recruit firms.

The FRT model shows that if the amount of effort matters in determining whether a state successfully recruits firms, then we should observe states competing with each other to exert more effort. In the context here, this implies that if these alternative measures of effort matter in recruiting firms, then other states will react to an increase in effort by either increasing their total economic development spending or their number of FTE employees to compete. Chapter four already shows that states are competing to recruit firms, thus the question here is whether these alternatives represent a better measure of a state's firm recruitment effort. If the analysis shows states remain competitive to recruit firms, then these measures are suitable alternative measures of a state's firm recruitment effort.

This chapter envisions the two alternative measures of recruitment effort as an exercise in sensitivity analysis: Does a different measure of firm recruitment effort change the fundamental results in chapter four that show states are competing to recruit firms? The next section describes the data used in the empirical analysis. This chapter applies the same methodology and empirical model from chapter four, so the subsequent section discussing the empirical model is brief. A detailed discussion regarding the results follows. The final section presents the conclusions.

## Data

The alternative measures of firm recruitment effort for this chapter's empirical analysis are available in state budget documents. Collecting the data for these measures

of effort follows the same process summarized in the data section from chapter four and is not discussed here. Although collecting this data is less labor intensive than firm recruitment spending, the number of states in the dataset remains unchanged–so that comparable analysis can be made between the different models, without the complication of a different dataset. This chapter also employs the same explanatory variables outlined in chapter four. Because it may not appear obvious, it is worth noting that the dependent variable has not changed; only the measure of it has. Therefore, the expected relationship between the explanatory variables and firm recruitment effort remain the same as predicted in chapter four. The discussion in this chapter focuses on explaining the difference between these alternative measures of effort and firm recruitment spending.

In 1992, the National Association of State Development Agencies (NASDA) put together a dataset consisting of total economic development spending. An important distinction between their data set and the one used here is how they collected the data. NASDA opted to collect the data using a survey and only for one year, while the data set here is seven years and collected by examining state budget documents. De Bartolome and Spiegel (1995) use the NASDA data to test whether states are competing for domestic and foreign investment in an effort to maximize the local net wage. In this chapter, total economic development spending represents a measure of a state's effort to recruit firms. We test this measure to determine if states are competing to recruit firms. The data here are likely more reliable than a survey, because when certain program spending needs to be verified, senior economic development officials were the only individuals who knew where programs are located in the budget documents. It is unclear who completed the surveys for NASDA.

*Table* 5 below presents the descriptive statistics for the alternative measures firm recruitment effort. In 2000, Pennsylvania recorded the highest total economic development spending at $421,800,000 while Vermont in 1997 represents the lowest spending at $960,000. The average spending for all states over the sample period is $61,800,000. The average number of FTE employees is 106.25 for the department in the sample. However, this number is skewed to the high–end, because of some outlying states with many FTE employees. The median number is 61, which provides a better picture of this data. New York had 600 FTE employees in 1998, while Vermont is, again, at the bottom with 14 employees in 1997 and 1998.

It is important to note that the empirical model controls for some of these state size effects. For example, Vermont has a very small population and size of government, especially compared to its neighbor to the west, New York. However, three of the controls in the model are population, gross state product, and own source revenue. Essentially this means that the empirical model controls for different sized states (in terms of population and size of government), thus the model explains the variability in a state's number of FTE employees or total economic development spending holding constant state population and size of government. Another issue is whether the measures of firm recruitment effort should be scaled by some factor. To answer this, it does not make sense to scale these effort variables, because it does not matter to the firms being recruited which state is spending more effort, recall from the FRT model that only relative effort across states matters.

Table 5: Descriptive Statistics (1997-2003) – Alternative Dependent Variables

| | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| Total Economic Development Spending* | $62 | $72 | $1 | $422 |
| Total Number of FTE Employees in the Department of Economic Development | 106 | 119 | 14 | 600 |

* Dollars ($) are in milliions and deflated to year 2000.

## Total Economic Development Department Spending

Total economic development spending is one of the easier measures of firm recruitment effort to obtain because it requires less disaggregation of data. However, every state budget includes some federal funds that need to be removed from total state economic development spending. De Bartolome and Spiegel (1995) use similar data and it appears that their data also only represents state spending.[8] It is not appropriate to include federal funds in these measures of effort because federal funds do not represent a state's effort to recruit firms. Therefore, removing programs like community economic development programs from total economic development spending is necessary, because the federal government's Community Development Block Grant (CDBG) largely funds this program.[9] In other cases, the program budgets typically separate where the funding comes from (general fund, federal, or other), so that only state spending is recorded. This dissertation is trying to determine whether states compete with each other to recruit firms, identifying their effort through state expenditures. Only the state's effort matters, so it is important to remove federal aid to states that falls into these spending categories. As an

[8] The 2002 NASDA State Economic Development Expenditure Survey is available, but at a cost of $200 – but for only major categories of total spending, possibly not as detailed as the data here. The 2002 and 1992 survey data set were not purchased for comparison in this dissertation.

[9] Fisher & Peters (1998) suggest removing federal programs that operate outside the control of the state government as well as other federal programs like industrial revenue bond (IRB) financing [page 32].

example of how states separate these program funds, in 2003 Tennessee spent $9.7 million on an industrial infrastructure program, $6.3 million came from the state's general fund, and the other $3.4 million was from other funds, in this program there were no federal funds to subtract. In certain situations, removing some irrelevant spending in the department is necessary because the program simply does not relate to economic development. For example, Alabama combines its economic development department with community affairs, so it is necessary to remove programs like neighbors helping neighbors, adopt–a–mile, traffic safety, and others. Removing these irrelevant programs ensures that the measure of a state's effort captures only economic development spending.

The primary difference between total economic development spending and firm recruitment spending (in chapter four) is that firm recruitment spending is a subset of total economic development spending. This means that the difference between these measures is that total economic development spending captures more spending programs, not included in firm recruitment spending. Some of the programs that represent total economic development spending (and not firm recruitment spending) are telecommunication and recycling initiatives, regional development projects, regional economic growth assistance programs, infrastructure investment, workforce development programs, economic development councils, economic development funds, roadwork development programs, and urban redevelopment initiatives. This list is not comprehensive. Recall from the data section in chapter four that program names change from state to state and within a state, as new governors have different priorities. Thus, each state requires careful independent analysis. Another rationale for testing this

measure is that, perhaps, total economic development spending represents an alternative objective of the state. Investing in infrastructure and other programs to create a better business climate is not as active as the firm recruitment spending approach, which targets specific firms and industry. This topic is analyzed in greater detail in chapter six, because here it is important to first determine whether it is an appropriate measure of a state's effort to recruit firms.

### Number of Full Time Equivalent (FTE) Employees

Another measure of firm recruitment effort in this chapter is the number of Full Time Equivalent (FTE) employees. This is also an easy measure to obtain because it requires very little dissaggregation of data. The important question here is whether the number of FTE employees is an appropriate measure of a state's firm recruitment effort. However, this particular measure is quite interesting, because it begs the question of what adds value to a firm, that is, do firms value the assistance and support from department staff (FTE employees) or department spending (total economic development spending and firm recruitment spending). Chapter four concludes that firms do value firm recruitment spending, because if firm recruitment spending matters in successful recruitment, states will spend more and compete with each other–and the empirical results confirm they do. Nonetheless, a department staff can be extremely valuable to recruitment because they can sometimes seal the deal, as in the example below.

As an example of how important department staff can be to successful firm recruitment, consider the case of Cabela's Inc. building its new distribution center and retail outlet in West Virginia. David Sims, a county commissioner, and friend Stanley

Klos played an instrumental role in clearing many hurdles to prepare a stripped mined site near Wheeling, WV for development. After developing the roads and preparing the site, local county administrator Greg Stewart and the state's director of economic development, David Satterfield, went to extreme lengths to make the deal happen with Cabela's CEO. The story explains how Satterfield and Stewart made financing deals over the phone, traveled at night with almost no gas at high speeds to meet with Cabela's CEO.[10] The only way this deal happened was through their effort, according to their web–page. Unfortunately, the number of FTE employees does not capture local effort in this data set, but this example reveals that states with more staff might have greater success recruiting firms. Thus, the number of FTE employees could represent an alternative measure of a state's effort to recruit firms.

There are also some complications in calculating the number of FTE employees. As is the case with total economic development spending, it is necessary to subtract the number of FTE employees attached to federal CDBG programs, because these employees do not represent a state's effort to recruit firms. In other cases, the assignment of FTE employees is not always clear, so, the total number of FTE employees is measured with some error. In addition, possibly not all FTEs are as successful or determined as David Satterfield in West Virginia, but it is impossible to measure the productivity or determination of these FTE employees. Therefore, we assume that the cross variation in

[10] Available on Stanley Klos' website, retrieved on March 30, 2007, from http://www.skibocentre.com/fh.htm.

the productivity or determination of economic development department FTEs is minimal, at most.[11]

## Empirical Model

The empirical model in this chapter is identical to the model that chapter four presents. In essence, the dependent variable in this chapter does not change; the dependent variable remains a state's firm recruitment effort. The important difference and contribution of this chapter is that it tests whether it matters how one measures a state's effort to recruit firms. The discussion above indicates reasons why the alternative measures of recruitment effort tested here could explain a state's effort to recruit firms. The results in chapter four serve as the foundation for this chapter, as the results there reveal states do compete to recruit firms. Therefore, if the results here do not change, then this implies that these alternative measures are suitable alternatives to firm recruitment spending.

As in chapter four, the first empirical model to test is OLS, for convenience it is

$$Y = XB + u \tag{32}$$

The next step in this model allows for spatial interdependence in the conditional mean and spatial correlation in the error. Repeating the model here for convenience it is

$$\underset{nT x 1}{Y} = \lambda \underset{nT x nT}{W} \underset{nT x 1}{Y} + \underset{nT x k}{XB} + \underset{nT x 1}{u}; \qquad \underset{nT x 1}{u} = \rho \underset{nT x nT}{W} \underset{nT x 1}{u} + \underset{nT x 1}{\varepsilon}, \tag{33}$$

The important difference here, as explained earlier, is that the dependent variable vector $Y$ now represents two alternative measures of firm recruitment effort. In addition, because this model is, essentially the same model from chapter four, the expected

[11]The number of FTE employees assigned to firm recruitment spending is not available, thus the number of FTE employees is an aggregate employment number for the state's entire department of economic development.

relationships between the explanatory variables and firm recruitment effort remain the same.

Again, to make a point of comparison in methodology, this chapter assumes a first–order error structure and tests for spatial interdependence and spatial correlation in the maximum likelihood framework. For convenience the log–likelihood function to maximize is

$$\begin{aligned} L = C - \frac{nT}{2}\ln\left(\sigma^2\right) + \ln\left(\left|I_n - \lambda W\right|\right) + \ln\left(\left|I_n - \rho W\right|\right) \\ - \frac{1}{2}\sigma^2\left(\left(\left(I_n - \lambda W\right)Y - XB\right)'\left(I_n - \rho W\right)'\left(I_n - \rho W\right)\left(\left(I_n - \lambda W\right)Y - XB\right)\right) \end{aligned} \tag{34}$$

It is also important to note that the nature of rivalry does not change in this chapter. Recall that chapter four defines neighbors or rivals according to whether states have a similar proportion of manufacturing employment, thereby defining the nature of rivalry. To isolate only the difference in the measures of firm recruitment effort, this chapter defines neighbors in the same way. In the results section that follows, the GS2SLS–GMM estimates of (33) are the primary focus, as this method remains the preferred methodology.

## Results

The results in this section are quite interesting, because they provide useful insights into the measures of firm recruitment effort. *Table* 6 and *Table* 7 report the empirical estimates for the alternative measures of firm recruitment effort, using total economic development spending and the number of FTE employees in the department of economic development, respectively. The estimates reported here indicate that these alternative measures are not equivalent to firm recruitment spending.

The primary interest in this chapter is to understand whether changing the measure of a state's firm recruitment effort fundamentally changes the results from chapter four. The parameter estimate of spatial interdependence, $\lambda$ signifies whether or not states are competing. The empirical models in (33) and (34) test for this effect directly, or more specifically, they test whether one state's effort is interdependently related to other states' effort. The FRT model, in chapter three, implies that if competition exists between rivals then $\psi' > 0$ and $\phi' > 0$, translating this comparative static result to the empirical model implies that $\lambda > 0$, if states compete for firms.

Total economic development spending is the first alternative measure of firm recruitment effort tested. In the 7th and 8th columns of *Table* 6 are the GS2SLS–GMM estimates; this method estimates the effect to be -0.03 and insignificant. The 2SLS and the GS2SLS–GMM estimates are nearly identical; in addition, the MLE method also finds that $\lambda$ is negative and significant (opposing competition). Putting these estimates of spatial interdependence together does not support that states are competing to recruit firms. Therefore, total economic development spending is not a suitable alternative to firm recruitment spending. Another possibility is that total economic development spending is not as active as firm recruitment spending. However, this question is relegated to chapter six.

The parameter estimate of $\rho$ is almost zero in column (7) of *Table* 6, so the 2SLS results in columns (3) and (4) are nearly identical to the GS2SLS–GMM results in columns (7) and (8). Similar to chapter four's results, the MLE method picks up the same sign on $\lambda$ and $\rho$ as the GS2SLS–GMM method, but the levels of significance and magnitude are not similar. However, this is not true for the estimates of the exogenous

controls reported in *Table* 7; the MLE estimates are similar to both 2SLS in columns (3) and (4) and GS2SLS–GMM in columns (7) and (8).

The total number of FTE employees in the department of economic development is the second alternative measure of firm recruitment effort. In column (3), (5), and (7) of *Table* 7, the estimated interdependence effect, $\lambda$, is negative, which opposes the presence of competition.[12] All three methodologies are consistent here, but the negative effect indicates that the number of FTE employees is not a suitable alternative measure of firm recruitment effort. There are some interesting changes in the effects of the explanatory variables in this regression, which are discussed below.

[12] As stated earlier in the theoretical chapter, a negative interdependence effect implies that states are not competing to recruit firms based upon the measure of effort employed. An alternative explanation of a negative relationship could imply that states are capturing spillover effects of other states increased spending on recruitment effort. However, this explanation is not consistent with states competing to recruit firms. Although this explanation is a possible reason why states would spend less effort as their neighbor spends more effort, the end result is that these neighboring states are not competing to recruit firms.

Table 6: Total Economic Development Spending Regression Results*

| | OLS | | 2SLS | | MLE | | GS2SLS-GMM** | |
|---|---|---|---|---|---|---|---|---|
| Y=Tot. Econ. Dvlpmt | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| Constant | 240.53 | 1.18 | 246.11 | 1.07 | 236.30 | 1.34 | 245.77 | 1.30 |
| Pop Growth | -12.21 | -1.15 | -11.81 | -0.98 | -10.49 | -1.19 | -11.74 | -1.18 |
| Tot Wage | 4.00E-03 | 4.03 | 3.96E-03 | 3.51 | 3.44E-04 | 3.83 | 3.96E-03 | 4.24 |
| PCT Unemp | 8.17 | 0.98 | 8.43 | 0.89 | 7.38 | 1.06 | 8.41 | 1.08 |
| GSP | -4.08E-03 | -5.67 | -4.06E-03 | -5.03 | -3.65E-04 | -5.68 | -4.06E-03 | -6.08 |
| Own Source | 6.29 | 2.14 | 6.15 | 1.83 | 5.35 | 2.10 | 6.15 | 2.21 |
| AID | -0.06 | -0.03 | 0.07 | 0.03 | 0.82 | 0.49 | 0.09 | 0.05 |
| SCITR | 8.01 | 2.85 | 8.19 | 2.48 | 6.44 | 2.61 | 8.15 | 2.98 |
| Gov Dummy | 7.78 | 0.63 | 8.31 | 0.59 | 9.41 | 0.90 | 8.29 | 0.72 |
| Prop Manuf | 0.02 | 0.01 | -0.07 | -0.04 | -0.54 | -0.35 | -0.08 | -0.05 |
| Population | 4.62E-05 | 6.26 | 4.66E-05 | 5.53 | 4.45E-06 | 6.82 | 4.66E-05 | 6.69 |
| Pct Black | 2.22 | 3.31 | 2.20 | 2.88 | 2.42 | 4.18 | 2.21 | 3.50 |
| Poverty | -9.56 | -3.78 | -9.56 | -3.40 | -7.40 | -3.44 | -9.51 | -4.09 |
| d02 | -8.09 | -0.51 | -7.81 | -0.44 | -6.21 | -0.33 | -7.80 | -0.53 |
| d01 | -4.79 | -0.28 | -3.99 | -0.20 | -2.32 | -0.12 | -3.96 | -0.24 |
| d00 | -13.07 | -0.62 | -11.91 | -0.49 | -9.28 | -0.42 | -11.89 | -0.59 |
| d99 | -2.20 | -0.11 | -1.09 | -0.05 | 1.65 | 0.08 | -1.02 | -0.05 |
| d98 | -1.16 | -0.05 | -0.20 | -0.01 | -0.13 | -0.01 | -0.21 | -0.01 |
| d97 | -6.34 | -0.35 | -6.21 | -0.31 | -5.99 | -0.29 | -6.19 | -0.37 |
| All 3 Dem | 12.16 | 0.96 | 11.87 | 0.84 | 4.73 | 0.44 | 11.69 | 1.00 |
| All 3 Rep | 0.73 | 0.05 | 0.82 | 0.05 | 2.40 | 0.17 | 0.90 | 0.06 |
| Elect. Yr | 9.29 | 0.86 | 9.32 | 0.78 | 6.86 | 0.73 | 9.27 | 0.94 |
| PCT HS | -2.94 | -1.47 | -3.03 | -1.32 | -2.74 | -1.58 | -3.02 | -1.60 |
| PCT Coll | -0.07 | -0.04 | 0.04 | 0.02 | 0.22 | 0.16 | 0.05 | 0.04 |
| PCT Urban | -0.25 | -0.92 | -0.26 | -0.83 | -0.30 | -1.22 | -0.26 | -1.01 |
| $\lambda$ | | | -0.03 | -0.17 | -0.29 | -2.53 | -0.03 | -0.26 |
| $\rho$ | | | | | 0.33 | 2.74 | 0.01 | |
| # of obs | 161 | | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | 0.67 | | | | 0.70 (0.65) | | | |

* Weight matrix is the proportion of manufacturing employment in the state.

** There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 7: FTE Employee Regression Results*

| | OLS | | 2SLS | | MLE | | GS2SLS-GMM** | |
|---|---|---|---|---|---|---|---|---|
| Y= # FTE Emp.'s | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| Constant | 201.64 | 0.89 | 343.89 | 1.32 | 321.41 | 1.48 | 343.72 | 1.62 |
| Pop Growth | -10.73 | -0.91 | -12.13 | -0.94 | -12.80 | -1.19 | -12.18 | -1.15 |
| Tot Wage | 2.33E-03 | 2.11 | 1.67E-03 | 1.32 | 1.91E-04 | 1.83 | 1.68E-03 | 1.63 |
| PCT Unemp | 29.97 | 3.22 | 24.86 | 2.35 | 26.38 | 2.99 | 24.94 | 2.89 |
| GSP | -1.73E-03 | -2.16 | -1.58E-03 | -1.80 | -1.72E-04 | -2.37 | -1.59E-03 | -2.22 |
| Own Source | 9.64 | 2.95 | 9.31 | 2.60 | 8.95 | 3.02 | 9.29 | 3.18 |
| AID | 6.89 | 3.35 | 7.92 | 3.41 | 7.51 | 3.97 | 7.90 | 4.18 |
| SCITR | 10.90 | 3.49 | 12.78 | 3.58 | 13.86 | 4.98 | 12.88 | 4.43 |
| Gov Dummy | -12.98 | -0.95 | -8.45 | -0.56 | -8.61 | -0.69 | -8.43 | -0.68 |
| Prop Manuf | 5.95 | 3.67 | 3.40 | 1.50 | 3.71 | 2.09 | 3.40 | 1.85 |
| Population | -7.18E-06 | -0.87 | 2.39E-06 | 0.23 | 3.14E-06 | 0.39 | 2.52E-06 | 0.30 |
| Pct Black | -1.20 | -1.60 | -1.10 | -1.34 | -1.12 | -1.66 | -1.10 | -1.65 |
| Poverty | 0.71 | 0.25 | 0.42 | 0.14 | 0.01 | 0.01 | 0.39 | 0.16 |
| d02 | 11.73 | 0.67 | 13.80 | 0.72 | 12.61 | 0.86 | 13.73 | 0.88 |
| d01 | 39.74 | 2.07 | 40.72 | 1.93 | 40.93 | 2.49 | 40.74 | 2.39 |
| d00 | 61.15 | 2.62 | 62.50 | 2.44 | 62.88 | 3.10 | 62.53 | 3.01 |
| d99 | 56.91 | 2.54 | 58.52 | 2.38 | 59.26 | 3.07 | 58.59 | 2.94 |
| d98 | 59.19 | 2.51 | 61.86 | 2.39 | 63.02 | 3.10 | 61.96 | 2.95 |
| d97 | 32.64 | 1.64 | 33.62 | 1.54 | 33.93 | 2.01 | 33.64 | 1.90 |
| All 3 Dem | -4.10 | -0.29 | -11.87 | -0.74 | -10.69 | -0.81 | -11.83 | -0.91 |
| All 3 Rep | 4.75 | 0.27 | -1.74 | -0.09 | -4.62 | -0.29 | -1.99 | -0.12 |
| Elect. Yr | 8.30 | 0.69 | 8.46 | 0.65 | 9.75 | 0.92 | 8.56 | 0.80 |
| PCT HS | -6.27 | -2.81 | -7.11 | -2.86 | -7.03 | -3.42 | -7.12 | -3.52 |
| PCT Coll | 1.76 | 1.05 | 1.99 | 1.08 | 1.97 | 1.31 | 1.99 | 1.33 |
| PCT Urban | -0.58 | -1.89 | -0.66 | -1.94 | -0.70 | -2.56 | -0.66 | -2.40 |
| $\lambda$ | | | -0.21 | -1.82 | -0.17 | -1.80 | -0.21 | -2.22 |
| $\rho$ | | | | | -0.10 | -0.72 | -0.01 | |
| # of obs | 161 | | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | 0.85 | | | | 0.86 (0.83) | | | |

* Weight matrix is the proportion of manufacturing employment in the state.

** There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

De Bartolome and Spiegel (1995) use similar data to the total economic development spending data in this chapter. In the fourth chapter both of their key results, regarding the relationship between economic development spending and wages (Tot Wage) and the proportion of manufacturing employment (Prop Manuf), cannot be replicated. However, that is after narrowly defining total economic development spending into firm recruitment spending only. The estimates in *Table* 6 columns (7) and (8), again, cannot replicate their results, even with similarly defined economic development spending data. [13] The total wages variable is positive and indicates states with higher wages spend more on economic development. In addition, the proportion of manufacturing employment variable is negative, but not significantly different from zero. One possible explanation is that the different results reflect an important aspect of the two data sets. De Bartolome and Spiegel (1995) use only a cross section of economic development spending data, while the data here is panel, tracking economic development spending over time, rather than for only one year could explain why the results do not match.

The estimates in *Table* 6 using 2SLS, MLE, and GS2SLS–GMM are similar in terms of their magnitude and significance for most variables. The OLS results in these tables provide a benchmark to compare the results using alternative methodologies. The rest of this discussion focuses on column (7) and (8) in *Table* 6 and *Table* 7 and compares the estimates to column (7) and (8) in *Table* 4.

[13] The model tested in this dissertation is different from that tested by De Bartolome & Spiegel (1995). The dependent variable however is very similar, with population on the RHS of the estimating equation; total economic development spending is close to the total economic development spending per worker in De Bartolome and Spiegel. They have fewer controls and have only a cross section, rather than the panel tested here. Although this dissertation is not a replication study, some qualitative comparisons can easily follow.

From the economic development spending regression, in *Table* 6, population growth (Pop Growth) is still negative, but is no longer significant. Percent unemployed (PCT Unemp) changes from negative and significant to positive and insignificant. This positive effect implies that states with higher percentages of unemployment spend more in total economic development, but less in firm recruitment spending. Own source revenue (Own Source) changes from convex and significant to concave and significant, which implies states that generate increased own source revenues spend more in total economic development spending. The state corporate income tax rate (SCITR) remains positive but is now significant at 1%, which is also the case for the percent poverty variable.

From the FTE Employee regression, in *Table* 7, it is worth noting that all three methodologies are similar in terms of their magnitude and level of significance. Again, to make a comparison, we focus on column (7) and (8) in *Table* 7 and compare it to column (7) and (8) in *Table* 4. Percent unemployment (PCT Unemp) and own source revenue (Own Source) change signs and are significant, which is similar to the results with total economic development spending as the measure of firm recruitment effort. Population (Population) remains positive, but is no longer highly significant. Percent high school (PCT HS) is negative and now significant at 1%, which means states with less educated workforces tend to have more staff in their departments of economic development. It is not intuitively clear why less educated states have more FTE employees in their department of economic development. Perhaps states that are more educated require less staff because their workers are more capable to handle department needs.

## Conclusion

The empirical model in this chapter is identical to the model in chapter four. The only change made to the model is the measure of a state's firm recruitment effort or how the dependent variable is measured empirically. Therefore, if the competition results hold (as shown in chapter four), these alternative measures are additional ways to measure a state's effort to recruit firms. The empirical estimates suggest that these two alternative measures are either not appropriate or reflect different objectives for the state. This yields some interesting insights into the measure of effort. The results here indicate that the hardest measure of firm recruitment effort to obtain is the most valuable measure to obtain. The results in chapter four indicate states do compete to recruit firms; thus the fact that these alternative measures of effort cannot show states are competing is very important. This implies that it does matter how one measures the effort of a state to recruit firms. It also suggests that De Bartolome and Spiegel's (1995) choice to employ the NASDA economic development spending data might not be an appropriate measure to identify competition for domestic and foreign investment.

Some explanatory variables changed in their signs and levels of significance. The relationship between the alternative measures of firm recruitment effort and percent unemployed and own source revenue both changed signs and became statistically significant. With total economic development spending as the measure of firm recruitment effort, state corporate income tax rate and percent poverty both increased in the magnitude and level of significance from more than 10% to less than 1%.

The question presented in the introduction asks whether it matters how firm recruitment effort is measured and proposes that there may be other measures of effort

that better explain a state's effort to recruit firms. Building off the foundation in chapter four, the results here indicate that these alternative measures are not appropriate measures of a state's effort to recruit firms. However, this chapter assumes that the proportion of manufacturing employment in a state identifies the nature of rivalry. Perhaps these alternative measures do represent appropriate measures of a state's effort to recruit firms, but the nature of how competition occurs is different. The next chapter researches this issue and tests alternative ways in which states might identify their rivals.

# CHAPTER 6: ALTERNATIVE MEASURES OF SPATIAL NEIGHBORS

## Introduction

This chapter is the final empirical chapter and highlights an important aspect in competition. Although it may seem obvious, a necessary requirement in any tournament is accurately defining the cohorts of rivals. The example of two baseball teams competing to win a game, discussed in the theoretical chapter, provides an intuitive understanding of the issue in defining rivals. In the baseball game example, the New York Yankees and the San Francisco Giants compete against each other to determine who wins the game. In this case, it is clear that the Yankees and the Giants are rivals, and each team can easily identify its rival. However, rather than identifying the San Francisco Giants as its rivals, perhaps the Yankees actually identify the New York Mets, Jets, Giants, Rangers, and/or the Knicks as rivals instead, competing to be New York City's best professional sports team. Defining one's rivals may not be always be so clear. In terms of this dissertation, a similar issue develops in identifying a state's rivals, because it is not perfectly clear how states actually identify their rivals. In the earlier chapters, the empirical analysis assumes that states view other states as their rivals if they have a similar proportion of manufacturing employment. However, it is possible that states identify their rivals in other ways, and this chapter allows for this possibility by testing different dimensions of rivalry among states.

The task in determining rivals is a common issue in spatial models, because determining the nature of rivalry is an empirical question. Researchers look to theory to help provide rationales for how competition might occur; in this and many other cases, theory does not provide a strong argument to define the nature of rivalry. Obviously, if

the nature of this rivalry were misspecified, then we would not expect to find states competing, because the test for competition incorrectly assumes which states are rivals of one another. Therefore, testing to determine whether states compete to recruit firms is essentially a joint test of whether these rivals compete and whether the nature of rivalry is correctly specified. To handle this issue accordingly, this chapter tests alternative specifications that define the nature of rivalry among states competing to recruit firms.

The previous literature in the field of economic growth/development suggests that one potential source for regional growth lies within export–based or basic economic activity. Historically, the manufacturing sector is a large source of export–based activity. Given the importance of this sector, perhaps states associate themselves with other states that have a similar manufacturing base or identify their rivals in this way. For competition, this implies that a state identifies its rivals as those states that are similar in this respect. In the earlier chapters testing for competition, the measure of a state's manufacturing base is the state's proportion of manufacturing employment to total employment in the state. This measure formulates states into cohorts of potential rivals and then tests to determine if these potential rivals compete. The results from chapter four indicate that formulating cohorts of states according to their proportion of manufacturing employment is one way that states identify their rivals. However, states may identify their rivals in other ways as well. Because the nature of rivalry between states competing for firms is not as clearly defined as the baseball game between the Yankees and Giants, this chapter allows for alternative specifications that defines the nature of rivalry.

Accurately defining the nature of rivalry is a common concern in spatial models. Typically, researchers handle this issue by testing alternative specifications that define

the nature of rivalry. The empirical procedure is quite simple in principle as re–specifying the spatial weight matrix, *W*, is the only change necessary. However, the alternative specifications of *W* only produce valid estimates if *W* is exogenous. Researchers cannot test whether the weight matrix specification is the correct specification, and this is why we test possible alternatives. In spatial econometrics, *W* represents a measure of economic distance and the weights within the matrix decline as distance increases. The measure of distance does not have to be geographical distance. As explained above, the measure of distance in chapters four and five use the proportion of manufacturing employment in a state, which defines rivals in terms of economic distance. The three alternative specifications that define the nature of rivalry here are: a percent black weight matrix (percent of population that is black), a Hirschman–Herfindahl Index (HHI) weight matrix of industry employment concentration, and a geographical contiguity weight matrix. After re–specifying the weight matrix, the next step is to test whether states compete to recruit firms. These results are useful because they help explain the nature of rivalry between states competing to recruit firms.

This chapter envisions the three alternative weight matrix specifications as a sensitivity analysis for competition among states to recruit firms. The next section describes the data used in the empirical analysis. This chapter applies the same methodology and empirical model tested in chapters four and five, so the subsequent section discussing the empirical model is brief. A detailed discussion regarding the results follows. The final section presents the conclusions.

## Data

### *Alternative Weight Matrices*

The variables used in this chapter are the same variables from chapters four and five, except for the Hirschman–Herfindahl Index (HHI) and the geographical contiguity matrix. This chapter builds sequentially on chapter five, which tests alternative measures of firm recruitment effort, but now with three alternative specifications of the weight matrix–that defines the nature of rivalry among states.

It is important to note that in this chapter the dependent and independent variables have not changed. The dependent variable remains a state's firm recruitment effort. Chapter four explains the first measure: firm recruitment spending and chapter five explains the other two alternative measures: total economic development spending and the number of FTE employees in the department of economic development. Chapter four also explains the list of explanatory variables used here. Since the dependent and independent variables have not changed, the expected relationships between the explanatory variables and firm recruitment effort remain the same, as outlined in the data section from chapter four.

The three alternative specifications of the weight matrix (that defines the nature of rivalry) are percent black, HHI, and geographical contiguity. Allowing states to identify their rivals in other ways alleviates some of the subjectivity in spatial models. Theory does not always provide a firm explanation of the nature of rivalry; therefore, researchers typically test two or three different weight matrix specifications (Boarnet and Glazer, 2002; Conway & Rork, 2004; Rork & Wagner, 2006); in total, this dissertation tests four different specifications of the weight matrix.

The percent black weight matrix identifies states that are demographically similar as rivals. This means that New Hampshire, Vermont, and Maine are close neighbors because their average percent black over the sample is 1%. On the other hand, Louisiana has an average of 32% over the sample period, which makes Louisiana a close neighbor with Georgia and South Carolina, which both have an average of 29% black. The average percent black across all states in the sample period is 13%. The rationale for the percent black weight matrix specification is that states may identify other states that are demographically similar as their rivals. Case, Hines, and Rosen (1993) examine how states' expenditures are interdependently related to their rivals–and those rivals are formulated based on the percent black in a state.[14] To explain their robust results, they test whether percent black is proxying for a region effect or for poverty; their analysis rejects these possibilities. They conclude that the racial differences between states have an important impact on spending patterns and states identify their rivals as states that are racially similar. If the empirical results show that states remain competitive to recruit firms, with this weight matrix specification, then this provides additional evidence that states identify their rivals as those states that have a similar racial composition.

Another possible way that states could identify their rivals is by examining a broader measure of their employment concentration compared to other states. Recall that the first weight matrix specification (in chapters four and five) only considers a state's proportion of manufacturing employment as the way in which states identify their rivals. However, perhaps states also identify their rivals in a broader view of employment concentration, rather than only the proportion of manufacturing employment. The HHI

[14] McGarvey, Walker, & Turnbull (2007) re-estimate the Case, Hines, and Rosen (1993) study, allowing for a more general error process to occur (rather than the common first-order spatial error model) and cannot reproduce significant interdependence results.

provides a method to compare how concentrated a state's employment is across multiple sectors. The formula for the HHI is

$$HHI = \sum_{i=1}^{n} s_i^2, \tag{35}$$

where $s_i$ is the proportion of a state's employment in (1) manufacturing sector, (2) trade, transportation, and utilities sector, (3) information sector, and (4) professional and business services sector.

The HHI provides an index [0, 1] measuring how concentrated a state's employment is across the four superstructures (NAICS classifications) listed above. If a state has a large concentration in one of the four superstructures, then the HHI reports a larger value. Likewise, smaller values of the HHI imply that a state's employment is spread across the superstructures more evenly. In the sample period, Indiana had the highest average HHI, 0.095, while New York had the lowest HHI, 0.056. The average HHI across all states in the sample period is 0.075. This descriptive information implies that New York and Indiana are not close neighbors of one another. Rather, Indiana closely associates itself with Arkansas (0.093) and Tennessee (0.090) while New York identifies Louisiana (0.059) and Rhode Island (0.061) as close rivals. The HHI allows states to identify their rivals in terms of a broader industry employment concentration measure, where similarly diversified or concentrated states are rivals. A rationale for using the HHI is that Indiana might identify Arkansas and Tennessee as desperate states trying to diversify their employment concentration, and because Indiana might be desperate as well, Indiana identifies these states as its rivals in firm recruitment. At the

same time, Indiana might not identify New York as its rival, because New York has greatest amount of employment diversification, and possibly different objectives.

Another alternative weight matrix specification is geographical contiguity. This is a conceptually less challenging specification in identifying rivals. The contiguity weight matrix specification is a very common measure (Case, Hines, & Rosen, 1993; Boarnet & Glazer, 2002; Conway & Rork, 2004; Fletcher & Murray, 2006; Rork & Wagner, 2006; and Edmiston & Turnbull, 2007). Geographers refer to this type of matrix as a first–order queen weight matrix, because the contiguity specification implies that states are rivals only if they share a geographic border with another state. In this case, Florida identifies itself with two rival states, Georgia and Alabama. On the other hand, Georgia identifies its rivals as Florida, Alabama, Tennessee, and South Carolina. Perhaps, states identify their geographical neighbors as their rivals. Boarnet and Glazer (2002) find that states do identify their geographic neighbors as competitors, and these competitors can influence the home state's voter preferences for public spending. In the context of this dissertation, Boarnet and Glazer's (2002) results suggest that voters look to their neighboring states to determine how successful their state is performing in firm recruitment. If their state is successful in firm recruitment, relative to their neighbor, the voter's prefer increased government spending. Therefore, the state government observes this voting behavior and reacts by competing with its geographic neighbor to be successful. Another rationale for this specification is that labor markets have increased mobility between states that share borders (Yilmaz, Haynes, & Dinc, 2002). Therefore, states compete with their geographic neighbors to recruit firms and also draw the labor from the neighboring states across the

border. Thus, sharing a border can matter. The contiguity specification here allows for the possibility that this is how states identify their rivals.

## Empirical Model

The empirical model in this chapter is identical to the model that chapters four and five present. This chapter examines all three measures of firm recruitment effort and tests three alternative specifications of the weight matrix. In chapter five, the two alternative measures of firm recruitment effort, could not produce results that indicate states compete to recruit firms, concluding that these measures do not accurately represent a state's firm recruitment effort. However, the analysis in chapter five assumes that states identify their rivals as those states that have a similar proportion of manufacturing employment. If this were not the case, then we would not expect to observe results that indicate states compete to recruit firms. Thus the results, so far, represent a joint test of whether these rivals compete and whether the nature of rivalry is correctly specified. If the empirical analysis here reveals states do compete, by only changing the nature of rivalry, then this indicates that states identify their neighbors differently.

Chapters four and five present the OLS results in *Table* 4, *Table* 5, and *Table* 6. These results do not change, as those models ignore the possible spatial effects analyzed here. For this reason, the OLS results are suppressed in the following results section and tables.

The model of interest is the spatial model that allows for spatial interdependence in the conditional mean and spatial correlation in the error. Repeating the model here for convenience, it is

$$\underset{nTx1}{Y} = \underset{nTxnT}{\lambda W}\underset{nTx1}{Y} + \underset{nTxk}{XB} + \underset{nTx1}{u}; \qquad \underset{nTx1}{u} = \underset{nTxnT}{\rho W}\underset{nTx1}{u} + \underset{nTx1}{\varepsilon}, \tag{36}$$

The important difference here, as explained earlier, is that the dependent variable vector $Y$ now represents all three measures of firm recruitment effort: (1) firm recruitment spending, (2) total economic development spending, and (3) total number of FTE employees in the department of economic development. In addition, the weight matrix $W$ is now replaced (one at a time) with three alternative specifications that define the nature of rivalry between states, which are: (1) percent black, (2) HHI, and (3) contiguity.

Again, to make a point of comparison in methodology, this chapter assumes a first–order error structure and tests for spatial interdependence and spatial correlation in the maximum likelihood framework. For convenience the log–likelihood function to maximize is

$$\begin{aligned} L = C &- \frac{nT}{2}\ln\left(\sigma^2\right) + \ln\left(\left|I_n - \lambda W\right|\right) + \ln\left(\left|I_n - \rho W\right|\right) \\ &- \frac{1}{2}\sigma^2\left(\left(\left(I_n - \lambda W\right)Y - XB\right)'\left(I_n - \rho W\right)'\left(I_n - \rho W\right)\left(\left(I_n - \lambda W\right)Y - XB\right)\right) \end{aligned} \tag{37}$$

However, in the results section that follows, the GS2SLS–GMM estimates of (38) are the primary focus, as this method remains the preferred methodology.

Following Case, Hines, and Rosen (1993) method for constructing the weight matrix, the elements of weight matrix $W$ is defined as

$$\begin{aligned} &\mathrm{w_{ii}} = 0 \text{ and} \\ &\mathrm{w_{ij}} = 1 / \left|\overline{\mathrm{NWEIGHT}}_{\mathrm{i}} - \overline{\mathrm{NWEIGHT}}_{\mathrm{j}}\right| / \mathrm{S_i}; \\ &\mathrm{S_i} = \sum 1 / \left|\overline{\mathrm{NWEIGHT}}_{i} - \overline{\mathrm{NWEIGHT}}_{j}\right| \end{aligned} \tag{38}$$

where $\overline{\text{NWEIGHT}}$ is the sample period mean, using the three new weight matrix specifications. These weights are row and column standardized to equal one.

Chapter four's discussion of empirical methodology section outlines the rationale for establishing a cut–off for neighbors in the weight matrix, and is not repeated here. Analyzing the raw data in the new weight matrix specifications also suggests ideal numbers to mark the cut–off. The statistics used to determine the new cut–off's are described here. In the percent black weight matrix, the maximum value is 3,925.6, the minimum value is 3.2, the average value is 40.1, and the median value is 10.9. The cut–off here is for values under 20. Recall, that these values have not (yet) been scaled by $S_i$. In the HHI weight matrix, the maximum value is 7,173.3, the minimum value is 25.4, the average value is 264.4, and the median value is 91.5. The cut–off here is for values under 100. The contiguity weight matrix does not require a cut–off value, because the formulation of this weight matrix does not assign values to every state, unlike the other measures. The contiguity weight matrix formulates a state's rivals only if they share a border, therefore, this matrix is already sufficiently sparse. Also, recall that in chapter four, the underlying objective here is to remove the effect that very distant neighbors create. As an example, New York and Indiana are the furthest neighbors defined in the HHI weight matrix and it is clear that these two states are not neighbors of one another. The established cut–off number removes this un–meaningful relationship, as the value between these two states now becomes a zero. This method allows the weight matrix to be sufficiently sparse so that model can identify spatial interdependence and correlation among neighbors, if it exists.

## Results

This section reports the results from the empirical model outlined above. Testing each measure of firm recruitment effort and the three alternative weight matrix specifications requires nine tables. To organize this discussion, the first topic analyzes the percent black weight matrix specification in the empirical model and then compares the three alternative measures of firm recruitment effort. The second and third topics are also organized in this fashion. *Table* 8 presents a visual explanation of how this discussion is organized. Before concluding, *Table* 18 presents a table like *Table* 8, but with the interdependence effects and significance levels for all of the different models.

Table 8: Summary List of Tables.

| | | *Alternative Weight Matrix* | | |
|---|---|---|---|---|
| | | % Black | HHI | Contiguity |
| *Measure of Firm Recruitment Effort* | Firm Recruitment Spending | Table 9. | Table 12. | Table 15. |
| | Total Economic Development Department Spending | Table 10. | Table 13. | Table 16. |
| | Total Number of FTE Employees in the Department of Economic Development | Table 11. | Table 14. | Table 17. |

The important contribution in this chapter is allowing states the possibility to identify their rivals in firm recruitment competition somewhat differently. Operationally, this involves re–specifying the weight matrix, W, in (36) and (37). The first topic considers the percent black in a state. This means that states identify their rivals as those states that are demographically similar. The results are quite interesting.

Looking at *Table* 9 columns (5) and (6), the estimated interdependence effect, $\lambda$, is positive and significant above the 10% level. This suggests that another way that states identify their rivals is by identifying those states that are demographically similar. Case, Hines, and Rosen (1993) also find this result for total expenditures. Moreover, it shows that when states identify their competitors in this way, they compete with each other to recruit firms, by increasing their firm recruitment spending. The results from *Table* 10 and *Table* 11 columns (5) and (6) indicate that either the alternative measure of firm recruitment effort does not accurately measure a state's effort to recruit firms or states do not identify their rivals in states that are demographically similar; as the interdependence effect is not positive and significant. However, combining these results with those in chapters four and five infers that firm recruitment spending is a good measure of a state's effort, and it is robust to alternative specifications to identify a state's rivals (using demographic distance). Therefore, this suggests that total economic development spending and the number of FTE employees are not good measures of a state's firm recruitment effort. One notable change between *Table* 4, from chapter four, and *Table* 9 is in the size of the interdependence estimate. The effect falls from a highly responsive 0.86 to 0.24. This means that when states identify their rivals as states that are demographically similar, the response to increase in firm recruitment effort is much less.

There are some other interesting results in *Table* 9, *Table* 10, and *Table* 11. Comparing the different methodologies in each table separately; 2SLS, MLE, and GS2SLS–GMM are similar in terms of their magnitude and level of significance. In fact, there are only two changes in the sign of the variable, in *Table* 10, but the estimates are insignificant. The MLE and GS2SLS–GMM estimates of $\rho$ have the same signs for each

model, but differ slightly in the level of significance. Comparing *Table* 4, from chapter four, and *Table* 9 shows that when states identify their rivals differently, the effect that the proportion of manufacturing employment (Prop Manuf) has on a state's firm recruitment effort is negative and significant, which does not support De Bartolome and Spiegel's (1995) argument for a positive relationship. *Table* 10, which uses total economic development spending, also does not find a significant positive relationship. In addition, total wages (Tot Wage) remain positive in *Table* 9, but are no longer significant.

Table 9: Recruitment Spending with % Black Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Rec. Spend. | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 2.59 | 158.85 | 143.57 | 2.94 | 127.91 | 2.68 |
| Pop Growth | -2.86 | -9.12 | -9.05 | -3.50 | -9.23 | -3.55 |
| Tot Wage | 1.03E-01 | 0.00 | 8.21E-05 | 0.34 | 1.14E-04 | 0.47 |
| PCT Unemp | -3.01 | -7.59 | -7.58 | -3.71 | -7.89 | -3.95 |
| GSP | -6.62E-01 | 0.00 | -1.15E-04 | -0.64 | -1.46E-04 | -0.79 |
| Own Source | -0.96 | -0.85 | -1.20 | -1.61 | -1.22 | -1.55 |
| AID | 2.68 | 1.65 | 1.18 | 2.42 | 1.21 | 2.28 |
| SCITR | 1.03 | 0.89 | 0.80 | 1.15 | 1.09 | 1.63 |
| Gov Dummy | -0.24 | -0.94 | 2.17 | 0.70 | 1.81 | 0.56 |
| Prop Manuf | -6.78 | -3.14 | -2.90 | -7.67 | -2.88 | -7.30 |
| Population | 2.84E+00 | 0.00 | 5.98E-06 | 3.06 | 6.27E-06 | 3.02 |
| Pct Black | 1.60 | 0.33 | 0.32 | 2.17 | 0.33 | 2.39 |
| Poverty | -0.52 | -0.40 | -0.12 | -0.19 | -0.07 | -0.11 |
| d02 | -0.68 | -3.22 | -2.57 | -0.78 | -2.18 | -0.73 |
| d01 | -1.31 | -6.84 | -6.23 | -1.67 | -6.93 | -2.00 |
| d00 | -1.23 | -7.77 | -7.28 | -1.55 | -7.81 | -1.74 |
| d99 | -0.57 | -3.48 | -3.13 | -0.70 | -3.37 | -0.81 |
| d98 | -0.30 | -1.89 | -1.82 | -0.38 | -1.12 | -0.25 |
| d97 | 0.15 | 0.81 | 0.53 | 0.14 | 1.30 | 0.37 |
| All 3 Dem | -1.85 | -7.06 | -8.35 | -2.61 | -9.28 | -2.91 |
| All 3 Rep | -1.81 | -8.73 | -10.73 | -2.70 | -11.38 | -2.86 |
| Elect. Yr | 0.06 | 0.19 | -0.77 | -0.29 | -1.08 | -0.41 |
| PCT HS | -1.03 | -0.62 | -0.49 | -1.03 | -0.36 | -0.77 |
| PCT Coll | -1.57 | -0.71 | -0.76 | -1.97 | -0.73 | -1.82 |
| PCT Urban | -0.27 | -0.02 | -0.03 | -0.39 | -0.01 | -0.18 |
| $\lambda$ | 0.28 | 1.61 | 0.11 | 0.89 | 0.24 | 1.71 |
| $\rho$ | | | -0.32 | -1.90 | -0.61 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.70 (0.65) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 10: Total Economic Development Spending with % Black Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Tot. Econ. Dvlpmt | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 231.26 | 1.01 | 235.57 | 1.25 | 212.32 | 1.15 |
| Pop Growth | -11.05 | -0.87 | -13.50 | -1.37 | -20.42 | -1.95 |
| Tot Wage | 4.08E-03 | 3.54 | 3.98E-04 | 4.31 | 3.83E-03 | 4.08 |
| PCT Unemp | 7.73 | 0.82 | 7.74 | 0.98 | 6.43 | 0.80 |
| GSP | -4.18E-03 | -4.66 | -4.09E-04 | -5.81 | -4.03E-03 | -5.51 |
| Own Source | 6.38 | 1.94 | 6.41 | 2.33 | 6.87 | 2.44 |
| AID | 0.19 | 0.08 | 0.01 | 0.01 | -0.02 | -0.01 |
| SCITR | 8.43 | 2.36 | 7.76 | 2.89 | 6.12 | 2.14 |
| Gov Dummy | 7.14 | 0.51 | 7.60 | 0.66 | 7.67 | 0.67 |
| Prop Manuf | -0.05 | -0.03 | 0.03 | 0.02 | 0.16 | 0.11 |
| Population | 4.73E-05 | 5.07 | 4.66E-06 | 6.26 | 4.69E-05 | 6.00 |
| Pct Black | 2.24 | 2.99 | 2.25 | 3.67 | 2.42 | 4.33 |
| Poverty | -9.48 | -3.35 | -9.58 | -4.11 | -9.64 | -4.14 |
| d02 | -8.15 | -0.47 | -8.22 | -0.59 | -9.16 | -0.74 |
| d01 | -5.33 | -0.28 | -4.99 | -0.32 | -5.33 | -0.38 |
| d00 | -13.75 | -0.59 | -13.30 | -0.70 | -13.68 | -0.76 |
| d99 | -2.48 | -0.11 | -2.39 | -0.13 | -2.51 | -0.15 |
| d98 | -0.47 | -0.02 | -1.56 | -0.08 | -3.88 | -0.21 |
| d97 | -5.84 | -0.29 | -5.74 | -0.36 | -3.05 | -0.21 |
| All 3 Dem | 12.12 | 0.86 | 12.42 | 1.06 | 12.88 | 1.07 |
| All 3 Rep | 1.08 | 0.06 | 0.18 | 0.01 | -3.49 | -0.23 |
| Elect. Yr | 9.45 | 0.79 | 9.61 | 0.97 | 11.25 | 1.12 |
| PCT HS | -2.87 | -1.28 | -2.86 | -1.55 | -2.49 | -1.37 |
| PCT Coll | -0.05 | -0.03 | 0.04 | 0.02 | 0.50 | 0.34 |
| PCT Urban | -0.29 | -0.85 | -0.26 | -0.97 | -0.25 | -0.89 |
| $\lambda$ | 0.05 | 0.24 | 0.01 | 0.10 | 0.01 | 0.06 |
| $\rho$ | | | -0.06 | -0.33 | -0.31 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.67 (0.61) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 11: Number of FTE Employees with % Black Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y= # FTE Emp.'s | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 213.79 | 0.79 | 253.56 | 1.24 | 257.48 | 1.18 |
| Pop Growth | -11.09 | -0.82 | -19.21 | -1.84 | -16.03 | -1.46 |
| Tot Wage | 2.31E-03 | 1.85 | 2.05E-04 | 2.06 | 2.11E-03 | 2.06 |
| PCT Unemp | 29.97 | 2.90 | 29.11 | 3.53 | 29.54 | 3.47 |
| GSP | -1.69E-03 | -1.80 | -1.52E-04 | -2.01 | -1.53E-03 | -1.97 |
| Own Source | 9.55 | 2.57 | 9.51 | 3.10 | 9.44 | 3.04 |
| AID | 6.75 | 2.62 | 6.50 | 3.14 | 6.44 | 2.97 |
| SCITR | 10.69 | 2.74 | 8.39 | 2.96 | 9.29 | 2.95 |
| Gov Dummy | -12.55 | -0.80 | -11.24 | -0.91 | -11.80 | -0.92 |
| Prop Manuf | 5.95 | 3.30 | 6.58 | 4.37 | 6.28 | 4.15 |
| Population | -7.45E-06 | -0.79 | -7.70E-06 | -0.97 | -8.17E-06 | -1.03 |
| Pct Black | -1.25 | -1.31 | -1.31 | -1.82 | -1.37 | -1.78 |
| Poverty | 0.64 | 0.20 | -0.73 | -0.30 | -0.20 | -0.08 |
| d02 | 11.73 | 0.60 | 10.51 | 0.80 | 11.17 | 0.77 |
| d01 | 39.80 | 1.86 | 39.16 | 2.65 | 39.50 | 2.44 |
| d00 | 61.22 | 2.36 | 60.94 | 3.22 | 61.22 | 3.03 |
| d99 | 56.79 | 2.28 | 56.36 | 3.16 | 56.23 | 2.92 |
| d98 | 58.67 | 2.21 | 54.60 | 2.84 | 55.77 | 2.69 |
| d97 | 32.37 | 1.46 | 33.93 | 2.22 | 32.44 | 1.93 |
| All 3 Dem | -4.26 | -0.27 | -8.18 | -0.63 | -6.25 | -0.47 |
| All 3 Rep | 4.45 | 0.22 | 6.76 | 0.42 | 5.69 | 0.34 |
| Elect. Yr | 8.23 | 0.62 | 10.02 | 0.93 | 8.93 | 0.81 |
| PCT HS | -6.37 | -2.42 | -6.91 | -3.47 | -6.87 | -3.25 |
| PCT Coll | 1.76 | 0.94 | 2.68 | 1.71 | 2.22 | 1.41 |
| PCT Urban | -0.55 | -1.37 | -0.16 | -0.54 | -0.31 | -0.93 |
| $\lambda$ | -0.02 | -0.12 | -0.10 | -1.14 | -0.08 | -0.70 |
| $\rho$ | | | -0.35 | -2.52 | -0.17 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.86 (0.84) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

The second topic considers HHI as the new weight matrix specification. This means that states identify their rivals as those states that have a similar HHI or broad measure of industry employment concentration. The results provide additional evidence that firm recruitment spending is a good measure of a state's effort to recruit firms.

Looking at *Table* 12 columns (5) and (6), the estimated interdependence effect, $\lambda$, is positive and nearly significant at 5%. This result suggests that another way states identify their rivals is those states that have similarly concentrated employment across different industries. In addition, it shows that when states identify their competitors in this way, they compete with each other to recruit firms, by increasing their firm recruitment spending. The results in *Table* 12 for the interdependence effect are very similar between MLE and GS2SLS–GMM in terms of magnitude and significance, and both methods estimate negative spatial correlation. In *Table* 12 column (7) the estimate of spatial interdependence is also much smaller in magnitude than in *Table* 4, from chapter four. There are three variables that change signs, but the variables are insignificant. The proportion of manufacturing employment is again, negative and significant, suggesting that states with a large manufacturing base spend less firm recruitment effort. In chapter four, gross state product (GSP) is negative and very significant; however, under the weight matrix specification in this chapter, gross state product is no longer significant.

Other than slight changes in the coefficients, the relationships between the explanatory variables and total economic development spending in *Table* 13 are very similar to the previous weight matrix specification results in *Table* 10 in this chapter and *Table* 6 from chapter five. This is also the case for the relationship between the

explanatory variables and total number of FTE employees in *Table* 14, compared to *Table* 11 in this chapter and *Table* 7, from chapter five.

The estimates for spatial interdependence in columns (5) and (6) from *Table* 13 and *Table* 14 reveal that the alternative measures of firm recruitment effort do not accurately measure a state's effort to recruit firms. However, the firm recruitment spending measure holds up very well. In all three tests, thus far, the spatial interdependence effect is positive and significant at above the 10% level. This implies that states do compete to recruit firms, and competition is robust to alternative specifications of a state's rivals.

Table 12: Recruitment Spending with HHI Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Rec. Spend. | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 136.51 | 2.11 | 154.33 | 3.27 | 139.10 | 2.59 |
| Pop Growth | -8.44 | -2.60 | -9.48 | -3.42 | -8.67 | -3.13 |
| Tot Wage | 1.57E-04 | 0.49 | -1.71E-04 | -0.73 | 9.03E-05 | 0.34 |
| PCT Unemp | -7.65 | -3.01 | -7.94 | -4.18 | -7.94 | -3.78 |
| GSP | -1.53E-04 | -0.68 | 1.07E-04 | 0.66 | -8.69E-05 | -0.47 |
| Own Source | -1.25 | -1.37 | -0.88 | -1.26 | -1.23 | -1.62 |
| AID | 0.98 | 1.62 | 1.02 | 2.35 | 0.92 | 1.86 |
| SCITR | 0.68 | 0.80 | 0.25 | 0.40 | 0.58 | 0.82 |
| Gov Dummy | 0.84 | 0.22 | 2.55 | 0.93 | 1.24 | 0.40 |
| Prop Manuf | -2.66 | -5.44 | -2.56 | -7.60 | -2.59 | -6.53 |
| Population | 5.97E-06 | 2.64 | 3.30E-06 | 1.99 | 5.21E-06 | 2.82 |
| Pct Black | 0.46 | 2.11 | 0.26 | 1.61 | 0.43 | 2.35 |
| Poverty | -0.05 | -0.06 | 0.31 | 0.55 | 0.10 | 0.16 |
| d02 | -3.33 | -0.70 | -3.18 | -1.14 | -3.30 | -0.93 |
| d01 | -7.25 | -1.35 | -7.06 | -2.17 | -7.79 | -1.90 |
| d00 | -8.76 | -1.35 | -8.27 | -2.00 | -9.26 | -1.84 |
| d99 | -4.77 | -0.76 | -5.30 | -1.39 | -5.50 | -1.15 |
| d98 | -3.57 | -0.55 | -6.38 | -1.51 | -4.82 | -0.96 |
| d97 | -0.73 | -0.13 | -2.40 | -0.77 | -1.42 | -0.35 |
| All 3 Dem | -7.35 | -1.91 | -7.08 | -2.34 | -7.64 | -2.37 |
| All 3 Rep | -9.78 | -2.01 | -9.08 | -2.55 | -9.97 | -2.49 |
| Elect. Yr | -0.36 | -0.11 | 0.29 | 0.11 | -0.31 | -0.11 |
| PCT HS | -0.41 | -0.65 | -0.62 | -1.30 | -0.43 | -0.81 |
| PCT Coll | -0.81 | -1.74 | -0.97 | -2.77 | -0.90 | -2.35 |
| PCT Urban | -0.09 | -0.93 | -0.03 | -0.49 | -0.09 | -1.10 |
| $\lambda$ | 0.22 | 1.12 | 0.36 | 2.88 | 0.33 | 1.94 |
| $\rho$ | | | -0.67 | -4.19 | -0.17 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.75 (0.70) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 13: Total Economic Development Spending with HHI Weight Matrix Regression Results.

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Tot. Econ. Dvlpmt | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 240.46 | 1.06 | 280.74 | 1.53 | 269.81 | 1.45 |
| Pop Growth | -12.58 | -1.04 | -14.76 | -1.42 | -14.30 | -1.38 |
| Tot Wage | 4.01E-03 | 3.63 | 3.70E-04 | 4.04 | 3.80E-03 | 4.14 |
| PCT Unemp | 8.26 | 0.89 | 2.64 | 0.34 | 4.49 | 0.58 |
| GSP | -4.08E-03 | -5.09 | -3.90E-04 | -5.93 | -3.95E-03 | -5.99 |
| Own Source | 6.24 | 1.90 | 6.68 | 2.47 | 6.54 | 2.39 |
| AID | -0.06 | -0.03 | 0.07 | 0.04 | 0.04 | 0.02 |
| SCITR | 7.98 | 2.56 | 7.16 | 2.80 | 7.38 | 2.89 |
| Gov Dummy | 7.97 | 0.58 | 8.70 | 0.78 | 8.64 | 0.76 |
| Prop Manuf | 0.07 | 0.04 | -0.67 | -0.54 | -0.44 | -0.34 |
| Population | 4.60E-05 | 5.47 | 4.56E-06 | 6.58 | 4.56E-05 | 6.51 |
| Pct Black | 2.22 | 2.96 | 2.01 | 3.17 | 2.06 | 3.30 |
| Poverty | -9.54 | -3.38 | -8.91 | -3.78 | -9.13 | -3.92 |
| d02 | -8.03 | -0.46 | -8.59 | -0.68 | -8.36 | -0.63 |
| d01 | -4.71 | -0.25 | -9.46 | -0.67 | -7.85 | -0.53 |
| d00 | -12.63 | -0.54 | -20.03 | -1.13 | -17.35 | -0.94 |
| d99 | -1.88 | -0.08 | -8.94 | -0.53 | -6.45 | -0.37 |
| d98 | -0.94 | -0.04 | -7.25 | -0.40 | -5.08 | -0.27 |
| d97 | -6.01 | -0.30 | -9.18 | -0.64 | -7.92 | -0.52 |
| All 3 Dem | 12.06 | 0.85 | 11.31 | 0.95 | 11.64 | 0.98 |
| All 3 Rep | 0.32 | 0.02 | 4.43 | 0.30 | 2.88 | 0.19 |
| Elect. Yr | 9.38 | 0.78 | 8.11 | 0.80 | 8.57 | 0.84 |
| PCT HS | -2.95 | -1.32 | -3.04 | -1.66 | -3.03 | -1.64 |
| PCT Coll | -0.11 | -0.07 | 0.08 | 0.05 | -0.01 | -0.01 |
| PCT Urban | -0.27 | -0.83 | -0.18 | -0.70 | -0.21 | -0.78 |
| $\lambda$ | 0.03 | 0.13 | 0.01 | 0.07 | 0.04 | 0.18 |
| $\rho$ | | | -0.25 | -1.25 | -0.17 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.68 (0.62) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 14: Number of FTE Employees with HHI Weight Matrix Regression Results.

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y= # FTE Emp.'s | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 198.11 | 0.79 | 253.05 | 1.25 | 248.24 | 1.21 |
| Pop Growth | -11.03 | -0.84 | -12.42 | -1.10 | -12.75 | -1.12 |
| Tot Wage | 2.55E-03 | 1.95 | 1.72E-04 | 1.68 | 1.94E-03 | 1.79 |
| PCT Unemp | 30.06 | 2.91 | 25.24 | 2.91 | 25.50 | 2.98 |
| GSP | -1.88E-03 | -1.99 | -1.35E-04 | -1.85 | -1.50E-03 | -1.95 |
| Own Source | 10.01 | 2.69 | 10.57 | 3.42 | 10.80 | 3.49 |
| AID | 6.79 | 2.96 | 7.38 | 4.00 | 7.27 | 3.88 |
| SCITR | 9.98 | 2.50 | 11.70 | 3.86 | 10.77 | 3.25 |
| Gov Dummy | -12.66 | -0.83 | -12.73 | -1.04 | -12.53 | -1.01 |
| Prop Manuf | 6.16 | 3.32 | 5.26 | 3.87 | 5.44 | 3.87 |
| Population | -7.49E-06 | -0.82 | -9.11E-06 | -1.22 | -9.28E-06 | -1.24 |
| Pct Black | -1.47 | -1.44 | -1.06 | -1.38 | -1.32 | -1.55 |
| Poverty | 0.71 | 0.23 | 0.66 | 0.26 | 0.65 | 0.25 |
| d02 | 10.13 | 0.51 | 13.03 | 0.94 | 11.44 | 0.80 |
| d01 | 38.01 | 1.76 | 37.23 | 2.35 | 35.83 | 2.23 |
| d00 | 58.90 | 2.23 | 56.73 | 2.81 | 54.99 | 2.72 |
| d99 | 55.13 | 2.19 | 51.04 | 2.68 | 49.85 | 2.63 |
| d98 | 56.20 | 2.08 | 56.06 | 2.70 | 53.49 | 2.57 |
| d97 | 31.55 | 1.42 | 28.91 | 1.81 | 28.32 | 1.76 |
| All 3 Dem | -2.27 | -0.14 | -4.38 | -0.32 | -2.55 | -0.18 |
| All 3 Rep | 4.48 | 0.23 | 9.59 | 0.60 | 9.02 | 0.56 |
| Elect. Yr | 9.06 | 0.68 | 6.33 | 0.56 | 7.30 | 0.63 |
| PCT HS | -6.26 | -2.53 | -6.66 | -3.29 | -6.62 | -3.23 |
| PCT Coll | 1.75 | 0.94 | 1.77 | 1.15 | 1.76 | 1.14 |
| PCT Urban | -0.56 | -1.63 | -0.53 | -1.86 | -0.51 | -1.77 |
| $\lambda$ | 0.10 | 0.46 | 0.03 | 0.23 | 0.11 | 0.67 |
| $\rho$ | | | -0.29 | -1.58 | -0.27 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.86 (0.83) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

The third and final topic in the results section discusses the estimates from the empirical model when states identify their geographic neighbors as their rivals. Operationally, this specification requires a contiguity weight matrix, where a state's neighbors are only those that share a geographic border. The results located below are in *Table* 15, *Table* 16, and *Table* 17.

The focus of attention in this chapter and dissertation is the spatial interdependence effect. The results from columns (5) and (6) in *Table* 17, using the number of FTE employees as the measure of firm recruitment effort, once again, cannot find a positive and significant interdependence effect. This measure of firm recruitment effort does not appear to be a good measure of a state's effort to recruit firms, regardless how a state identifies their rivals.

The other two measures of firm recruitment effort are interesting. In *Table* 15, the 2SLS, MLE, and GS2SLS–GMM estimates of spatial interdependence are consistently negative–which opposes competition. These are the first results to reject competition among states, using firm recruitment spending as the measure of a state's effort to recruit firms. This is quite interesting because it shows that a state's geographic neighbors is not how a state identifies its rivals in firm recruitment competition and this is contrary to what press headlines from high–profile cases indicate.

In columns (5) and (6) from *Table* 16, the spatial interdependence effect is positive and significant at the 10% level. These are the first empirical estimates that reveal positive spatial interdependence when total economic development spending is the measure of firm recruitment effort. This result appears contradictory to the firm recruitment spending measure, because it implies that states identify their border states as

rivals and compete with each other to recruit firms, by increasing total economic development spending. The maximum likelihood estimates cannot find a similar effect in columns (3) and (4). This result does provide empirical support for Taylor's (1992) theoretical argument that states have an incentive to build infrastructure as a recruitment tool for attracting new industry. Although chapter five explains the argument for why a state might spend more in total economic development spending, as a way to recruit firms, the results in this chapter suggest that these two measures of effort measure different objectives of a state. Total economic development spending captures a state's objective to create a better business climate for all potential firms, by competing with its border states for infrastructure investment, telecommunication and recycling initiatives, roadwork development programs, etc. However, firm recruitment spending captures a state's objective to target specific firms and this type of firm recruitment effort does not occur with a state's geographic neighbors. Thus, these two measures of firm recruitment effort do capture a state's effort to recruit firms, but the measure relevant to the active nature of states recruiting firms in this dissertation is firm recruitment spending only. Total economic development spending explains a state's passive effort to be the best state in the region for firms to locate or grow naturally.

Table 15: Recruitment Spending with Contiguity Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Rec. Spend. | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 132.09 | 2.21 | 154.19 | 3.44 | 139.63 | 3.02 |
| Pop Growth | -9.61 | -3.11 | -7.70 | -3.20 | -8.78 | -3.64 |
| Tot Wage | 2.64E-05 | 0.09 | 1.10E-04 | 0.49 | 4.44E-05 | 0.20 |
| PCT Unemp | -6.28 | -2.56 | -6.04 | -3.31 | -5.99 | -3.17 |
| GSP | -7.40E-05 | -0.35 | -1.65E-04 | -1.03 | -1.02E-04 | -0.63 |
| Own Source | -0.01 | -0.01 | -0.22 | -0.33 | 0.04 | 0.06 |
| AID | 0.35 | 0.59 | 0.71 | 1.67 | 0.43 | 0.93 |
| SCITR | 0.70 | 0.85 | 0.63 | 1.01 | 0.67 | 1.06 |
| Gov Dummy | 4.66 | 1.26 | 3.19 | 1.16 | 4.55 | 1.57 |
| Prop Manuf | -2.29 | -4.96 | -2.32 | -6.56 | -2.22 | -6.20 |
| Population | 4.24E-06 | 1.94 | 5.70E-06 | 3.54 | 4.69E-06 | 2.78 |
| Pct Black | 0.50 | 2.52 | 0.54 | 3.50 | 0.53 | 3.41 |
| Poverty | -0.27 | -0.37 | -0.63 | -1.15 | -0.46 | -0.82 |
| d02 | -3.87 | -0.85 | -3.64 | -0.79 | -3.77 | -0.95 |
| d01 | -3.20 | -0.63 | -3.61 | -0.75 | -2.98 | -0.69 |
| d00 | -5.96 | -0.98 | -7.05 | -1.29 | -6.07 | -1.21 |
| d99 | -3.11 | -0.53 | -3.42 | -0.64 | -3.08 | -0.64 |
| d98 | -3.01 | -0.49 | -3.06 | -0.55 | -2.92 | -0.58 |
| d97 | -1.99 | -0.38 | -2.17 | -0.44 | -2.24 | -0.51 |
| All 3 Dem | -1.96 | -0.49 | -2.27 | -0.77 | -1.51 | -0.48 |
| All 3 Rep | -10.77 | -2.30 | -9.30 | -2.66 | -10.33 | -2.86 |
| Elect. Yr | 0.29 | 0.09 | 0.06 | 0.02 | 0.20 | 0.08 |
| PCT HS | -0.40 | -0.68 | -0.67 | -1.50 | -0.51 | -1.12 |
| PCT Coll | -0.73 | -1.67 | -0.48 | -1.47 | -0.61 | -1.81 |
| PCT Urban | -0.12 | -1.43 | -0.17 | -2.67 | -0.16 | -2.37 |
| $\lambda$ | -0.45 | -3.27 | -0.42 | -4.38 | -0.49 | -4.59 |
| $\rho$ | | | -0.29 | 2.50 | 0.13 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.75 (0.70) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 16: Total Economic Development Spending with Contiguity Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y=Tot. Econ. Dvlpmt | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 234.18 | 1.04 | 176.02 | 0.94 | 187.75 | 0.97 |
| Pop Growth | -4.69 | -0.35 | -16.14 | -1.59 | -5.46 | -0.47 |
| Tot Wage | 4.28E-03 | 3.81 | 3.94E-04 | 4.48 | 4.23E-03 | 4.53 |
| PCT Unemp | 5.06 | 0.53 | 12.57 | 1.64 | 7.35 | 0.89 |
| GSP | -4.48E-03 | -5.16 | -3.77E-04 | -5.65 | -4.34E-03 | -5.92 |
| Own Source | 6.02 | 1.85 | 5.46 | 1.94 | 5.60 | 1.95 |
| AID | 1.94 | 0.72 | -1.23 | -0.64 | 1.81 | 0.76 |
| SCITR | 8.33 | 2.67 | 6.62 | 2.62 | 7.37 | 2.80 |
| Gov Dummy | 6.09 | 0.45 | 7.09 | 0.65 | 5.29 | 0.46 |
| Prop Manuf | -1.34 | -0.67 | 0.24 | 0.15 | -1.65 | -0.93 |
| Population | 5.02E-05 | 5.67 | 4.02E-06 | 5.94 | 4.68E-05 | 6.25 |
| Pct Black | 1.83 | 2.23 | 2.41 | 3.81 | 1.79 | 2.53 |
| Poverty | -8.80 | -3.06 | -9.44 | -3.98 | -8.44 | -3.40 |
| d02 | -8.42 | -0.48 | -6.10 | -0.52 | -6.86 | -0.52 |
| d01 | -8.73 | -0.45 | 1.05 | 0.08 | -5.26 | -0.35 |
| d00 | -16.13 | -0.69 | -4.69 | -0.27 | -10.40 | -0.56 |
| d99 | -2.89 | -0.13 | 5.88 | 0.36 | 3.06 | 0.17 |
| d98 | 0.02 | 0.00 | 6.61 | 0.38 | 6.19 | 0.33 |
| d97 | -3.33 | -0.17 | 1.90 | 0.13 | 3.28 | 0.21 |
| All 3 Dem | 6.71 | 0.45 | 8.25 | 0.68 | 3.16 | 0.25 |
| All 3 Rep | -3.32 | -0.18 | 3.55 | 0.25 | -1.42 | -0.09 |
| Elect. Yr | 9.84 | 0.83 | 7.07 | 0.76 | 8.45 | 0.86 |
| PCT HS | -2.76 | -1.24 | -2.31 | -1.25 | -2.27 | -1.20 |
| PCT Coll | -0.27 | -0.16 | -0.10 | -0.07 | -0.32 | -0.22 |
| PCT Urban | -0.02 | -0.04 | -0.28 | -1.00 | 0.04 | 0.12 |
| $\lambda$ | 0.23 | 1.15 | -0.01 | -0.10 | 0.28 | 1.60 |
| $\rho$ | | | -0.29 | -1.81 | -0.18 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.70 (0.64) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

Table 17: Number of FTE Employees with Contiguity Weight Matrix Regression Results

| | 2SLS | | MLE | | GS2SLS-GMM* | |
|---|---|---|---|---|---|---|
| Y= # FTE Emp.'s | (1) | (2) | (3) | (4) | (5) | (6) |
| | Coef. | t | Coef. | t | Coef. | t |
| Constant | 218.80 | 0.85 | 273.02 | 1.30 | 239.87 | 1.12 |
| Pop Growth | -14.20 | -0.86 | -24.12 | -1.93 | -17.58 | -1.28 |
| Tot Wage | 2.27E-03 | 1.83 | 1.77E-04 | 1.80 | 2.06E-03 | 2.02 |
| PCT Unemp | 30.33 | 2.92 | 28.54 | 3.32 | 29.49 | 3.41 |
| GSP | -1.64E-03 | -1.77 | -1.09E-04 | -1.47 | -1.42E-03 | -1.85 |
| Own Source | 9.76 | 2.68 | 10.24 | 3.30 | 9.97 | 3.24 |
| AID | 6.38 | 2.34 | 5.24 | 2.42 | 6.05 | 2.65 |
| SCITR | 10.73 | 3.07 | 9.51 | 3.38 | 10.30 | 3.57 |
| Gov Dummy | -12.51 | -0.82 | -13.50 | -1.10 | -12.99 | -1.04 |
| Prop Manuf | 6.07 | 3.31 | 6.40 | 4.20 | 6.21 | 4.05 |
| Population | -8.14E-06 | -0.85 | -1.59E-06 | -2.08 | -1.11E-05 | -1.39 |
| Pct Black | -1.15 | -1.37 | -1.20 | -1.77 | -1.20 | -1.73 |
| Poverty | 0.35 | 0.11 | -0.11 | -0.04 | 0.23 | 0.09 |
| d02 | 11.76 | 0.60 | 11.87 | 0.87 | 11.84 | 0.79 |
| d01 | 40.57 | 1.89 | 39.65 | 2.52 | 39.94 | 2.36 |
| d00 | 62.16 | 2.38 | 59.86 | 3.01 | 60.94 | 2.92 |
| d99 | 57.49 | 2.31 | 54.07 | 2.87 | 55.87 | 2.81 |
| d98 | 59.34 | 2.26 | 53.92 | 2.72 | 56.96 | 2.72 |
| d97 | 33.30 | 1.50 | 31.47 | 1.92 | 32.12 | 1.83 |
| All 3 Dem | -3.16 | -0.20 | -3.80 | -0.29 | -3.70 | -0.28 |
| All 3 Rep | 5.16 | 0.26 | 18.07 | 1.12 | 10.39 | 0.63 |
| Elect. Yr | 8.54 | 0.64 | 8.69 | 0.83 | 8.54 | 0.78 |
| PCT HS | -6.39 | -2.55 | -6.52 | -3.18 | -6.46 | -3.12 |
| PCT Coll | 1.80 | 0.96 | 0.97 | 0.63 | 1.44 | 0.93 |
| PCT Urban | -0.63 | -1.70 | -0.51 | -1.67 | -0.56 | -1.83 |
| $\lambda$ | -0.03 | -0.34 | -0.05 | -0.75 | -0.03 | -0.42 |
| $\rho$ | | | -0.23 | -2.10 | -0.09 | |
| # of obs | 161 | | 161 | | 161 | |
| R Sqr (R-Bar) | | | 0.86 (0.83) | | | |

* There is not an analytic expression for the variane-covariance matrix of $\rho$; therefore, the std. error and t-stat. cannot be calculated.

This chapter tests three alternative measures of a state's firm recruitment effort and three alternative specifications that identify a state's rivals in firm recruitment. *Table* 18 summarizes the GS2SLS–GMM spatial interdependence results from the nine tables above, and as a comparison includes chapter's four and five results.

Table 18: Summary of Spatial Interdependence Results*

| | | *Alternative Weight Matrix Specifications* | | | |
|---|---|---|---|---|---|
| | | Prop Mfg | % Black | HHI | Contiguity |
| *Measure of Firm Recruitment Effort* | Firm Recruitment Spending | 0.86 (2.72) | 0.24 (1.71) | 0.33 (1.94) | -0.49 (-4.59) |
| | Total Economic Development Department Spending | -0.03 (-0.26) | 0.01 (0.06) | 0.04 (0.18) | 0.28 (1.60) |
| | Total Number of FTE Employees in the Department of Economic Development | -0.21 (-2.22) | -0.08 (-0.70) | 0.11 (0.67) | -0.03 (-0.42) |

* GS2SLS-GMM coefficient estimates are first and t-statistic in parentheses.

## Conclusion

A very important aspect in any tournament is accurately defining the competition. Obviously, if the nature of this rivalry were misspecified, then one would not expect to find rivals competing, because the test for competition mistakes whom competitors identify as their rival. This chapter allows states to identify their rivals in different ways, by re–specifying the nature of rivalry among states. In the empirical model, this involves only changing the weight matrix, $W$. The empirical results reveal that states do compete to recruit firms and identifies the nature of this competition.

When firm recruitment spending is the measure of a state's firm recruitment effort, the spatial interdependence effect remains positive and significant when the specification of a state's rival is in terms of economic or demographic distance. When defining a state's rivals as those that share a geographic border, the results change dramatically in the opposite direction of competition. Combining these results reveals that firm recruitment spending is an appropriate measure of a state's effort to recruit firms; and states compete to recruit firms when their rivals are defined in terms of economic and demographic distance, but not geographic distance.

When states identify their rivals in terms of economic or demographic distance, total economic development spending does not appear to be an appropriate measure of a state's effort to recruit firms. However, the results change when states identify their rivals in terms of geographic distance. The results show a positive and significant interdependence estimate (at the 10% level). This suggests that states spend more in total economic development spending to compete with their geographic neighbors to provide the best business climate for firms to locate and grow naturally. It does not represent a state's aggressive approach to recruiting firms, which appears to be the case if one only reads the headlines in the press. Only rigorous testing of this measure can rule out total economic development spending as an appropriate measure. The results provided thus far suggest that total economic development spending and firm recruitment spending are fundamentally different and measure similar, but different objectives of a state.

Finally, the results here conclude that the number of FTE employees in the department of economic development is not an appropriate measure of a state's firm

recruitment effort. Regardless of how a state identifies its rivals, this measure of firm recruitment effort cannot obtain positive and significant results to indicate states compete.

# CHAPTER 7: CONCLUSION

This dissertation represents a contribution to the regional economic development literature. It is the first empirical study that analyzes firm recruitment competition among states. The recent Supreme Court case between DaimlerChrysler and residents in Ohio places the topic of firm recruitment competition at the forefront of discussion in state economic development departments. Many politicians, press, and academics believe that states compete to recruit firms because of the widely publicized examples of high–profile cases. The results from chapters four, five, and six show that, in fact, states do compete with each other, but the nature of this rivalry is not based upon their geographic neighbors. Instead, the results indicate that states identify their rivals by associating their state with others that are similar in economic and demographic terms. The empirical results also indicate that it matters in how researchers measure a state's effort to recruit firms. Using different measures of firm recruitment effort fundamentally change the conclusions that a state's effort is interdependently related to its rivals. One alternative measure, total economic development spending, can indicate states compete with their geographic neighbors. But, in the context of the alternative model specifications tested in this dissertation, it is not likely that this measure accurately portrays a state's active effort to recruit firms. Rather, total economic development spending represents a state's objective to create a better business climate for firms and passively recruit firms. The most difficult measure of firm recruitment effort to obtain is firm recruitment spending; testing this measure identifies the nature of rivalry among states, thus this data is a very important contribution to the literature.

Manually obtaining this data involves speaking with the senior officials from states' economic development departments. These officials are very interested in the results from this dissertation, because the results indicate to them, who and how they compete with other states–suggesting that they do not know. The empirical results from chapters four, five, and six show that states compete with their economically and demographically similar neighbors to recruit firms. About 30% of the states in the sample requested a final draft of this study, and one state economic development agency requested a copy of the preliminary results–which is evidence of how important these results are to state economic development officials. Although, sometimes these officials identify their geographic neighbors as their competition, the analysis here identifies their neighbors as the states that are economically or demographically similar. Perhaps this is because the firms they are trying to recruit view these similar states as substitutes.

Firms realize the potential economic impact they can create in a regional economy and is why states believe they have to offer large incentive packages to lure them away from alternative locations. The literature in this field provides mixed messages concerning the effectiveness of these incentive packages. However, there is a consensus that states can affect the firm location decision when the firm is considering two otherwise indifferent locations. Thus, incentives can act as a tiebreaker in the final stage of site selection. The antecedent question that this literature has failed to answer is whether states actually are competing with each other. This dissertation answers that question by employing a unique high–quality dataset designed to test for spatial competition among states for recruiting firms. The theoretical model in chapter three predicts that if recruitment spending matters in successfully recruiting firms, states will

compete with each other to spend more. The empirical results reveal that firm recruitment spending does matter in successfully recruiting firms. This means that recruitment spending can affect the firm location decision, since firm recruitment spending matters in successfully recruiting firms; it necessarily alters the firm's location decision from one location to another.

The FRT model of interjurisdictional competition motivates the empirical analysis by providing a theoretical model of how states might compete for firms. It suggests that competition exists between states if a neighboring state increases its effort and the home state reacts by increasing its own effort. Some measures of a state's effort are observable and the empirical chapters test whether states compete in terms of this observed effort. The model also predicts that the optimal response for a state with a net location disadvantage is to try harder, or exert more effort to recruit the firm, which is intuitively appealing.

Chapter four provides the first empirical estimates of interstate competition for firms. Measuring a state's effort by the budget expenditures for firm recruitment programs is the most difficult variable to capture. This manually calculated data represents a major contribution to this literature. The spatial analysis aligns states into cohorts of rivals and then tests for the presence of competition among them. This chapter identifies rivals by their proportion of employment in the manufacturing sector, so that if two states have very similar proportions, then these states are rivals. Using the preferred GS2SLS–GMM method, the results overwhelming support the claims that states are competing with each other to recruit firms. The level of significance and magnitude is very high, indicating that they are very competitive. When a rival state increases its

spending by $100, the home state reacts by increasing its recruitment spending by $86–a considerably large response. The exogenous controls that explain recruitment spending are also quite interesting. The public demand controls imply that rapidly growing states oppose future development, while highly populated states encourage it. Moreover, states ridden with high unemployment and poverty are unable to aggressively compete for businesses with increased recruitment spending.

The fifth chapter builds on the fourth chapter's foundation for empirically testing whether states compete for firms. The empirical model here is identical to the model that chapter four presents. In this chapter, the only change made to the model from chapter four is the measure of a state's firm recruitment effort. The objective of state economic development departments is to influence the private sector by creating the ideal location for firms to relocate or expand naturally within the state. One way to achieve this objective is through overall economic development spending on a wide variety of programs, thus total spending might explain a state's effort to recruit firms. Another measure is the number of FTE employees in the state's department of economic development. Perhaps, states view their staff as an inexpensive substitute for spending on special programs and provide added value to firms. If a state has a larger staff in its department of economic development than its competitor, this state is expending more effort at recruiting firms to locate within the state. The results do not find interjurisdictional competition in recruitment effort (as opposed to chapter four). This indicates that these two alternative measures are not appropriate measures of a state's effort to recruit firms. This implies that it does matter how researchers measure the effort of a state to recruit firms.

Chapter six is the final empirical chapter in this dissertation and highlights an important aspect of competition, which is the need to accurately define the nature of rivalry. Obviously, if the nature of this rivalry were misspecified, then one would not expect to find competitors competing, because the test for competition mistakes whom a competitor identifies as their rival. This chapter allows states to identify their rivals in different ways, by re–specifying the nature of rivalry among states. The empirical results reveal that states do compete to recruit firms and identifies the nature of how they compete. When firm recruitment spending is the measure of a state's firm recruitment effort, the spatial interdependence effect remains positive and significant in the cases where a state's identifies its rival in terms of economic or demographic characteristics. However, states do not appear to define their rivals in terms of geographic distance.

Total economic development spending appears to be a measure of a state's effort to create a better business climate. The results show states compete with their geographic neighbors by increasing their total economic development spending, however, this is the only occurrence when this measure suggests states compete. Thus, perhaps, this measure identifies a state's objective to recruit firms, but in a passive approach to be a better location than its surrounding states. The firm recruitment spending measure suggests that states compete with rivals outside the region to recruit firms and for that recruitment policy to be effective, it appears that their state also has to be a better location than the surrounding states.

An important policy implication from this research is that firm recruitment spending is a necessary tool for states to recruit firms. Viewing this competition from the perspective of game theory, the strategy for states resembles the game of prisoner's

dilemma. The optimal amount of spending for both states to recruit firms is zero–if they can collude, but the Nash equilibrium is positive spending for both states. If one state spends zero, then other state's best strategy is positive spending because, ceteris paribus, it wins the firm. This implies that each state's best response is positive spending, regardless or the other state's choice to spend. Thus, given that competition exists between states, if one state chooses not to compete (spending on firm recruitment) then they will lose potential firms to other states. There remains the possibility that a firm will still select a non–competitive state, but only if the benefits from that location outweigh the incentives it receives from the competing state. So, unless states can cooperate to form an agreement that ends the spending on firm recruitment, each state has a rational incentive to spend on recruiting firms.

Further research is needed. Perhaps the policy emphasis in the U.S. will change over time in favor of other emerging sectors in the U.S. economy. Although the manufacturing sector is historically regarded as the key to growth, the change in technology over the past decade may change the focus of recruitment effort to the banking, finance, or biotech industries. Another extension of this study is expanding the data set to include more states in the sample. Maybe the western states are fundamentally different in their firm recruitment effort; a complete data set could test for this possibility.

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## VITA

Michael Tasto was born and raised in rural Minnesota until graduating from High School in 1997, when he moved to New York City to attend St. John's University. In 2001, he completed his undergraduate degree in economics. A year later, he married Sharmeelee Mahipal, who was finishing her undergraduate degree in psychology from Hunter College. After working for two years as Vice-President of a conference center in Manhattan, Mike decided to attend graduate school in economics.

In 2003, Mike moved with Sharmeelee to Atlanta, Georgia to attend the Ph.D. program in economics at Georgia State University. He was awarded the AYSPS Dean's Fellowship and served as a graduate research assistant for Dr. Geoffrey Turnbull.

During his last year in the Ph.D. program Mike taught principles of micro/macro economics at Gordon College. His research interests developed into urban and regional economics and public finance. He earned his Master's degree in economics in May, 2006 and defended his doctoral dissertation in July, 2007. Finally, he accepted an appointment as Assistant Professor at Southern New Hampshire University.