

**ECONOMIC COMPETITIVENESS AND THE DETERMINANTS OF
SUB-NATIONAL AREA ECONOMIC ACTIVITY**

A Report for the Office of Revenue Analysis, OCFO, District of Columbia

**GEORGE WASHINGTON INSTITUTE OF PUBLIC POLICY
September 30, 2008**

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Introduction

The purpose of this paper is to review the empirical and theoretical literature on area economic competitiveness and the sub-national location of economic activity. Thus, we are interested in why economic activity locates where it does, and, from the perspective of a given sub-national area, what is it about the area and its characteristics that make it competitive, i.e., an attractive or unattractive place for the location of different kinds of economic activity.

The framework we employ for our review is that of “competitive advantage¹.” The basic premise underlying the concept of competitive advantage is that a firm will locate in an area where it can produce and bring to market the goods and services it produces at greatest profit. The locational characteristics that determine where a firm will be able to produce at greatest profit vary by sector (the outputs the firm produces). A particular area can be thought of as competing against other areas as a potential location for economic activity. Some of its characteristics and attributes will be favorable to the location of a particular form of economic activity relative to those of other areas, while others may be unfavorable. An area will have a competitive advantage for a particular kind of economic activity if that activity can produce and bring to market its goods or services in that area and derive a greater profit than it would if it located elsewhere. Since competitive advantage conceptually relates to *specific* types of economic activity, an area may have competitive advantage for some kinds of economic activity but not for others. Nonetheless, the term is frequently used to characterize an area with respect to its

¹ The term “competitive advantage” is derived from, but is not the same as the term “comparative advantage.” An area has a *competitive advantage* for a particular type of activity if a firm engaged in that activity can produce and bring to market its product at greater profit than it can elsewhere. *Comparative advantage*, on the other hand, is a term that relates the competitiveness of two or more places with respect to two or more types of economic activity. Area A may hold an absolute (competitive) advantage in producing both Good X and Good Y compared to Area B, but if its advantage is greater with respect to Good X the principal of comparative advantage suggests that Area A should focus on producing Good X where its relative advantage is greatest, and Area B should focus on producing Good Y where its relative disadvantage is least. Thus, competitive advantage implies an absolute advantage, while comparative advantage implies a relative one.

entire economy, i.e., an area has a competitive advantage or disadvantage for the location of economic activity in general.

Since the purpose of this review is to serve as a back-drop for a study that we propose on the competitiveness of the Washington DC regional and city economies, our discussion is directed towards that end. The project will consist of two parts: research on the Washington, DC region and its competitive advantages – i.e., the determinants of the location of economic activity in the DC region relative to other regions - and research on the economy of the city of Washington, DC and, in particular, the determinants of location of economic activity *within* the region. This approach is consistent with the literature, which makes clear that location decisions generally consist of a two-step process with the first step consisting of a regional choice and the second, but later, decision consisting of a specific location within the chosen region (Cohen 2000).

As Blair and Premus (1987) observe, after a review of surveys of business executives, for the first stage -- regional or state selection -- variations in labor availability and quality, state taxes, climate, and market proximity tend to be key determinants. In the next step, choice of a specific location within the region, factors that are available throughout the region, but vary with specific sites become predominant considerations – land costs, access to major roads, and school quality being three major factors. Anderson and Wassmer (2000) similarly argue that first a firm chooses a “market” in which to locate, which is a regional decision, and then chooses a “site,” which is a local decision within the preselected region. Fiscal characteristics of an area (including but not limited to targeted economic development incentives) become important to firms once they have reached the phase of decision-making focusing on “site” location (P.25-26).

Approaching the Literature

Spatial Units:

Conceptually the appropriate spatial area that defines an area economy is not precise. However, it is widely agreed that an area economy should be defined by its interactions, and particularly by its labor market interactions, rather than by legal

jurisdictional boundaries across which economic interactions easily occur. An area economy encompasses the area throughout which employees can commute to jobs, and through which income generated is circulated, implying a multiplier effect throughout the area. Such areas are relatively closed in a labor market sense, but open in that they trade goods and services with other areas. Regional economies, operationally defined in the US as metropolitan areas, are thus the most appropriate spatial units for analysis; indeed, many now argue that the United States economy is effectively comprised of regional economies, which are the fundamental unit of analysis (see Acs and Armington 2003, Barnes and Ledebur 1998, and Pastor, Dreier, Grigsby, and Lopez-Garza 2000). Smaller areas such as neighborhoods or cities are too open to job and income exportation to be usefully analyzed as economies, while larger areas such as states contain more than one labor market and are thus too broad. In addition to regions, existing literature examines determinants of economic activity in states, cities, and counties as units of analysis. In our literature review we examine these studies as well, although we focus on studies that employ the region (and, within a region, the city) as the relevant unit.

Economic Activity: What is being explained?

Conceptually the most encompassing descriptor of an area economy is its output, the value of what it is that the area produces in total and by sector. However, data measuring area output - gross state, regional, or city product - are not easily available over time (and their availability and reliability are in descending order of geographic scale – they are easily available at the state level, available at the metropolitan and county level, and difficult if not impossible to obtain for smaller units), and relatively few studies utilize output (gross product or value added) as the dependent variable.

The indicators of economic activity that are more frequently used in the literature include change over time in gross product, employment, earnings, firms (particularly new firm births or net new firm creation), business establishments, income, and property values.² Of these, earnings and employment are, compared to output, the next most direct

² A large number of studies examine determinants of area population growth. While population growth is conceptually distinct from economic growth, empirically population growth and economic growth are highly correlated, at least at the regional level (see Glaeser, Scheinkman, and Shleifer 1995). A growing economy results in population growth through in-migration, while growing area population results in

measures of economic activity. Earnings are highly correlated with output since they represent the labor component of output, while employment is a measure of the utilization of an area's human resources in economic activity. While employment is an input to economic production rather than an output, it is a relevant indicator of the extent to which an area is utilizing its productive capacity. Employment is also a major contributor to economic development as an end in itself, since jobs confer status and dignity as well as income.

Earnings and employment also interact in important ways. Earnings per job is a proxy measure for productivity (though gross product per job is better), and the interaction of earnings and employment provides important information about an area economy. High employment may be associated with low earnings if employment is concentrated in low-skilled, low-paying sectors or with high earnings if the employment is concentrated in high-skilled, high-paying sectors.

Personal income is a less direct measure of area economic activity since it includes components that are not generated by that economy such as transfer payments (social security, welfare, etc.), dividends, and interest. Property values are a poor indicator of economic activity since they reflect not only business demand for land, but also residential demand which is based partly on a set of amenity level factors not closely related to economic activity (retirement communities, for example, may have high property values).

Whatever the indicator being used, studies may be concerned either with the economy as a whole (e.g., total output, employment, or earnings) or with a specific sector or sectors of interest (e.g., output, employment or earnings in the manufacturing sector). Studies may attempt to explain the level of activity or type of competitive advantage at a particular point in time or changes in these over time (see Carroll and Wasylenko 1994).

economic growth as the local service sector responds to greater demand and the area experiences an increase in employable labor. However, given the extensive body of work on determinants of population growth, we focus in this review on the more direct measures of economic activity. We discuss literature that attempts to jointly determine employment and population growth (see Leichenko 2001, Levernier and Cushing 1994, and Steinnes and Fisher 1974).

Methodologies for Assessing Area Economic Competitiveness:

Several essentially descriptive techniques are used to assess an area's economic competitiveness. These techniques are all, in one way or another, based on an analysis of the area's current or potential ability to trade with the outside world. An economy – a region or metropolitan area in our case – grows by exporting goods and services that it produces to outside of the region, thus bringing income into the area. That new income then further increases area income as a portion of it is spent on local goods and services (the multiplier effect). Area income can also grow through “import substitution” if the area begins to produce for its own consumption goods and services that it previously purchased from outside of the area. Import substitution is clearly more likely to occur as an area increases in size.

Export base analysis examines an area's economy to identify what it is that the area economy is exporting to the outside world – that is, what are the economic drivers of the area economy - how great an advantage it has in that sector, whether its advantage is eroding or increasing, and whether the demand for what it has an advantage in is increasing, declining or holding steady. The analysis is descriptive in that it identifies the economic drivers, but does not explain *why* the area has an advantage in those sectors. Traditional export base analysis separated an area's economy into a basic sector and a local sector, with the basic sector consisting of manufacturing, agriculture, or extractable resources and the local sector consisting of all other sectors, which were seen to be derivative from the basic sector. More recently it has become acknowledged that many services are also exportable and that traded services (e.g., financial services, professional services such as legal services, architectural services, advertising services, etc.) should also be considered part of an area's export base.

The calculation of location quotients (LQs) is a simple way to identify an area's economic base (see Maki and Lichty, 2000, pp. 196ff for a technical description and examples). A location quotient is simply the ratio of the share of an area's employment (or earnings or output) in a particular economic sector relative to the share of the nation's employment (or earnings or output) in the same sector. If the ratio is well above 1.0, the conclusion is that the area is producing more of that product than is necessary for local needs and therefore must be exporting some out of the area. Changes in location

quotients over time indicate whether an area is gaining or losing its competitive advantage for that product. Areas that have a high LQ in industries for which external demand is declining or which pay low wages are not as happily situated as those for which demand is increasing or which pay high wages.

Shift-share analysis is a more sophisticated and nuanced technique for identifying an area's economic drivers and its competitiveness. Shift-share analysis decomposes an area's change in employment (or earnings or output) into three components: 1) a national component - what would have been expected had the area's total employment increased at the same rate as national employment, 2) an industrial share component – what would the area's employment have been had each sector of its economy increased at the same rate as that sector did nationally, and 3) the competitive shift, defined as the difference between the actual change in employment in each sector and the expected change due to the industrial share. If the sector increased in the area at a greater rate than nationally, it implies that the area had a competitive advantage in that sector over that time period. Shift-share analysis is relatively easy to understand and, although cumbersome, easy to calculate, and it is routinely done, either by staff or consultants, as part of an area's assessment of its own economy. However, it is extremely sensitive to the level of sectoral disaggregation at which the shift-share analysis is conducted. Conducting it at the two or even three digit level risks the possibility that a sector will mistakenly be identified as having a positive competitive shift that may instead be due to a sector at the four or five digit level in which the area specializes having experienced very high growth rates nationally.

Cluster analysis is a recent expansion of the export base analysis framework (see Porter 2000, Cortright 2006). Cluster analysis starts from the same basic premise as export base analysis but argues that the economic sectors incorporated in the North American Industrial Classification System (NAICS), the basic building block for analysis for LQs, imposes artificial constraints that make it difficult to understand how an area economy actually operates. Instead of an economic driver (or drivers) consisting of a single industry, in the real world that industry is part of a cluster of productive activities that are related to it, many of which are classified in other NAICS sectors. A cluster might embody not only the firms producing the exportable good itself, but local suppliers

to those firms, institutions that train the labor force for the activities of the firms and suppliers, professional and financial services that provide services to these firms, etc. Cortright (2006), in a qualitative analysis, finds that clusters usually emerge and grow as a result of labor market pools, supplier specialization, knowledge spillovers, entrepreneurship, path dependence, local demand, and cultural factors.

Unfortunately, unlike the calculation of location quotients, the identification of the clusters driving the area economy is complex once one moves beyond an intuitive sense of the likely cluster members, and there are relatively few examples of actual research identifying area economic clusters (but see Hill and Brennan 2000, and Luger and Goldstein 1991). The two things that make cluster analysis different (and more difficult) are that it looks at a set of related activities (that are seldom grouped together in the NAICS data) and defines geography in terms of the cluster, which seldom corresponds to MSA, state, county, or city level data. For this reason, cluster analysis is used much less often, and usually focuses on a specific area and industry such as the research triangle in North Carolina (Luger and Goldstein 1991). To be done accurately, cluster analysis requires area input-output tables by highly disaggregated industrial sectors so that clusters of supplier networks can be identified. Formal cluster analysis, a mathematical procedure that can be used to identify groups of industries that share characteristics, is then applied to identify clusters (see Hill and Brennan 2000 for an explanation of this technique, which they pioneered).

Methodologies for Determining the Causes of Area Economic Competitiveness:

Location quotients, shift-share analysis, and cluster analysis are all techniques that provide useful information about the activities for which the area has a competitive advantage, how that is changing over time, and whether it is in high growth or low growth sectors and high wage or low wage sectors. However, they do not provide information on *why* the competitive advantage exists. For that purpose it is necessary to investigate the factors that determine the location of various kinds of economic activity, and how an area's economy compares on those factors to other areas. Two types of research questions are particularly relevant. First are efforts to explain either the level or (more often) the growth of *economic activity* within an area. Second are efforts to

explain why *firms* locate where they do. The second tradition is a somewhat more restricted, though still quite relevant, question, since most change in economic activity levels results from change in activity for existing firms and from new firm births in relation to existing firm deaths, rather than from firm relocation (see, for example, Acs and Armington 2003).

Three different kinds of methodologies have been applied to address these questions: econometric modeling (particularly for the first question), surveys of business executives on the determinants of their locational choice (particularly for the second question), and the hypothetical firm approach (see Tannenwald 1996). We discuss each briefly below.

Econometric or “Revealed Preference” studies: Statistical studies using econometric techniques are the most prevalent approach. Once a unit of analysis (e.g., state, metropolitan area, county or city) and a dependent variable (e.g., level or change over time in employment, earnings, or gross product) have been selected, cross sectional and/or time series data are used to create a data set. Multivariate statistical techniques such as regression analysis are then used to evaluate the impact of each of a variety of possible explanatory variables (or vector of variables) on the dependent variable while holding constant the other independent variables. The independent variables include measures of some subset of area characteristics that are potentially related to an area’s competitive advantage, i.e., its ability to engage in economic activity. The resulting multivariate model then allows the researcher to quantitatively estimate the impact of a particular factor, while controlling for other factors.

A major advantage of these statistical techniques is that by controlling for a variety of factors, they limit the possibility of omitted variable bias. Omitted variable bias is the statistical equivalent of not having a control group – it occurs because the effect the researcher is measuring is the result of something not accounted for. However, many of the variables that ought to be controlled for do not lend themselves to measurement. For example, factors such as regulatory policy or entrepreneurial energy could be hypothesized to impact economic growth, but in practice are very hard to measure. The effect of these omitted variables is captured in the presumed effect of

variables contained in the model to the extent these variables are correlated with omitted variables (thus resulting in a misestimate of the actual effect of the included variable) or lost in the error term of the model. As this suggests, the findings of these econometric studies are very susceptible to the choice of model specification (what is included in the model) and how variables are operationalized. In some cases, variables that are theoretically important can not be included because they cannot be easily operationalized and measured (e.g., taxes, regulations, business climate, and entrepreneurial energy for example). This raises the important question of whether the model is more sound with a poor proxy (average residential and business tax rates as a proxy for effective total business taxes or proprietorship per capita as a proxy for entrepreneurial energy to give a few examples) or with omitting these variables.

Differences in findings thus may well result from differences in study specification and operationalization rather than real differences in factor effect. The present literature review will discuss some of the various approaches taken and will show that the choice of both which variables to include and how to measure them has a significant impact on the results.

The econometric cross-sectional studies using region as the unit of analysis provide a good example of the approach we will use for the first model in our own study explaining regional economic activity and inter-regional location decisions so that we can better understand the determinants of the Washington, DC region's competitive advantages. (See Blumenthal, Hill, and Wolman 2009, forthcoming for an example of one such recent study, including reviews of the literature from other studies.) Unfortunately the smaller number of studies using central city as the unit of analysis in cross-sectional studies (see Berry and Glaeser 2005, Cullen and Levitt 1999, Gasper and Glaeser 1998, Glaeser and Saiz 2004, and Shapiro 2006) provides much less guidance in terms of our second model, which is to explain *intra*-regional economic location to better understand why economic activity locates within the District of Columbia rather than elsewhere within the metropolitan area. The cross-sectional city econometric studies in effect ask why activity locates in the city of Washington, DC as opposed to Philadelphia, Boston, Chicago, Los Angeles, etc. rather than why it locates in a central city as opposed to its suburbs.

More relevant for our research are the studies that attempt to explain intra-regional location, and, in particular, why economic activity locates in the core city as opposed to the suburbs. The literature concerned with intra-regional location is much sparser than the inter-regional location literature. Some studies model economic activity or change in the various counties within a single metropolitan area (see Anderson and Wassmer 2000, Boarnet 1994, Dardia 1998, and Leo and Anderson 2006). However, since most of the data are available only at the county level, very few studies compare cities to suburbs (or the rest of the region) for a single region (but see Mark, McGuire, and Papke 1998). Even fewer studies examine how cities do in comparison to their suburbs across the United States (see Brennan and Hill 1999, 2005) or how counties do relative to one another across metro areas (see Levernier and Cushing 1994).

Surveys of business executives: An alternative to the econometric approach is to ask business executives directly why they locate where they do. This approach obviously is directed at firm location decisions rather than determinants of overall economic activity. In these studies, a survey is sent to business executives asking them why they chose to locate in a particular region. The major advantage of this approach is that the data comes from actual decision makers and is more accessible to researchers and consumers with limited statistical training. For example, a Brookings Institution survey went to corporate site selection managers, planning and location consultants, economic development specialists, and academics who were asked directly about trends in business location, the most important factors in choosing a location, and the process by which decisions were made. The most significant findings of this project were that characteristics unique to each firm have a large impact on the types of factors that affect location decisions, and that the factors that prompt a firm to choose a location (region) are very different from those that prompt a firm to choose a specific site within a location (Cohen 2000). However, like all survey approaches, low response rates and respondent bias are limitations. Respondent bias is a particular concern in firm location surveys because business leaders have the incentive to overstate the importance of tax incentives and subsidies offered by governments in their firm location decisions. Despite this worry, survey research tends to find that labor market conditions, input availability, property

costs, and ease of transportation are the major drivers of firm location choices (Bell, Brunori, Green, Wolman et al., 2005).

The hypothetical firm approach: Finally, another approach is to use cost and profit data to create long-term profit estimates for hypothetical firms locating in various areas. Jurisdictions are then compared in terms of the profit differentials a firm would face based on location choice. In practice, this latter method tends to focus on input costs (especially labor and energy) and local tax policies, as it is hard to quantify the effect something like temperature would have on profit margins. A particularly thorough example of this type of study is Fisher and Peters' *Industrial Incentives* (1998), which generated locational profit estimates for sixteen hypothetical firms in 24 possible states. These types of analyses are extremely useful for measuring the impact of government policies on business profits but tend to be few in number due to the extensive data requirements. An additional limitation of these studies is that while they can quantify the effects of taxes and business climate on profits in theory, they do not measure where business actually locates.

Overall Findings on the Determinants of Competitiveness³

As discussed above, research on the determinants of competitive advantage has relied on a number of different analytic techniques, including econometric studies, surveys, and hypothetical firm modeling procedures. However, across all three methods and over a variety of time periods, data sets, and industries, several factors emerge as consistently important as determinants of competitive advantage and location at the regional level: labor (access to, quality, costs), agglomeration economies, markets (for both inputs and outputs), and transportation access. Surveys and case studies have frequently also found that business climate can be an important factor.

³ Portions of the following sections of the review on determinants of overall competitiveness and of specific area characteristics and attributes affecting competitiveness are drawn from GWIPP's previous work for the National Center for Real Estate Research (Bell, Brunori, Green, Wolman, et al. 2005).

Important factors across sectors: Thompson (1961) reviewed the early generation of econometric and survey studies of manufacturing plant location and identified five main factors, in order of importance:

- 1) access to markets,
- 2) location relative to raw materials,
- 3) transportation costs,
- 4) availability and cost of energy resources, and
- 5) labor costs.

More recent surveys of business executives yield broadly similar findings. A nationwide survey conducted by Deloitte-Touche in 1994 of corporate real estate executives who assisted companies with location decisions found that real estates costs were the number one factor for determining site location, followed by labor force issues, transportation, real estate availability, market access, regulatory environment, and labor costs (Mackay 1994). In a more recent survey, Musil (2001) writing for Site Selection, which periodically surveys corporate executives on the factors important in making location decisions, noted that the “key” factors for location decisions were proximity to customers, access to highways, real estate costs, and pro-business government officials.

Earlier econometric studies also were in general agreement on important factors explaining regional economic growth and competitiveness. A 1989 review of econometric studies by Milward and Newman (1989) similarly found that traditionally the primary factors influencing site selection by businesses were access to labor (measured usually by the supply of labor), labor costs (and unionization), transportation (number of highways, proximity of railroads, etc.), access to markets, and access to raw materials. The latter two factors were determined by measuring transportation access as well as proximity to customers and raw material suppliers. The findings of such studies have been consistent since the early 1940s and reflect the model that assumes businesses decide to locate in places that will maximize profits. Under this model, firms choose locations that satisfy input requirements (costs of labor and raw material), access to market, and transportation costs.

While these factors continue to be paramount, more recent studies show that human capital characteristics – labor skills and education – have increased substantially

in importance and now equal or exceed labor costs as an important factor for some industrial sectors. In a review of recent literature, Malpezzi (2001) found that education was the single biggest factor in predicting economic growth. Later studies have also shown that as labor quality (human capital) increases in importance so do area amenity and quality of life characteristics that attract high quality labor (Glaeser and Saiz 2004).

Agglomeration economies (savings derived as a consequence of proximity to other firms) also appear as important determinants (see Quigley 1998 for a review of the literature) and there is some evidence that their impact has increased over time (see Glaeser et al 2001). More recent studies also have resulted in a more nuanced view of the importance of state and local taxes. Earlier econometric studies generally found a lack of effect (unlike the result from many surveys of business executives), but some recent studies find that state tax systems (in particular relative burdens) may also be significant factors. Dalenberg and Partidge (1995) found that aggregate tax burdens were negatively related to employment, while Slemrod (2003) found that net corporate taxes had a negative effect, but there was no relationship between employment and either sales or individual income taxes. And both Cohen (2000) and Anderson and Wassmer (2000) find that fiscal and business environments matter at the local level, but not the regional. That is, once a firm has picked a market or region in which to locate, government attributes are an important factor in choosing a specific site.

Factors important for location of manufacturing plants: Many studies have focused on a single industrial sector, most frequently manufacturing. In one of the largest and most comprehensive studies, Bartik (1985) examined corporate location decisions for new manufacturing plants in the United States during the early 1980s. He found that availability of land, unionization (and existence of right to work laws), corporate tax rates, transportation systems (highways and railroads), wage rates, and existing manufacturing activity had the largest effects on manufacturing decisions. He also found that education levels of the population, construction costs, population density, and energy costs had little or no significant effect on location decisions of manufacturing plants. Regional manufacturing choices also tend to be sensitive to airline access, a large labor

pool, and the age of the private infrastructure (Irwin and Kasarda 1991). At the local level, different factors affect manufacturing location choices.

The largest survey of corporate executives was conducted by Schmenner (1982). He examined Dun and Bradstreet data on Fortune 500 plant openings and then conducted extensive surveys with executives from the companies that opened plants. He found that labor issues (wage rates, unionization) were the largest factors in plant location decision - - cited by 80 percent of business executives as being the most important factor.

Schmenner's review found that proximity of markets was the next most important factor. He also found that, at least prior to the time his survey was conducted in the early 1980s, quality of life and tax issues were not significant factors. Schmenner's results are consistent with other large scale surveys of plant location conducted earlier. (See Mueller and Morgan 1962; Greenhut and Colbert 1962; Stafford 1974; and Goldstein 1985).

Kieschnick (1981) surveyed firms that were offered tax incentives as a means of luring business development and found that less than one percent of business executives surveyed made their decision based on the availability of tax incentives. He reported that the most important factors influencing the location decision were labor costs, labor productivity, market size and accessibility, access to raw materials, and the quality of transportation services. A survey of 204 business executives from companies opening plants conducted by Heckman (1982) had similar results: the most important factors were labor costs, production costs (raw materials), and transportation costs. Of secondary importance to the business executives were land availability, education, local cost of living, and housing availability. Taxes and business incentives were of negligible importance to the surveyed executives.

An even more recent survey, conducted by Deloitte Consulting Group and the National Association of Manufacturers (2005), surveyed chief executive and chief operating officers at 220 manufacturers in the United States and Canada to determine location preferences. The survey found the following factors as "critical" (not ranked in order of importance) in determining where to locate: utility reliability; access to customers; costs of labor; ease of doing business (regulatory environment); and labor relations (specifically unionization and existence of right to work laws). It also found that property taxes and corporate income taxes were "very important," while port access,

airport service, access to local amenities, and availability of government grants and incentives were assessed as “least important.”⁴

Using the hypothetical firm approach, Fisher and Peters (1998) constructed location specific profit estimates for 16 hypothetical firms in 24 states based on the different taxes applying to each firm in each of the states. They found that the benefits of a more “business friendly” tax environment are highly sensitive to the choice of industry and hypothetical firm size. In extreme cases (going from their hypothetical worse city to the hypothetical best city), firms can save between 60 and 80 cents an hour in wage equivalents: “In other words, the difference between the best and worst sites is equivalent to paying all employees 72 cents an hour less, for each hour worked over the 20-year life span of the plant. In most instances, the wage equivalent data are in the 60 to 80 cents an hour range” (P.145). However, these results are sensitive to both type of firm and firm size, with the hypothetical large furniture and fixtures firm receiving a benefit of only 48 cents hour, and a large drug firm receiving a benefit of \$1.82 an hour. While these benefits appear to result in considerable cost savings based on location choice, Fisher and Peters note that differences between firms not located at either polar end of the spectrum are much smaller: “the difference between the best and worst sites is substantial, but, except at the extremes, small random position changes do not appear to matter much” (P.145).

High tech: The high technology sector has also received considerable attention in the empirical literature. Studies of high-tech industry location decisions, while difficult to generalize from since there is little agreement on exactly which industrial sectors belong in that category, nonetheless agree that highly educated and skilled labor and proximity to research universities and institutions were factors of primary importance. Devol (1999) conducted an extensive study of where the nation’s high technology industry was locating. He found that the factors most influencing high technology site selection were access to a well educated work force, close proximity to universities and research

⁴ That many surveys on site location have found that taxes and incentives are of minimal or secondary importance is remarkable. Experts in the study of site location have long noted the inherent bias of asking business executives if low taxes and incentives are important (Bartik 1991).

institutions, existing network of suppliers, availability of capital, climate and other quality of life factors, and the cost of living.

Other research has reached similar results. Audretsch and Feldman (1996) found that technology driven research and development clustered in areas with high levels of industry research, universities, and skilled labor. Cortright and Meyer (2001) found that the existence of other high technology firms was the single largest indicator of where high technology firms choose to locate (with the implication that areas without significant high tech presence have a difficult time attracting the industry). The importance of clusters has been studied as a factor in business location decision, particularly with respect to the high technology industry. A cluster is a geographically proximate group of interconnected companies in a particular field. Porter (2000) found that most new business formation occurs within existing clusters rather than in isolated locations.

Premus (1982) surveyed high technology company executives regarding location choices. He found availability and cost of technical labor to be the most important factors in high tech location decisions with proximity to a university system and low taxes important secondary factors. Premus' research is consistent with later work (Haug 1991), which also found that labor agglomeration and proximity to universities were key to location decisions by high-tech firms. Survey research has found that tax incentives and other government assistance have very little impact on high-technology location decisions. Fulton and Shigley (2001) found that proximity to a university, access to skilled labor, and existing Internet infrastructure had the most bearing on high tech location decisions, while tax incentives and government assistance had the least.

Factors affecting location of specific business functions: Limited research has also distinguished among business *functions* in examining business location. Using survey data Cohen (2000) found that the importance of factors depends on the business function. For research and development functions, proximity to universities and clusters of highly educated employees was of paramount importance, while much less so for other business functions. No other factors have been statistically significant in determining the location of research and development facilities, except proximity to a corporation's headquarters. Utility availability and costs were factors only for manufacturing location decisions. The

following factors have been found to influence the location of a corporation's headquarters: accessible international airport; high end hotels, restaurants, and entertainment (including professional sports teams); attractive housing for executives; strong educational system; and available land on which to build (Cohen 2000).

Even the question of where to incorporate (which is distinct from the headquarters research noted above) has been studied. Bebchuk and Cohen (2002) empirically studied firms' decisions about where to incorporate. That study found that the most important factor governing location results was the existence of anti-takeover laws, but also that firms were consistently more likely to incorporate within their home states.

Area Characteristics and Attributes Affecting Economic Activity

As the above discussion indicates, the list of area characteristics that the literature considers as possible determinants of the location of economic activity and includes as potential explanatory variables in empirical studies is quite diverse and includes:

1. Agglomeration economies/population size
 - a. urbanization economies
 - b. localization economies
2. Labor force characteristics
 - a. quality/human capital
 - i. knowledge and skills
 - ii. soft skills (motivations, etc.)
 - b. cost
 - c. availability of required labor
 - i. percentage of labor force of working age
 - ii. willingness to work (labor force participation rate)
 - iii. occupational composition of labor force
3. Transportation access and cost relative to suppliers and markets
 - a. connections to interstate highway system
 - b. connections to railroad network/ports
 - c. air connections to national and global economies
4. Land costs/housing costs
5. Energy availability and cost
6. State and/or local taxes
7. State and/or local public service levels and quality
8. Economic development incentives (tax breaks, training subsidies, infrastructure subsidies to firms)
9. Infrastructure
10. State and/or local business climate/regulatory environment

11. Amenities/quality of life/climate/crime and public safety
12. Area industrial composition and mix
13. Entrepreneurship and innovative capacity
14. Characteristics of broader multi-state regions

In addition, there is widespread agreement that the set of factors that are responsible for inter-regional location decisions are not necessarily the same that are important for intra-regional decisions (Leichenko 2001, Mark et al. 1998). Many of the most important factors in choosing among regions are invariant within a region (labor force quality and cost, climate) so other factors less important at a regional level may play a role in intra-regional location (e.g., taxes, public service levels and quality, government efficiency, public safety).

We now turn to a consideration of the various possible individual factors potentially affecting the location of economic activity. In each case we will distinguish, where there is research evidence, on any differences between inter-regional and intra-regional decisions and among sectors. We begin each section with a short discussion of expectations drawn from theory, followed by results from empirical literature drawing heavily, though not exclusively, on existing literature reviews where available.

Agglomeration Economies

Agglomeration economies are the bedrock rationale for the advantages cities and urban regions possess for economic activity (See Fujita, Krugman, and Venables 1999 and Glaeser et al. 1995). Agglomeration economies are external benefits that accrue to firms as a result of their location in an area where a large number of other firms are located. They are usually measured by city or regional population size.

Agglomeration economies can be divided into *urbanization economies* and *localization economies*. Urbanization economies involve cost savings accruing to all or most economic activity in the area as a result of large and diverse labor markets, support services and consumer demand. Localization economies involve savings to firms in a particular sector that result both from the fact that firms producing inputs and services to this sector are likely to co-locate in the same area in response to demand, thus reducing

costs, and from the easy communication and spread of ideas and innovations among firms in the same sector

Quigley (1998) provides a review of research on agglomeration economies in general. He writes:

The general finding is a parallel shift outward in the production function for larger metropolitan areas. For example, Shefer (1973) analyzed a group of 20 industries across MSAs, concluding that doubling city size would increase productivity by 14 to 27 percent. Sveikauskas (1975) used more sophisticated methods but a smaller number of industries and found that a doubling of city size would increase output by six to seven percent. Segal (1976) aggregated across industries but constructed careful measures of urban capital stocks and concluded that in “large” cities of about two million or more in population, productivity was about 8 percent higher than in smaller cities (Quigley 1998, 134).

In her review, Beeson (1992, 23) concludes that “the empirical evidence to date indicates that productivity growth tends to be highest in the largest metropolitan areas.” She cites Fogarty and Garofalo (1988) and her own work, but does note that the relationship may be non-linear with the growth rate of productivity higher for very large and small cities and lower for those in between.

Glaeser, Kolko, and Saiz (2001) found that as metropolitan area size doubled in 1980, wages rose by 5.1 percent. By 1990 wages rose by 8.2 percent for every doubling of metropolitan area population. Glaeser et al. (1992) note that not only do these findings indicate agglomeration economies increase with size, but that they also cast doubt on the argument that agglomeration economies are declining.

There is a lively debate in the literature on whether localization economies or urbanization economies play a more important role. Since localization economies derive from external benefits accruing to firms located where there are many other firms in the same industries and urbanization economies derive from the co-location of large numbers of firms regardless of industry, some measure of industrial specialization is usually used as a variable. If localization benefits are driving total agglomeration benefits, we would expect to see economic growth increasing faster in areas with higher industry concentrations. If urbanization benefits drive agglomeration benefits, growth should be quicker in areas with a wider variety of industries at the core of their economy. Some research suggests that agglomeration benefits exist for areas with higher concentrations in

industries that share a similar knowledge base (and therefore, labor pool) but that within industries, increased competition does not provide agglomerative advantages. Feldman and Audretsch (1999) find that innovations decrease with higher industry concentration but rise with higher concentrations of industries that share the same knowledge base.

Labor Force Quality and Cost

Human Capital: It is nearly universally accepted that human capital is of critical importance, both as a determinant of individual success in the labor market and of the economic fortunes of regions. Why should this be the case? Labor, while universally recognized along with capital and land as the key factors in the production process, is not an undifferentiated factor; it varies in its quality. Higher quality labor is labor that, because of its characteristics, is more productive – it produces higher output per unit of labor. The characteristics of labor quality vary by activity and type of good or service being produced. In earlier times physical strength and durability were critical attributes of high quality labor for production, while the ability to make accurate calculations quickly was an important attribute for sales personnel. Over the past decades there has been an increasing emphasis on intellectual skills embodied in human capital as an important differentiator of labor quality. Endogenous growth theory in particular emphasizes the role of human capital in economic growth.

Thus, it is not surprising that the most consistent finding in the empirical literature is that human capital (education and skills of the area labor force) is significantly and positively related to metropolitan area growth in economic activity. In his review of the literature on economic development, Malpezzi (2001) argues that human capital is a strong and consistent predictor of economic growth at the regional level. Human capital in most of the empirical studies is proxied by level of education, usually the percentage of an area's population with a college degree, although some studies include the percentage with a high school degree or with less than a high school degree.

The strong relationship between human capital and employment growth is consistent across a number of different model specifications, data sets, and time periods. At the metropolitan level, empirical evidence confirms the strong relationship between

the percent of a population with a college degree and growth in employment (Blumenthal et al. 2009, Dalenberg and Partridge 1995).

Nor is this relationship a recent development. Simon (1998) examined the effects of human capital on employment growth at the metropolitan and city levels from 1940 through 1986. He found that human capital is a significant predictor of employment growth with the relationship growing stronger over the time period of study. In various specifications, he employed percent of the population with a high school degree, percent of the population with a college degree, and median years of education. All different operationalizations of human capital were statistically significant and positive, though college education tends to have a larger substantive effect than either high school education or median years of education.

Bhatta (2001) found a statistically significant and positive relationship between college education and per capita income growth. Shapiro (2003) found that from 1940 to 1990, a 10 percent increase in a metropolitan area's college educated population was associated with a roughly 0.6 percent increase in the area's employment growth. Growth in wages tends to be higher in cities with greater concentrations of college-educated residents. Overall, a 10 percent increase in the share of college-educated residents leads to a 0.2 percent increase in wage growth. Weissbourd and Berry (2004, 32) studied the determinants of metropolitan area per capita income and average wage per job and concluded that of all the variables included, education was the single biggest driver of economic growth over the 1990s. Their findings indicated that for each two percent growth in the proportions of college graduates income growth increased by roughly one percent. Pack (2002) also found that the percentage of MSA population with a college degree in 1970 was significantly and positively related to growth in MSA per capita income between 1970-1990. Glaeser and Saiz (2004, 67) estimate that a metropolitan area with an additional 10 percent of its population with college degrees will have an increase in expected income growth of two percent. Rauch (1991) finds that an additional year of average education in a metropolitan area is associated with an increase of 2.8 percent in total factor productivity (defined in terms of wages and rent).

One would also expect that over a larger set of industries, those industries that are most dependent on skilled labor would see the strongest relationships between human

capital and employment increase. For example, Carlton (1983) found that technical expertise (measured by the number of engineers in a region) increased employment in the Communication Transmitting Equipment, but not in Fabricated Plastic Products or Electronic Components.

In addition, formal higher education is not the only route to economic competitiveness and growth; training and spillovers also positively increase productivity. Marcotte (2006) found that taking courses at a community college has a positive effect on earnings, even if the students did not obtain a credential, such as a certificate or associate's degree.⁵ However, Blumenthal et al. (2009 forthcoming) found that the percent of the population that had attained some college but not a bachelor's degree was not significant for either metropolitan employment or GMP growth, although the percentage of the population with at least a bachelor's degree was significant for both.

Human capital seems to have an additive effect as well, with high rates of human capital generating human capital growth in addition to economic growth. Berry and Glaeser (2005) find that in recent years, areas that started with higher levels of human capital (measured as the share of the population with a bachelor's degree) tended to experience higher rates of growth in human capital.

These findings suggest that regardless of how growth is defined – employment, wages or income – education contributes to regional economic growth, and that college education has a stronger predictive value than does high school. However, since labor markets are generally metropolitan wide, human capital differences (as well as labor cost differences) are unlikely to play an important role in the location of most economic activity *within* a metropolitan area.

Labor Cost: Neo-classical economic theory suggests that regional labor cost as well as quality affects an area's competitive advantage, particularly for lower-skill sectors. High

⁵ See also Weissbourd and Berry (2004) who found that in 39 of the top 100 cities, the number of adults with some college and no degree was greater than the number with college degrees (p. 30). Weissbourd and Berry examined the relationship between education and income, using high school degrees, college degrees, associate degrees, and some college but no degree. Interestingly, they found a positive relationship between high school degree and change in city per capita income but a negative relationship between some college and change in income when controlling for the other levels of education. Glaeser, Scheinkman, and Shleifer (1995) found that the percent of the population with high school degrees and some college is more important than the percent of college graduates for city population growth.

wage rates, controlling for productivity, in a comparable industry and occupation in one area relative to another ought to result in the decline of economic activity over time in the former area and a consequent decline in wage rates. However, the empirical literature provides a set of diverse findings.

Bartik (1992) reviewed 44 econometric studies on the effects of wages on business location decisions conducted between 1979 and 1991. He found that in 25 of those studies wages had a negative and significant effect on business location decisions.

Henderson, Kuncoro, and Turner (1995) estimated that, controlling for labor quality, a 1 percent increase in area wages for the five manufacturing industries they examined reduced metropolitan employment in those industries by one percent. Wasylenko and McGuire (1985) also found, although at the state level, that state hourly pay for manufacturing workers was negatively and significantly related to state employment growth, controlling for state median years of education. Blumenthal et al. (2009, forthcoming) found that average metropolitan area wage per job in 1990 was negatively related to area employment and GMP growth between 1990-2000 (i.e., areas with higher wage rates in 1990 experienced slower growth over the course of the next decade). However, it is important to emphasize that these findings occur in the *ceteris paribus* condition. Higher wage rates that imply higher productivity and higher skills, if required for a job, may not indicate a competitive disadvantage.

Moreover, in this area, as in many others, findings are not consistent, and empirical evidence does not always support the hypothesis that high wages are an impediment to growth. Simon (1998) found that from 1977 to 1997, original wages were an insignificant factor in employment growth across 39 industries. Using data from 1966 to 1981, Dahlenberg and Partridge (2001) also failed to capture a relationship between manufacturing wages and employment.

On the other hand, Weissbourd and Berry (2004) found that the relationship between wages and wage growth is quadratic or U-shaped. For wages lower than about the median, \$21,090; increasing wages reduce economic growth. After wages reach about the median, growth in wages is positively related to original wages. Thus, in areas with lower than average wages, employers seem to be attracted to cheap labor, while in

areas with higher than average wages, employers follow more expensive labor, possibly since higher-end labor tends to be more skilled.

Weissbourd and Berry's findings regarding the higher end of the wage distribution and human capital's impact are supported by the work of Berry and Glaeser (2005). The latter find that in the 1970's the relationship between original wages and wage growth was negative 36 percent, but that in the 1990's, the relationship was positive 15 percent, a switch they attribute to the increasing importance of education in economic growth. Recognizing the increases in productivity that accompany education (Glaeser and Saiz 2004), increased wages are an acceptable price for employers if they are paying for higher quality human capital. As noted above, Rauch (1991) finds that both years of experience and years of education generate externalities that lead to higher metropolitan wage increases and estimate that for each additional year of average education levels, total factor productivity increases 2.8 percent. Since most econometric models include a human capital measure that reflects education levels, but does not account for years of experience or intangible skills such as creativity, it is possible that the positive relationship observed between wages and economic growth at the higher end of the wage distribution is capturing some of the omitted effects of human capital.

Labor Supply: Since labor is an input into production, we would expect that as the labor supply increases, economic growth would as well, both because labor is readily available and because excess labor supply ought to put a downward pressure on wages and thus the cost of production. In a study of GSP growth from 1969 to 1986, Mullen and Williams (1994) find that increasing civilian labor forces do tend to increase the rate of GSP growth.

High and non-transitory unemployment levels, which indicate labor availability, should also impact economic growth over time, but the direction of the relationship is unclear. Traditional economic theory would suggest that high levels of unemployment generate excess supply, driving down the cost of labor and thus attracting labor intensive industries. If this were the case, we would observe both employment and wage increases in locations with high original unemployment. However, high unemployment levels are also an indicator of low human capital and given the strength of the relationship between

human capital and wage growth, we might also observe declining wages in areas with high original unemployment. Weissbourd and Berry's (2004) findings weakly support the latter hypothesis – a one standard deviation increase in original unemployment is associated with a 0.17 standard deviation decrease in wage growth, albeit a substantively small relationship. Firm location research finds a mixed relationship between unemployment and growth – in Fabricated Plastics, there was a positive relationship observed between unemployment and firm location, but in Electronic Components, the relationship is negative; and in Communications Transmission Equipment, there is no relationship (Carlton 1983). Data from the 1960's to 1980's suggests a negative relationship between unemployment and employment growth (Dalenberg and Partridge 1995, Modifi and Stone 1990). These mixed results suggest that there is not a clear relationship between unemployment levels and economic competitiveness – and that unemployment is a poor proxy for labor supply since it is likely to pick up labor quality aspects as well.

Transportation Access and Costs

The earliest theoretical approach to the location of economic activity focused on transportation cost minimization as the major factor in determining firm location. Firms would locate close to either their market (or, if their markets were dispersed, at some median location among markets) or their source of raw materials, depending upon the weight and value of inputs and final outputs, the presence of transportation networks, and the consequent cost of transportation. Thus, if inputs had low value per weight and were concentrated in a single area, and if markets were dispersed, the rational firm would locate in close proximity to the source of its major input to minimize production costs. Areas that were located close to transportation facilities (ports) or were highly linked into transportation networks (rail or highway) were advantageous locations for firms with widely dispersed markets and low input costs relative to the final value of the good. Lower transportation costs were a major factor in the formation of “hub” cities – cities that grew up around their comparative advantage in offering low-cost transportation venues (Konishi 2000). Many of these hub areas continue to prosper since they have

well-established concentrations of industries, yielding agglomerative benefits, as well as continuing to offer transportation access at lower average costs (Fujita and Mori 1995).

The research results discussed below show that transportation costs and access remain an important and relevant component of firm location decisions, although the development of the interstate highway system and of air transport has changed the relative importance of transportation modes as well as the advantage of regions relative to one another.

In a review of the empirical literature on location determinants, Laulajainen and Stafford (1995) found that studies have shown that manufacturing firms were influenced most frequently by transportation issues. That is, the chief determinants of where a manufacturing operation would locate were access to raw materials and costs of bringing materials to plants (Cohen 2000). The Deloitte survey of corporate real estate executives (Mackay 1994) found that transportation ranked third among 17 factors as site selection factors for large corporations.

Recent research indicates that regions whose airports are highly connected to the national and global economy are likely to experience greater economic growth than those regions less well connected. Brueckner (2003) found that every 10 percent gain in airport traffic is related to a 1 percent gain in service employment. Green (2007) found that “a one standard deviation increase in [airplane] boardings per capita produces an 8.0 percent increase in employment growth... [Airline] hub cities saw employment grow between 8.4 percent and 13.2 percent faster than in nonhub cities.” Some research has shown that after 1950 at the regional level, airport centrality is a better predictor of employment growth than is highway access (Irwin and Kasarda 1991).

Transportation is also an important factor in intra-regional economic development. While inter-regional growth is related to access to major transportation hubs that can move large quantities of inputs and outputs, such as ports, rails, or airports, intra-regional growth is more heavily impacted by transportation access for individuals. In the New Jersey counties bordering New York City, employment growth was positively related to access to both highways and commuter rails (Boarnet 1994). Voith (1996) finds that Philadelphian suburban property values are more heavily impacted by job growth in neighborhoods with access to public transportation and shorter commute times.

These findings suggest that transportation's ability to increase the fluidity of the labor force provides small jurisdictions with a competitive advantage, while regions with the ability to mobilize resources and final products enjoy a competitive advantage regionally.

Intra-regionally, there is some evidence that transportation hub status gives that location an advantage over other jurisdictions in the region. Looking at county employment growth relative to central county growth, Levernier and Cushing (1994) find that county job growth decreases slightly with increased tonnage shipped through the central county port; and that there is a strong, negative relationship between central county access to a highway corridor accessing external markets and the growth of outlying counties.

Land Costs/Housing Costs

Land costs might affect area economic growth and firm location decisions through two different mechanisms. First, the cost of land is a cost to the firm in the production process, and the importance of land costs rises for sectors or for specific firms that require substantial amounts of land. To the extent that the cost of land varies inter-regionally, land costs should be a factor in inter-regional location decisions. Land costs are also the primary component in residential housing costs, and areas with high housing costs may find it difficult to attract labor. This might be a particular location deterrent to firms that need to attract high quality and educated labor from outside of the area.

Land costs may also affect economic growth intra-regionally. In fact, it has been suggested that land costs are a more important factor for intra-regional economic competition than they are for inter-regional competition as they play into the firm location decision only after a region has been selected for expansion (Blair and Premus 1987). Data jointly modeling population and employment growth in terms of competition between counties and their central cities found that during the 1970s, housing prices (of which land costs constitutes the greatest portion) were the single biggest driver of population growth (Levernier and Cushing 1994). The elasticity of county population growth with respect to housing costs was well over 1 for white residents and almost 8 for black residents (both significant at the 0.01 level). Population

growth then turned out to be the single biggest driver of employment growth during this period.

Energy Cost

Similar to labor, energy is an input used by all industries. Thus, it is expected that high energy prices would be a deterrent to economic growth as they increase the costs of production and that areas with relatively high energy prices would be disadvantaged as locations for energy intensive economic activity. During the 1970's, electricity prices (defined as the average industrial bill for the 300 to 600,000 KWH use class) were a significant, negative indicator of employment growth in the aggregate, and for all sectors except manufacturing (transportation, wholesale trade, retail trade, FIRE, and services) (Wasylenko and McGuire 1985). Looking at the effects of energy costs (measured as electricity price for 300 KW – 120,000 KWH and city gate price of natural gas), Carlton (1983) found that energy prices had a strong negative relationship to firm location choices in the Fabricated Plastic Products, Communication Transmitting Equipment, and Electronic Components sectors and were a better prediction of location than were wage rates.

Tannenwald (1996) used the hypothetical firm approach to evaluate the effects of energy price on capital spending. He modeled energy prices as cost per million of BTUs of fossil fuels and electric energy, and average cost per million BTUs from all forms of fuel for the industrial sector, and found that industrial energy costs have a strong negative relationship to capital investment. These studies suggest that high energy prices do, in fact, reduce economic growth and provide high energy cost regions with a competitive disadvantage.

Since energy prices are likely to vary between regions but not within regions, energy costs may affect inter-regional location decisions but not intra-regional ones. For example, in a study of increases in new manufacturing establishments in Indiana during the late 1980's, the authors tested for the effect of utility prices on new establishment births, finding no relationship (Rainey and McNamara 1992). However, a relationship is

plausible in multi-state regions, where two or more regulatory regimes exist or where there are multiple utility providers, as is the case in the Washington, DC region.

State and local taxes and services:

Taxes are a cost of doing business. Public services are benefits to the state and community in which a business is located. Some of these public services benefit business directly - infrastructure provision and maintenance, police protection, trash disposal – while others such as education and health care have indirect benefits. Taxes are a deterrent to business location and economic growth, while a high level and quality of appropriate public services are an attraction. But, as is widely recognized but not always taken into account, taxes pay for public services.

Given the above, it is not surprising that the vast literature on the role of public sector fiscal policy on an area's competitive advantages can be summarized, at one level, quite succinctly. If the level of spending and quality of public services are held constant, *increases in taxes* negatively affect employment and economic activity. If the level of taxes is held constant, *increases in public services* positively affect employment and economic activity. Put another way, for any given level of taxes, an area that can provide services more efficiently and/or more appropriate for the needs of business will have a competitive advantage over other areas. For any given level and mix of services, a community that can provide these at a lower tax burden to business will have a competitive advantage over other areas. Both of these effects have a much larger effect on the competitive advantage of municipalities relative to one another within a metropolitan area than they do on the competitive advantage of a metropolitan area relative to other metropolitan areas.

There is much less agreement, however, on the magnitude of these effects. In a meta-analysis of the literature on the effects of taxes, Bartik (1992) found a small to moderate, but statistically significant and negative relationship between tax rates and economic growth (elasticity in the range of -0.1 to -0.6), with the magnitude very sensitive to model specification and data source. Manufacturing businesses appeared particularly sensitive to tax rates, while the impact decreases for all industries in larger,

more urban locations. In an ideal situation – a small, suburban community seeking to attract manufacturing industries, the impact of tax rates on growth is strong enough that it is *plausible* for a small suburban district to decrease their tax rates and increase their tax revenues. However, Bartik cautions that each job created could cost between \$1,906 and \$10,800 in forgone revenues not including the additional costs of providing city services to new residents.

Noting Bartik's conclusion drawn from a review of the literature that a reduction in taxes of ten percent will increase employment, investment or firm births by between one and six percent, Wasylenko (1997, 38) remarks, "The range of the elasticity is not estimated with much precision, and it matters a great deal to policymakers whether the elasticity is -0.1, -0.6, or somewhere in between." After his own review of the literature, Wasylenko (1997, 49) concludes, "taxes have a small, statistically significant effect on interregional location behavior. The suggested estimate of interregional activity is -0.2." Thus, a ten percent increase in taxes would reduce economic activity by approximately two percent.

Two literature reviews, Lynch (1996) and Kusmin (1994), find little evidence that the level of state and local taxation figures prominently in business location decisions. Lynch, in particular, stresses that there is no evidence that state and local tax cuts, when paid for by reducing public services, stimulate economic activity or create jobs. Lynch also reviewed several surveys and concluded that there was a modest potential impact of taxes on location decisions. For example, in a 1978 survey, Schmenner found that firms were almost as likely to relocate to areas with higher taxes, as they were to relocate to areas with lower taxes (Lynch 1996, 22).

Tomljanovich (2004) examined the effect of various taxes on state economic growth and concluded that sales tax rates, corporate income tax rates, property tax rates, and income tax rates have little or no effect on state growth rates. This result is generally consistent with the findings above. However, Yamarick (2000) found that both personal income and marginal property tax rates have a negative impact on growth in state economic activity, whereas the sales tax rate is insignificant.

Within a metropolitan area changes in tax policy will have a much more pronounced impact on economic growth for the individual jurisdiction increasing (or

reducing) local taxes. For example, summarizing research on how differences in property tax rates across local governments within a metropolitan area affect economic growth and development, Bartik concludes that a 10 percent reduction in a community's local business property tax will increase business activity in the community by around 20 percent – *assuming all other communities leave their property tax rates unchanged and there is not an offsetting decrease in local spending* (Bartik 1994, 853, italics added). Again, the caveat that all things must remain equal to realize these results is not a realistic assumption when local governments within a metropolitan area are likely to engage in inter-jurisdictional competition.

These findings are consistent with subsequent research by Mark, McGuire and Papke (2000). Looking at population and employment growth across local governments within the Washington DC metropolitan areas, they find that employment growth rates are highly sensitive to the levels of personal property tax and sales tax. In each case, a 10 percent reduction in the tax would be expected to increase employment by approximately 20 percent over the long term. Their empirical results suggest that local real property taxes are not important influences in either residential or business location decisions. Similarly, they conclude that taxes on individuals (personal income, sales, and residential property taxes) are not important influences on residential choice (Mark et al. 2000, 121).

On the service side, government services can be considered either a cost reduction to a firm located in the area (e.g., the higher the quality education system, the lower the firm's cost for on-the-job training) or an amenity to it or its employees. As noted above, however, not all public expenditures are of equal value to a firm. Fisher (1997), in his review of the literature concludes, "In many studies, government spending, public capital, or public services are estimated to exert a positive and statistically significant effect on economic development... But the results vary greatly. Perhaps the most that can be concluded is that some public services clearly have a positive effect on some measures of economic development in some cases." Of the public services reviewed, Fisher finds that only for transportation are there consistent findings of a positive relationship, while the other services – public safety, education, and public capital – have different effects across different studies.

Very few of the studies Fisher reviews use metropolitan areas (as opposed to states) as the unit of analysis to allow estimation of the competitive effect of metropolitan area service levels controlling for taxes as well as other factors affecting area competitive advantage. This is largely because taxes are not levied at the metropolitan level but rather at the state and local levels. Modifi and Stone (1990) estimated the effect of state and local taxes and expenditures on manufacturing employment and investment for all 50 states between 1962-1982. They found that even after controlling for taxes, public expenditures had a negative effect on manufacturing employment and investment in states where the increases were for transfer payments, but a positive effect when the added spending went to health, education, and public infrastructure purposes.

Dalenberg and Partridge (1995) examine the determinants of total employment among 28 metropolitan areas over a 15 year time period and find that, controlling for tax revenues, change in metropolitan area education spending is positively and significantly related to employment change, while change in metropolitan area highway spending is negatively and significantly related. However, as Fisher (1997) points out, these measure the effects of marginal changes (and thus areas that spend more on highways may have poorer roads to begin with) and, more importantly, reflect inputs (spending) rather than outcomes (e.g., quality education, safe and efficient roads). Additionally, firms do not receive general metropolitan area public services, but public services from the specific jurisdiction within that area where they locate. Thus, it makes sense here to look at intra-metropolitan studies. Fisher reports that Luce (1994) found that local government highway expenditures and public safety expenditures were positively related to local employment within metropolitan areas.

One huge limitation in the ability of econometric approaches to sorting out the effect of taxes and public services on economic growth is the difficulty in obtaining a valid estimate of the independent variables, tax burden and the quality of government services. With respect to tax burdens, Tannenwald (1996) argues that tax competitiveness should be a measure of the tax burden a *marginal facility* will bear over its entire *lifetime* and should account for taxes to all levels of government (federal, state, local) and the interaction of taxes with profits. He argues that some of the most common indicators – statutory tax rates, taxes paid as a percentage of income – to name a few fail

this test. Tannenwald then uses an alternative approach to evaluate the effects of taxes on economic growth. He models the after tax returns for various hypothetical firms and looks at the relationship between adjusted profits and capital investment using data from New England in 1991. He finds that the relationship of after tax rate of return to marginal investment is insignificantly related to capital investment but that average per capita expenditures on public safety are positively related to investment. It should be noted that this methodology was a replica of a study by Papke (1987) using 1978 data, which found opposite results – taxes reduce investment while public safety spending has no impact. Tannenwald (1996) attributes the differences in results to slightly different model specifications, industry samples, and macroeconomic differences between the time periods. When Fisher and Peters (1998) use the hypothetical firm approach, they find that going from the worst possible jurisdiction to the best in terms of tax policy and incentives offered to firms would result in considerable savings to a firm, but that cost savings are fairly small when comparing similar jurisdictions.

Spatial Economic Development Incentives

A major issue in the field of economic development is the extent to which government policies designed to attract firms actually succeed in this endeavor. Presumably subsidies that effectively lower the cost of production for a firm will, *ceteris paribus*, provide it with an advantage if it locates in the area providing the subsidy. Opponents of efforts to attract firms argue that when sub-national governments compete, the result is no new job creation and less economic development for the nation as a whole. However, while this may be true nationally – or statewide – for an individual locality successfully attracting economic activity through offering a subsidy will be positive-sum if the benefits derived by the local governments exceed its cost. Tannenwald (1996) notes that fiscal competition between sub-national governments is a 350 year old practice in the U.S. and that in moderation; it can promote efficiency in state and local government.

However, the question is whether such subsidies work (and at what cost) or whether they are more likely simply to provide a windfall for firms that would have

located in the area in any case. Malpezzi (2001) provides a good discussion on the use of specific tax abatements. As he notes:

Today, nearly every state and the majority of municipalities provide at least some such incentives to some firms. The "traditional" view of economists, at least until a decade ago, was that firm-specific incentives were usually "infra-marginal subsidies," that is, tax breaks given to firms that had already decided to move there for other reasons. Certainly firms who decide to pick a particular location on transport, labor force, and other grounds have an incentive to claim to local officials that they are actively considering other locations in hopes of getting a tax break. Many studies in the seventies and early eighties seemed to confirm this. However, some recent research suggests that while not as central to the location issue as labor force, input, transportation, and other issues, on the margin, taxes can matter.

In a 1990 study, Rubin (1990) found that 32 percent of firms granted New Jersey enterprise zone tax incentives said that these incentives were the sole or major factor in their location decision; 68 percent said such incentives were not the sole or major factor in their location decisions. Surveys by Inc. Magazine, Fortune, and Industry Week found that taxes, and to a lesser extent, business incentives did play a role in business location decisions; but all these surveys found that tax incentives were less important than economic variables like worker productivity, efficient transportation networks, and access to materials and products.

However, targeted tax incentives by a local government within a metropolitan area do seem to be more effective than metropolitan-area-wide or statewide tax incentives. If one suburb cuts its taxes within a metropolitan area, and others do not, it is likely to see an upsurge in business activity. Bartik (1992) and Haughwout and Inman (2002) imply, however, that business tax relief in central cities may not be as effective as such relief in suburbs.

Anderson and Wassmer (2000) review the literature on economic development incentives finding that they are prevalent at the local level across the U.S. and take on a number of different forms. They conclude that "there are both theoretical and empirical reasons to believe that local taxes, business-related expenditures, and economic development incentives can influence the intrametropolitan location of business firms" (P.59).

Infrastructure

Roads, transportation networks, water and sewer lines, communication networks, and other infrastructure facilities are frequently seen as critical factors to be in place for economic growth to occur in developing countries, although the literature doesn't accord them the degree of importance it previously did. Nonetheless, it seems intuitive that the level and quality of infrastructure are important for efficient production in developed countries as well in developing ones. Thus, we might expect that all else being equal, better quality infrastructure would increase regional competitiveness. Indeed, this appears to be the case at the national level. Bell and McGuire (1997) review a broad array of studies and conclude that infrastructure investments have a modest positive effect on the nation's private sector economic activity. This conclusion confirms a general intuitive belief that infrastructure networks (roads, airports, water and other core infrastructure services) are important ingredients in a modern, productive economy.

However, it may be the case that, while some threshold level of infrastructure is required for efficient production, achieving higher levels above that may provide diminishing cost advantages and that, in any case, the level and quality of infrastructure may not differ significantly among regions within a developed country such as the United States. In that vein, Malpezzi (2001) writes that while the magnitude of the effect of infrastructure on economic development is unclear, there is a consensus in the literature that "appropriate" infrastructure provision will improve productivity and generate returns on investment. By "appropriate" he means that some infrastructure investments that will generate higher returns than others, and he notes that in the U.S. there is a bias against maintenance in favor of new capital products. If infrastructure maintenance varies substantially among regions, then differences in infrastructure quality may translate into cost disadvantages for firms located there.

A difficulty with empirical research on the importance of infrastructure as a factor in an area's competitive advantage is that it is difficult to get a meaningful measure of the quantity and quality of local characteristics. Dalenberg and Partridge (1995) measure metropolitan infrastructure as the value of stock of road, water, and sewerage public capital as a percent of metropolitan personal income, and find a negative relationship

between public infrastructure level and employment growth. Looking at state level data from 1970 – 1986, Evans and Karras (1994) attempt to measure the relationship between public capital and private productivity (defined as private nonagricultural gross state product). The authors look at the net stocks of: highway capital, water and sewer capital, other infrastructure capital, and government capital; and current services for: education, highway, health and hospitals, sewers and sanitations, and police and fire. Across a number of specifications, the authors found either negative or nonexistent relationships between government infrastructure and private output for all variables except education, which was positively related to private productivity. However, Fisher (1997) found that of the 15 studies he reviewed that included measures of highway facilities or spending, 10 found positive impacts on economic development, with 8 of the studies having statistically significant findings. Part of the difficulty is that most measures rely on spending or stocks (in monetary value terms) without accounting for quality. Since increased spending may be an indicator of low quality, a negative relationship between spending and growth could signify that infrastructure quality is an important predictor of economic growth.

Thus, the empirical evidence finds an unclear relationship between infrastructure and economic growth at the state and regional levels. We were unable to find any research at the intra-regional level, but obviously local infrastructure elements that are part of a regional network and maintained regionally are unlikely to vary much across the region. Infrastructure components that are built and maintained by local government units (e.g., local roads), may vary in quality, and, reasoning from the above discussion, if the quality of the infrastructure is poor enough in comparison to other localities, may disadvantage the local government as location for certain kinds of economic activity.

State and Local Business Environment

Surveys of business executives (especially Cohen 2000) and much anecdotal information identify an area's "business climate" as an important factor in location decisions and as a deterrent to growth if the area is identified as having a poor business climate. The attributes of business climate, however, are difficult to identify

conceptually – like pornography, it appears that business people know it when they see it – and are even more difficult to measure. They range from broad cultural attitudes towards business, to state or local laws and regulations that impose restrictions on business or tilt the balance of labor and management more towards labor, to inefficient governmental practices that cause excessive delays in businesses receiving required government approval. Some of these business climate attributes are a function of the state government and affect all sub-units in the state, while others are features of local level governments. All of these in some ways impose costs on business activity and/or make that activity a more unpleasant exercise.

Business climate issues have been examined more at the state level than at the regional level. Right to work laws and percentage of the labor force that is unionized have both been used as measures of state business climate. Right-to-work laws are state laws that prohibit union shops.⁶ Union shops, legal in 28 states, require that if employees at a firm are unionized, all employees at that firm must belong to the union. In 22 states, however, employees are not required to join a union even if other employees at that firm have unionized. These employees have the “right to work.” They may choose to belong to the union, but are not required to

Right-to-work laws are highly controversial; yet research suggests that right-to-work laws are a reasonable method of reflecting states’ business environment. For example, Holmes (1998) proposed that enactment of a right-to-work law reflects a state’s pro-business policies, citing a consulting firm’s study in which those states that had high rankings on 15 “pro-business” characteristics of state policy (of which right-to-work was only one element, and all were equally weighted) all had right-to-work laws. Grimes and Ray (1988) found a positive relationship between employment growth between 1950 and 1985 and right-to-work status. The growth rate in those states with right-to-work laws was consistently above the national level. Grimes and Ray explicitly note that the differences between right-to-work states and those without such laws may reflect social, political and economic differences.

Tannenwald (1997) examined studies of right-to-work laws, finding that they had a positive and statistically significant association with economic activity, but raised

⁶ The following section is drawn from Blumenthal et al, 2009, forthcoming.

concerns of endogeneity and other problems with studies that used the variable. Holmes (1998) sought to address the identification problem by examining manufacturing growth in counties across state borders between states with and without right-to-work laws. He found that crossing the border from an “anti-business” to a “pro-business” state, as indicated by passage of a right-to-work law, was associated with a greater increase in the share in manufacturing and a higher growth rate in manufacturing. Results were similar when he considered share of employment in large establishments rather than in manufacturing, although the differences across borders were insignificant when considering large establishments in industries other than manufacturing.

Blumenthal et al. (2009, forthcoming) found that the existence of state right to work laws was positively and significantly associated with growth in employment and in gross metropolitan product for metropolitan areas in states that had such laws.

Unionization levels are also used as a measure of state business climate. Bartik (1985) found that unionization levels had a negative effect on employment and the existence of right-to-work laws had a positive effect on manufacturing plants’ location decisions, which suggests that metropolitan areas in states with right-to-work laws are more attractive to manufacturers, and perhaps to other businesses. However, in a review of the literature on unionization he wrote six years later (1991), Bartik found that there was insufficient evidence across studies to conclude that unions have a negative effect on economic growth and Carroll and Wasylenko (1985, 1994) also fail to find a relationship. At the intra-regional level, Leichenko did not find a relationship between city competitiveness and unionization rates either.

Federal and state regulations that differentially affect regions and impose higher costs economic activity in some areas than in others also can affect an area’s competitiveness for some kinds of activity. In an attempt to measure the effects of regulation on firm location choices several studies take advantage of variation in enforcement patterns under the Clean Air Act. Under 1977 amendments to the Clean Air Act, each county in the United States is classified as being either in or out of attainment on a yearly basis. Within nonattainment counties, firms are subject to more stringent regulation, with larger and newer firms facing tougher targets than older and smaller

firms. Alternatively, in attainment counties, only new, very high-emitting firms are subject to regulation.

To test the effects of regulatory stringency on firm location, size, and organization, Becker and Henderson (2000), look at firm births and sizes for four high-polluting industries (industrial organic compounds, miscellaneous plastic products, metal cans and barrels, and wood furniture) and a control group of low-polluting apparel industries from 1963-1992, both in attainment and non-attainment counties. The authors find that high-polluting industries in non-attainment counties experience a decline in plant births ranging from 26 percent in plastics to 45 percent in industrial organic chemicals, with the effect hitting the corporate sector a full census period before it hits the nonaffiliated sector. The authors also observe an increase in small firm births relative to large firm births in non-attainment counties for high-pollution industries (Becker and Henderson 2000). In attainment counties (not subject to significant EPA regulation), these patterns in plant births were not observed

Also, taking advantage of variation in Clean Air Act enforcement, Greenstone (2002) estimates the effects of environmental regulation on employment, capital stock, and output. He uses data on all plants in the U.S. from 1967 to 1987 and measures attainment status by county for each of the four Clean Air Act toxins - CO, O₃, SO₂, and TSPs. Greenstone concludes that during the first 15 years of the Clean Air Act, pollution-intensive industries in non-attainment counties lost 590,000 jobs, \$37 billion worth of capital stock, and \$75 billion worth of output. These studies suggest that, at least as far as environmental regulation goes, businesses are sensitive to regulatory policies in terms of location choices, investment decisions, and output levels. With respect to inter-regional vs. intra-regional importance, in the case of environmental regulation findings were observed at the level of enforcement – counties in this case. For regulations at the state or city level, states or cities respectively, are likely to be where variation in regulatory impacts on economic competitiveness are most likely to be observed.

Amenities/quality of life

With human capital becoming an increasingly strong determinant of economic competitiveness, those areas that have or are better able to attract a more highly educated and trained labor force may have a competitive advantage for economic activities requiring more highly skilled labor. Amenities and quality of life are important because there is increasing evidence that highly educated people who are residentially mobile and have a variety of job options favor areas with a high quality of life. In short, the conventional assumption that people follow jobs may in some cases be turned around. For certain kinds of jobs that require high levels of education and for which there is national demand, jobs may follow people; firms may locate disproportionately in areas where desired amenities are present to gain access to the educated labor force that has chosen to locate there. In some cases, the literature suggests that employees will also accept lower wages if they can locate in a place with high amenity levels, allowing firms to pay less for labor and access a more qualified labor supply.

Recent empirical evidence appears to support the importance of amenities, more than did earlier studies. In his review of the literature, Malpezzi (2001, 91) notes that “A growing number of studies have documented the potential economic importance of a clean environment, a desirable climate, and in general localized amenities (as a determinant of economic growth).” Studies have shown that lifestyle amenities are particularly important for companies that require higher skilled, more talented labor. “The future of most cities depends on their being desirable places for consumers to live. As consumers become richer and firms become mobile, location choices are based as much on their advantages for workers as on their advantages for firms” (Gottlieb 1994).

Rauch (1991) finds that amenities (a culture per capita index based on the number of symphony orchestras, opera and dance companies, theaters, public television stations, fine arts radio stations, museums, and public libraries in a metropolitan area) are negatively and significantly related to average wages, implying that workers are willing to accept lower wages (thus implying lower labor costs for area firms) to gain access to the increased area amenities available.

Recently Richard Florida (2002) has emphasized the importance of amenities and lifestyle characteristics as a contribution to urban economic growth and development. He presents data, for example, that suggests a relationship between bohemian/gay lifestyles

and growth. However, Weissbourd and Berry (2004) presents evidence that an “art score,” derived from the Places Rated Almanac was unrelated to change in metropolitan area per capita income during the 1990s. Glaeser (no date) also finds that the relationship Florida observed between bohemian/gay lifestyle and population growth disappears when years of schooling (percentage of residents with four or more years of college) is controlled for.

Gottlieb (1994) reviews and summarizes a variety of other studies, noting “few econometric studies of firm location have focused on amenities as the primary variable of causal interest....When amenities are a secondary concern in econometric studies of economic growth, the chances for misspecification or ambiguous results are greatly increased.” His review presents a variety of these contradictory results. Further, in a study that compared “traditional” economic development inputs to those suggested by Florida, the traditional inputs (educated adults, manufacturing sector size, business sector size, and proprietorships) outperformed the “creativity” inputs (creative class, tech concentration, Bohemian index, Melting Pot index, and Gay index) in predicting job growth, income growth, and job instability (Donegan, Drucker, Goldstein, Lowe, and Malizia 2008).

Climate, which is a component of quality of life factors, has also been found to be an important determinant of the location of economic activity (Gabriel, Matthey, and Wascher 1999). Desirable climate (often defined as dry and temperate) consistently has been found to be significantly and positively associated with economic growth. Blumenthal et al. (2009 forthcoming) found that climate (average July temperature) was positively related to change in gross metropolitan product. Temperature has been measured in numerous ways, including heating degree days and cooling degree days (Green 2007), and average January temperature and average July temperature (Glaeser and Shapiro 2001), and all find that pleasant places grow faster. . Glaeser et al. (2004) find that when education levels are interacted with January temperature, there is a negative relationship between the log of number of heating and of inches of precipitation and the log change in wages rates (both total and for manufacturing). The authors argue that their observed negative relationship with wages and temperature occurs because workers demand a higher wage premium when they are living in less pleasant climates.

Thus, it appears that the relationship between climate and economic advantage mostly occurs because places with pleasant climates have an advantage in attracting population – and therefore, labor pools.

Indeed, research has shown that amenities and pleasant climate attract population and workers, which, as explained above, can positively, affect economic activity. Glaeser et al. (2001) found that a variety of amenity characteristics are related to population growth at the county level. These include both temperate and dry climates, proximity to an ocean coast, live performance venues per capita, and restaurants per capita, all of which were positively and significantly related to county population growth (bowling alleys per capita and movie theaters per capita were negatively and significantly related).

Population growth is greatest in areas with warm, dry climates. Growth patterns across the nation consistently suggest that western areas grow the fastest in terms of population, followed by southern areas, with northeastern areas often experiencing population decline (Glaeser et al. 2001). Much of this regional variation may be explained by the attractiveness of warmer and dryer climates in the south and west. Glaeser (2003) finds that between 1961 and 1990, state populations were expected to grow 2.3 percent for every 1 degree temperature increase. He attributes this finding to technological improvements making southern living more comfortable (most importantly, air conditioning and improvements in sanitation that reduced diseases such as malaria) and reduced transportation costs rendering the northern competitive advantages of rivers and ports null. With the removal of barriers to settlement, people migrated to places that were more pleasant to be in. Whether climate is evaluated by controlling for region or by measuring the impact of temperatures or rainfall, econometric evidence uniformly finds that pleasant climates attract people.

Using data from the 1981 *Places Rated Almanac*, Rauch (1991) finds that pleasant temperatures increase property values (but have no impact on wages), while a dummy variable for coastal towns increases both property values and wages. When controlling for region, Weissbourd and Berry (2004) found that the Northeast (which has a cold, rainy climate) grew more slowly than the nation as a whole in terms of population. In an alternative specification, the authors found that there was a statistically significant

positive relationship between July temperatures and population growth, while average precipitation levels are negatively correlated with growth (Weissbourd and Berry 2004). Data from the 2000 census show that western cities (which tend to be the warmest and driest) experienced the fastest growth rates, followed by southern cities. Northeastern cities declined in population (Glaeser et al. 2001). During the 1970's July temperature was positively related to employment growth in aggregate, as well as employment growth in transportation and services, but not related to growth in retail trade or FIRE, and only marginally related to growth in manufacturing and wholesale trade (Wasylenko and McGuire 1985). Looking at data from 1970 to 2000, Glaeser and Saiz (2003) find that the as the number of heating days and the inches of precipitation increase, population growth decreases.

Many of the kinds of amenities that affect firm location on the inter-regional level (cultural opportunities, sports, restaurants, climate) are unlikely to affect intra-regional location, although certain dis-amenities (crime, pollution, noise or unsightliness) may be more of a factor intra-regionally than inter-regionally. Blumenthal et al. (2009 forthcoming) found, for example, that the central city crime rate was not a significant factor in determining change in metropolitan employment, earnings, or gross metropolitan product, but it was negatively and significantly related to change in city employment. This is consistent with findings from New Jersey counties in the late 1980s, which found that violent crime rates were a significant negative predictor of county employment growth (Boarnet 1994). Research from 1970 to 1990 suggests that for every 1 percent increase in crimes, cities lose 10 percent of their population. More significantly, perhaps, the population loss tends to be comprised of wealthier and more educated individuals, thus reducing the quality of the labor supply (Cullen and Levitt 1999).

Economic/industrial structure

An area's economic growth may be related to the industry portfolio that it has inherited. If the area has a substantial proportion of its employment in industries that grew rapidly nationally, it is likely to be well-positioned to grow within the area;

conversely if the industry has declined nationally, it will be difficult for a metropolitan area (or a city) to buck the national trend. However, if the labor force of a region with predominantly declining industries is particularly educated, adept, and creative, the area's economy may be able to survive and even prosper in an industry that is declining nationally (Glaeser 2003). The component of the economic base to receive the most attention is the relative size of the manufacturing sector (usually measured in terms of percent of employment), which is hypothesized to be inversely correlated with economic development. The rationale behind this hypothesis is that regions with large manufacturing sectors "likely had an industrial structure and economic base characteristic of the old economy – relatively low-skilled operations requiring low levels of human capital and therefore increasingly susceptible to global competition" (Blumenthal et al. 2009, forthcoming).

Nonetheless, the literature on the effect of industrial structure on an area's economic growth finds conflicting evidence for the hypothesis that manufacturing concentrations impede job creation. Much of the conflict appears to result from the period studied. At the metropolitan level from 1940 through 1986, Simon (1998) found that there was a negative relationship between the manufacturing employment share and employment growth from 1960-1980, but that from 1950-1960, manufacturing increased growth, and in the 1940's there was no relationship. However, Weissbourd and Berry (2004) found that the share of 1990 metropolitan area employment in manufacturing was significantly and positively related to both metropolitan area per capita income growth and average wage per job growth between 1990 and 2000, and Blumenthal et al. (2009, forthcoming) found that higher concentrations of employment in the manufacturing sector in 1990 was significantly and positively related to growth in metropolitan employment and product between 1990 and 2000. Weissbourd and Berry suggested that the diverse range of activities grouped within the manufacturing sector, including microchips and biotechnology, may account for such findings. Blumenthal et al. (2009, forthcoming) surmised that most of the expected decline in manufacturing occurred from the late 1970s through 1990 and that areas with a high manufacturing location quotient in 1990 were those that were left with, or had developed, high productivity manufacturing activity.

Indeed, in a case study of Boston, Glaeser (2003) argues that the majority of the decline in the manufacturing sector occurred up to 1980, and he chronicles how through high levels of human capital and adaptability, Boston has been able to regroup as a thriving urban center, despite having once been dependent on a manufacturing base. This suggests a final explanation for why literature on the importance of prior industrial structure to growth tends not to have consistent empirical findings: the interaction between human capital and economic structure. Glaeser and Saiz (2004) find that the relationship between education and economic growth across regions is stronger in declining cities than in growing cities, due to the importance of education in promoting adaptability. If manufacturing cities have high levels of human capital, they may be able to adapt their economic base rendering the negative effects of previous dependence on manufacturing insignificant.

Just as there is a debate about the role of the manufacturing sector in economic development, there is disagreement about the role of high-tech or high-skill industries, in their ability to induce economic growth. With the growth of high-tech areas such as Silicone Valley, California or Research Triangle, North Carolina, research has examined whether high-tech industry concentrations drive faster economic growth. Much of the difficulties in finding empirical consistency results from large differences in measurement techniques across studies. First, there is no agreement on exactly which sectors constitute high-tech industries. Second, technological innovation should promote economic growth by increasing productivity, generating knowledge spillovers, and attracting entrepreneurial and skilled labor pools. However, measuring high technology is more problematic. Malpezzi (2001) describes the following measures that have been used: number of industry scientists, academic papers published (sometimes within a specific field), university concentrations, high-tech employment growth, and patent levels. While the theoretical consensus remains, empirical data has yet to provide consistent estimates of the relationship between high tech industry and economic development. Note that many of the measures of high-tech industries (such as papers published and universities) are likely to be correlated with the most common measure of human capital – college education.

Despite this uncertainty regarding the importance of the high-tech sector (defined as SIC industries that spent above-average revenues on research and development and employ an above-industry-average number of technology-using occupations), recent research by Devol (1999) found significant relationships between metropolitan output in high-tech industries and total metropolitan growth. Devol finds that high-tech metro output and the high-tech location quotient can explain 51 percent of GMP growth from 1975 – 1998 and 65 percent of GMP growth from 1990 – 1998. His findings suggest that an average annual growth of 5 percent in high-tech output increases GMP growth rates by 1 percent. Devol argues that high-tech industries yield faster growth rates due to an economic multiplier that results from higher wages in the high-tech industries, an increased demand for professional services serving high-tech industries, and knowledge spillovers between high-tech firms and employees.

Entrepreneurship and Innovation

Entrepreneurship – the willingness to risk investment to start a business – is required for new businesses to flourish. Since Chinitz’s seminal article comparing Pittsburgh and New York (1961) researchers have focused on entrepreneurship as an important attribute of an area’s endowment affecting its growth and its competitive advantage. As Chinitz’s case study approach suggested, the propensity for entrepreneurship varies across space (see also Acs and Storey, 2004)

In a study on Labor Market Area (LMA) employment growth, Acs and Armington (2003) conclude that entrepreneurial activity is the single most important factor in creating jobs. LMA’s are regions defined in terms of the labor market pool; thus characteristics of potential employees are very important in determining growth rates. Entrepreneurship is operationalized as new firm birth rates per thousand in the labor force and percent of the labor force that is also proprietors, with firm births being the stronger of the two variables. This is not surprising since during the years from which the data was drawn (1991-1996), *all* net job growth came from companies that were less than two years old, while establishments over two years old accounted for job loss.

Innovation is often used as a synonym for entrepreneurship, but they are quite different concepts. Entrepreneurship connotes the willingness to take risks, while

innovation implies the ability to create new products, processes, techniques, etc. Glaeser and Saiz (2004) argue that innovation is increasingly considered to be an important driver of economic growth. Positive impacts have been found between science and research and development activities and economic development (Felsenstein 1996; Hill and Lendel 2007). These results suggest that the presence of research universities will aid economic growth. As discussed above, the importance of universities in providing educated workers is well established. However, research institutions offer substantially more than that. Higher educational institutions can be thought of as multi-product firms, with each product making a unique contribution to the city and regional economy (Goldstein and Renault 2004; Initiative for a Competitive Inner City 2002).

Research universities generate place-specific economic impacts by providing educational services with an associated supply chain. Universities can have profound regional labor market impacts by providing scarce technical talent. Universities that are aligned with their regional economic base can also improve productivity by the transfer of tacit knowledge through their labs and their graduates. Research universities can also turn knowledge creation into a traditional, exportable good. Finally, they also may succeed at the low-probability event of inventing a technology that fundamentally changes the economic structure of the region itself. But we must constrain our expectations, because the epoch-making inventions of the integrated circuit and the combustion engine took place outside of the academic setting.

The presence of universities has been found to be positively related to per capita income growth (Pack, 2002). This association rests on two pillars. First, we expect the flow of money to research universities and the products they produce to have a positive impact on economic performance. Second, major research universities have been shown to attract private research and development as well as facilities, such as occurred in Research Triangle Park and near Stanford University (Pugh-O'Mara 2005).⁷

Summary

The empirical literature on sub-national economic competitiveness is vast, and we have reviewed only a portion, though we believe a reasonably representative portion, of

⁷ The above three paragraphs are drawn from Blumenthal et al., 2009 forthcoming

it. As noted at the beginning, in some areas there are generally accepted findings, while in others findings are inconsistent. In some cases, important possible factors have been understudied due primarily to difficulties in operationalizing and measuring important concepts.

In the following table we attempt to summarize the findings, making a distinction between factors that affect the economic competitiveness of a region relative to other regions and factors that affect the competitiveness of the primary city in a region relative to its suburbs. We summarize the findings for each factor both in terms of the importance of the factor and in terms of the consistency of the findings.

Summary of Research Findings on Determinants of Area Growth/Location Decision

	Effects On		Importance			Findings		
	Regional Level	Local Level (w/in region)	High	Medium	Low	Consistent	Inconsistent	Not Enough Studies
Agglomeration Econ.	√		R			R		
Labor Quality	√		R ₁	R ₂		R ₁ , R ₂		
Cost	√		R ₂	R ₁		R ₂	R ₁	
Availability	√			R				R
Transportation	√	√	R	L		R, L		
Land Costs	√	√		R, L		L		R
Energy Costs	√			R		R		
State Taxes	√			R			R	
Services	√			R			R	
Local Taxes		√		L			L	
Services		√		L			L	
Local Econ. Dev. Incentives		√			L	L		
Infrastructure	√	√			R, L			R, L
State & Local Bus. Climate	√	√		R, L				R, L
Amenities/Climate	√		R ₁	R ₂			R ₁ , R ₂	
Crime		√		L				L
Economic Structure	√			R			R	
Entrepreneurship	√			R				R

R = regional

R₁ = sectors with skilled workers

R₂ = sectors with unskilled workers

L = local

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