The Economic Geography of Talent

September 2000

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Acknowledgements: The research was supported in part by the Alfred P. Sloan Foundation. Richard Kind Mellon Foundation, and the Heinz Endowments. Gary Gates, Sam Youl Lee, Ji Woong Yoon, Derek Davison, and Karin Tuxen provided research assistance.

Abstract

The paper explores the economic geography of talent. It argues that the distribution of talent – that is high human capital individuals – plays a fundamental role in the distribution of high-tech firms and in regional economic outcomes. To shed light on these issues, this paper summarizes the results of statistical research as well as interview and focus groups.

The findings shed light on the geography of talent, the factors that shape that geographic distribution, and the effects of talent and the location of high-technology industry and other regional outcomes. They indicate hat the economic geography is talent is associated with diversity (low entry barriers) and quality of place. Talent in turn attracts high-technology industry. Together, talent and technology based industries generate positive regional economic outcomes in the form of higher per capita incomes.

The findings further suggest that the ability to attract talent is a fundamental dimension of city and regional growth. This contrasts with the preoccupation in the extant literature that emphasizes the attraction of firms and the formation of industrial clusters. It is talent that orients the location decisions of firms and which underpins the formation and evolution of industrial clusters.

Furthermore, the research suggests that places matter significantly in the economic geography of talent. Places provide the infrastructure required to generate, attract, and retain talent. Place-based advantages stem in turn from two underlying economic factors: low entry barriers to human capital and efficiencies in the delivery of consumer services. Simply put, there is an economic rationale behind what may be perceived as “nice” places to live.

Introduction

Geographers, economists and other social scientists have long been concerned with the economic geography of firms and industries. Ever since the pioneering work of von Thünen and Marshall, scholars have probed the processes of firm location, the spatial division of labor, and the phenomena of agglomeration, clustering, and industrial complex formation (Piore and Sabel 1984; Henderson 1974; 1988; Porter 2000, Krugman 1991). This important body of work has for the most part focused on the geographic distribution of firms, and the forces that make economic actors concentrate or alternatively disperse their activities over space.

Those concerned with economic geography however have paid much less attention to the various economic, social, and geographic forces that act on and shape the spatial distribution of people who establish firms and populate industries. There is a significant literature on human capital, but it has not sufficiently dealt with geographical and regional factors and it has certainly not linked human capital to regional outcomes in ways that control for the independent effects for industry mix or other place-based characteristics.

Recent years have seen renewed interest in the role of human capital in economic development. In a seminal paper, Lucas (1988) builds upon Jacob's basic insights to offer a theory of the role of human capital in cities and economic development. Jacobs (1961, 1969) long ago called attention to the central role played by people in the generation and organization of economic activity in cities. In her view, cities play a crucial role in economic development, through the generation and mobilization of new knowledge. The scale of cities and their diversity of inhabitants create the interactions that generate new ideas. In other words, the diversity of economic actors within cities, and their high level of interaction promote the creation and development of new products and new technology.

Building upon this insight, Lucas essentially argues that cities function to collect and organize human capital, giving rise to strong external economies, which he refers to as external human capital, that increase productivity and spur growth.

> If we postulate the usual list of forces, cities should fly apart. The theory of production contains nothing that holds a city together. A city is simply a collection of factors of production - capital people and land - and land is always far cheaper outside cities than inside. Why don't capital and people move outside combining themselves with cheaper land and thereby increasing profits? Of course people like to live near shopping and shops need to be located near their customers, but circular considerations of this kind explain shopping centers, not cities ...It seems to me that the "force" we need to postulate to account for the central role of cities in economic life is of exactly the same character as external human capital. What can people be paying in Manhattan or downtown Chicago rent FOR, if not to be near other people" (Lucas 1988).

Several studies (Eaton and Eckstein 1997; Black and Henderson 1999) have found that workers are more productive when they locate around others with high levels of human capital. Other empirical studies have found that human capital is strongly associated with urban and regional growth. Research by Glaeser, Sheinkman and Sheifer (1995) found a strong relationship between human capital and city growth. In other research, Glaeser (2000) noted that it is the need to access common pools of labor or talent rather than access to suppliers and customers what drives the tendency of firms to cluster together in regional complexes. Simon (1998) found a strong relationship between the average level of human capital and regional employment growth over the period 1940-1986. Glendon (1998) found a strong positive relationship between the level of human capital in a city at the turn of the 20th century and subsequent economic growth. Following Jacobs (1961), Glendon suggested that cities and regions with high levels of human capital were able to more readily incubate new ideas and shift their industrial structures into growing industries (see Mathur 1999 for a review of human capital based theories of economic development).

The “new growth theory” associated with Romer (1990) calls attention to the importance of knowledge and human capital in generating economic growth. As he notes: “what is important for growth is integration not into an economy with a large number of

people, but rather into one with a large amount of human capital" (Romer 1990). Furthermore, the rise of the so-called knowledge economy has created renewed interest in the role of human capital in economic activity. Firms have recognized that the "new economy" is driven by human capital – a phenomenon that the consulting firm, McKinsey and Company has dubbed the "war for talent." High human capital individuals are highly mobile. Shortages of talent in key sectors such as software development and information technology have been noted in numerous studies and reports. Cities and regions in the United States and around the world have also become much more concerned with their ability to generate, attract and retain highly educated and highly skilled people upon which knowledge based industries depend. All of this has generated renewed interest in the relationships between knowledge creation, human capital, and economic growth.

This paper has a rather basic aim: It hopes to reacquaint those who work in the fields of economic geography and urban and regional economics with the importance of the economic geography of human capital. At one level, this paper is a descriptive exercise. It aims to provide a rich empirical description of the economic geography of talent using a variety of measures. It also tries to systematically sort through and shed light on the factors that shape that observed geographic distribution. And, it examines the effects of the economic geography of talent on regional outcomes such as the location of high-technology industries and regional incomes.

At a second level, the paper also aims to develop and test theory regarding the economic geography of talent. Here, it attempts to identify the mechanisms by which talented individuals select locations and sort themselves into places. Following Lucas and Jacobs, the underlying theory is that talented and productive people - that is people with high levels of human capital - tend to co-locate to realize gains in productivity. Put another way, the basic mechanics of city formation, growth and structure turn on the process of productive agents selecting locations that reinforce their productivity. This is very different

from the cost-minimization and firm linkage theories of clustering that dominate much of economic geography.

Taking this as a point of departure, the theory further argues that the characteristics of places matter significantly in this sorting process. People are attracted to real places. Cities and regions facilitate the co-location of people that results in resource mobilization, new knowledge generation, and new ideas; and reduces the costs associated with generating and transmitting ideas and knowledge. Places thus provide the historically inherited and built up social and economic capabilities that create the capacity to attract human capital. Because knowledge is non-rival and partially excludable, knowledge spillover occurs in places that have qualities that facilitate that spillover. The implication here is that places need to be taken much more seriously into account. Simply put, place contributes to and shapes the geographic sorting of human capital.

Places attract talent through two interrelated mechanisms. Glaeser (1999) has called attention to the role of both market and non-market forces in shaping urban and regional processes and outcomes. Both are important to the economic geography of talent. On the one hand, places are home to market based forces, i.e., the industries and firms, which create the demand for talent. On the other hand, they reflect what can be referred to as a set of place-based characteristics – a bundle of amenities, lifestyle options, types of people and the like – that function to attract human capital. Anyone who has taught in a university and made their own location decision or has tried to attract faculty should understand the role of place-based characteristics or quality of place. Talented people do not simply select a place to work based on the highest salary, they are typically concerned with a whole series of place-based characteristics.

The theory identifies two types of non-market forces that are associated with place: amenities and diversity. Recent research by Glaeser, Kolko and Saiz (2000) find an association between amenities and city growth. They suggest that high human capital

workers not only increase productivity, but that high human capital areas are pleasant places to live in. They conclude that: "If cities are to remain strong, they must attract workers on the basis of quality of life as well as on the basis of higher wages" (Glaeser, Kolko and Saiz 2000: 23). Furthermore, these place based characteristics not only provide for the lifestyles needs of high human capital. They are reflective of a place which efficiently delivers a wide range of services.

According to the perspective advanced here, diversity is even more important. In formal terms, high amenity places reflect underlying efficiencies in the delivery and consumer services. The theory suggests that places that attract diverse groups of people (by race, ethnicity, nationality, gender, and sexual orientation) can be said to have a high degree of system openness. Simply put, such places comprise an environment that is easy to plug into. In formal terms, such places can be said to have low entry barriers for talent.

In advancing this basic theory, the paper is organized around two more targeted arguments or hypothesis. The first hypothesis concerns the factors that affect the geographic distribution of talent. The ability of cities and regions to attract high human capital individuals is a function of their openness and quality of place as well as the demand that comes from high-technology industries. Here, I argue that the economic geography is jointly shaped by: (1) demand, (2) low entry barriers, i.e. diversity/ openness, and (3) quality of place. The second hypothesis concerns the effect of the economic geography of talent on regional economic outcomes. Previous models have looked at the direct effects of human capital on employment growth and income. This paper adds to this line of research by controlling for the independent effects of industry mix (i.e. high technology industry) and place-based characteristics (i.e. amenities and diversity). Cities and regions with high levels of talent will generate relatively higher levels of both high-technology industry and income. This reflects the fact that the distribution of human capital

is highly skewed. Places that attract such talent are able to generate higher levels of firms and economic activity, while those that do not are less likely to do so.

To shed light on these issues, this paper summarizes the results of empirical research on the economic geography of talent. Qualitative research consisting of interviews, focus groups and field studies was employed in an exploratory fashion to probe the factors associated with the location decisions of highly talented people. Quantitative research was used in a more confirmatory fashion to provide an empirically based explanation of the factors that shape the economic geography of talent.

The paper is organized as follows. The next section outlines the research design and methodology. The paper then turns to findings, starting with an empirical description of the economic geography of talent. It then turns to an analysis of the relative effect of the various factors that effect that observed distribution. This is followed by an analysis of the effect of talent on economic outcomes such as the location of high-technology industries and regional incomes. The final section summarizes the key findings and provides a discussion the implications of the work.

Identifying the Economic Geography of Talent: Research Design

The paper employs a variety of qualitative and quantitative data to shed light on the economic geography of talent. While the bulk of the research revolved around quantitative statistical analysis, qualitative research was done to help structure and inform the collection and analysis of statistical data.

Qualitative Research

The quantitative research included interviews, focus groups, and field research in several cities and regions. The qualitative research was exploratory in nature, and designed to inform and structure the quantitative statistical research outlined below

Interviews were used to shed light on the factors that motivate the location decisions of people. Unstructured open-ended interview were conducted with more than 100 people who were making or had recently made location decisions. The interviews focused on the various factors involved in these location decisions, including job opportunities, labor markets, amenities, diversity, and cost of living among others. Additional interviews were conducted with human resource executives, CEOs, recruiters, workforce development officials, and economic developers throughout the country.

Structured focus groups were conducted with the assistance of a professional focus group organization to further assess the factors involved in personal location decisions. Four focus groups were done. The participants included college seniors in scientific and technical fields, college seniors in management disciplines, graduate students in technical and management disciplines, and young professionals. Advanced college and graduate students were utilized for several reasons. They possess relatively high levels of human capital, are relatively mobile, and are in the process of making location decisions. The focus groups were conducted in Pittsburgh, Pennsylvania in April 1999. Participants originally came from a wide a range of regions throughout the United States and the world and represented a wide range of races, ethnicities and nationalities.

The fieldwork involved site visits to and personal interviews with private companies and government agencies in Seattle, Washington and Austin, Texas. These regions were selected because they have generated strong knowledge based industries, have low rates of unemployment, and have developed strategies to attract talent. Austin, for example, is known for its so-called “Wired for Talent” strategy that is designed to attract talent from around the country - a partnership between Hire.com, a leading developer of recruitment software, the Austin-American Statesman, the Mayor’s office, and the Chamber of Commerce.

Data, Variables, and Statistical Methods

The bulk of the research is based upon an empirical analysis of the economic geography of talent of the factors that affect that distribution, and of its effect on the location of high-technology industries and other economic outcomes. This aspect of the research was confirmatory in nature.

The aspect of the research employs several types of variables and measures: (1) human capital or talent measures, (2) quality of place such as amenities, (3) diversity measures, (4) measures of high-technology industry location, and (5) regional income measures. These data are used to generate the descriptive statistics, maps, and trends, and also in the statistical and econometric analyses described below.

The analysis is based on the 50 largest metropolitan regions, those with populations of 700,000 and above. For most regions, the metropolitan statistical area or MSA is employed as the unit of analysis. The consolidated metropolitan statistical area or CMSA is used as the unit of analysis for the five largest regions: San Francisco, Los Angeles, Miami-Fort Lauderdale, New York, and Dallas-Fort Worth, to account for broad commuting patterns in these regions.

The research employs three measures of talent. The basic talent measure is a measure of highly educated people defined as those with a bachelor's degree and above. Two additional measures are used to supplement this: professional and technical workers and scientists and engineers. Each of these measures is normalized on a percentage basis or per thousand people and based on the 1990 Decennial Census Public Use Microdata Samples. Table 1 provides descriptive statistics for the various measures used in this research.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Diversity	50	1.32	0.87	0.19	5.39
Hightech	50	1.40	1.88	0.06	8.24
Scientists & Engineers	50	15.77	5.62	6.33	30.93
Professional & Technical	50	286.84	30.27	235.75	356.18
Talent	50	0.24	0.05	0.14	0.42
Coolness	43	6.35	1.51	1.00	10.00
Median House Value	48	84.65	30.60	51.39	186.20
Cultural Amenity	50	1804.76	1458.98	482.00	9375.56
Recreational Amenity	50	2275.82	727.94	933.00	4390.00
Climate	50	579.91	116.79	293.00	903.00
Per Capita Income	50	24350.10	3264.02	19412.92	34751.28
Per Capita Income Change	50	2881.09	982.89	297.38	4682.39

The paper employs a variety of measures of quality of place. The first group of variables includes indicators of traditional arts, cultural and recreational amenities, adapted from *the Places Rated Almanac (*Boyer and Savageau 1989*).* These include measures of recreational and cultural amenities and a climate measure. The culture measure is a composite based on the following factors: radio broadcast time devoted to classical music, public television stations, public library book acquisitions, non-profit art museums and galleries; performances of fine arts and musical groups, access to the culture of adjacent urban areas. The recreation measure is also a composite based upon: restaurants, public golf courses, bowling lanes, zoos and aquariums, family theme parks, automobile race tracks, pari-mutuel betting attractions, college and professional sports teams, miles of coastline (ocean or Great Lake), inland water area, and national parks. The climate measure is a composite index that includes very hot and cold days, seasonal temperature variation, heating and cooling days, freezing days, zero-degree days, and ninety-degree

days. In general, climates that lack extremes in temperature tend to fare well in this measure.

The paper also employs a rather unique measure of amenities that are thought to attract a certain subgroup of high human capital individuals. This measure is adapted from the so-called "coolness factor" developed by a *POV magazine (*December-January 1999). The measure is based on the percentage of population ages 22-29 (with points added for diversity), nightlife (number of bars, night cubs and the like per capita) and culture (number of art galleries and museums per capita). Another measure of amenities is median house value. Since Rosen (1974) researchers have argued that amenities are at least partially capitalized in land rents. In recent research, Glaeser, Kolko and Saiz (2000) use housing prices to construct an "amenity index." They regress housing prices on per capita income and use the residual as reflecting demand for local amenities. Given this, a straightforward measure of amenities is median house value at the MSA level. This measure is also adapted from the 1990 Decennial Census.

The paper employs another unique measure of place-based characteristics - an index of the population that is gay developed by Black et al (1998). This is used a joint measure of amenities and diversity. On the one hand, Black et al (1998) find that the location of gay households reflects a preference for a wide cluster of what can be termed "urban" amenities (Black et al 1998). According to this research, gay male couples have smaller families and require smaller homes. In addition, their household income is relatively high, as the household is comprised of two male incomes. This work thus observes that the index of the over/under-representation of gay male couples relative to the population serves as a strong measure of amenities. In addition, the gay index provides a measure of diversity, another important dimension of quality of place. The interviews and focus groups indicate that diversity is a characteristic or "amenity" sought after by highly educated workers in knowledge-based industries. The gay index is based

on data from n the 1990 Decennial Census Public Use Microdata Samples (1% and 5%), identifying households in which a householder and an unmarried partner were both of the same sex (in this case male). Approximately 0.01 percent of the population was composed of gay coupled men. The index is basically a location quotient that measures the percentage of gay households compared to the national population of gay households divided by the percent of total population in a city compared to the total national population.

The research employs several measures of regional outcomes. A measure of high-technology industrial location is based on the composite score provided by the Milken Institute, arguably the best available measure of high-technology industry location. The Milken index is based on the percent of national high-tech real output multiplied by the high-tech real output location quotient for each metropolitan area (see Milken Institute 1998). Two measures of income are used: per capita income level and absolute income change. Income level is for 1997, and income change covers the period 1991-1997. These data are from Bureau of Economic Analysis.

A variety of statistical and econometric analyses are used to examine the factors associated wit the geographic distribution of talent and its effects of high-technology industry location and regional incomes. Correlation analyses are employed to obtain a first approximation of these relationships. Mutivariate regression models are used to better control for various effects and provide a more precise estimate of the factors that shape these patterns. Separate regression models are developed to account for the factors that shape the geographic distribution of talent, and for the effects of that distribution on regional economies. The structure of the models and their results are discussed below.

Findings

The findings of the research are organized in three sections. The first section presents a basic picture of the economic geography of talent. The second section

examines the factors that shape that observe geographic distribution. The third section examines the effect of the distribution of talent on some basic regional economic outcomes.

The Economic Geography of Talent

It is initially important to get a basic picture of the economic geography of talent. To do so, Figure 1 provides three separate maps of the geographic distribution of talent. As these data show, the distribution of talent in the United States takes shape according to a distinct economic geography. This geography is uneven: Talent is not spread evenly across the landscape. Places differ considerably in their ability to attract and sustain high-human capital individuals.

The first map presents the economic geography of the basic index of talent, the percentage of the population with a bachelor's degree and above. The differences here are rather striking. The top-ranked region, Washington DC, has roughly 42 percent of its population with a bachelor's degree or above. It is followed by Boston, San Francisco, Austin, Atlanta and Seattle - which all have more than 30 percent of their populations holding a bachelor's degree or above. Eight other regions have more than 25 percent of their population holding a bachelor's degree or above. There are a large number of regions with less than 20 percent of their population holding a bachelor's degree and above. The 50th ranked region, Las Vegas has just 14 percent of its population with a bachelor's degree and above. To put this another way, more than 30 of the top 50 regions have less than 25 percent of the population with a bachelor's degree and above.

The distribution of professional and technical workers reflects a similar geography (see Figure 1). Again the top-ranked region is Washington DC with more than 350 professional technical workers per 1000 population. It is followed by Austin, Denver, Seattle, Minneapolis-St. Paul and Atlanta – all which have more than 330 professional and

technical workers per 1000 population. The lowest ranked regions however have less than 250 professional and technical workers per 1000 population.

The distribution of scientists and engineers reflects a somewhat similar geography, as Figure 1 shows. Again Washington DC is the leading region followed by Seattle, San Francisco and Denver - each with more than 25 scientists and engineers per 1000 population. An additional six regions have more than 20 scientists and engineers per 1000 population. The lowest ranked regions have less than 10 scientists and engineers per 1000 population. In fact, more than half of the top 50 regions have less than 15 scientists and engineers per 1000 population - roughly half the proportion of Washington D.C. or Seattle which are the top-ranked regions.

From these descriptive data, it is clear that the distribution of talent is unevenly distributed at the regional level. Regions such as Washington DC, Boston, San Francisco, Seattle, Austin, Atlanta and several others have relatively high concentrations of talent regardless of measure. Indeed, there is considerable overlap between two of the three talent measures. The correlation between the basic talent index and professional and technical workers is 0.405. However, the correlation between the basic talent index and scientists and engineers is less than one (0.092). The correlation between professional and technical workers and scientists and engineers is lower still (0.044). Regions that are able to attract highly educated people also clearly able to attract professional and technical workers. The most highly ranked of them are also able to attract scientists and engineers. This lends some credence to view that talent tends to attract talent.

It remains to be seen however what are the factors that shaped these observed geographic differences. This is the question to which I now turn.

Factors that Shape the Economic Geography of Talent

With this basic descriptive exercise behind us, I now turn to an examination of the factors that shape the distribution of talent. This is the most important part of the research and it draws on both the qualitative and statistical analysis

The interviews and focus groups shed important light on the factors that shape the location decisions of high human capital individuals and hence the geographic distribution of talent. The basic finding from the focus groups and interviews is that talented people are attracted to a mix of market and non-market factors. Market factors like demand clearly matter. People certainly migrate to jobs. The interviews and focus groups however indicate that high human capital individuals will not typically locate in labor markets where it may be hard to find another job. Because of a perceived decline in firm loyalty and the expectation of a career path based on mobility and job shifting, high human capital individuals strongly favor locations that posses what are best thought of as "thick labor markets."

Furthermore, high human capital people have many employment options and thus are able to orient their location search to balance economic and lifestyle considerations. The focus groups and interviews indicate that non-market factors clearly matter. First of all, talented people attract other talented people. Also, high human capital individuals seek out locations with high levels of quality of place, defined as cultural and recreational amenities such as active recreation, high quality restaurants, bustling street life and music venues. These are important in and of themselves and also as visual and audio cues that a place is "with it," "hip," or "cool" and thus attractive to other talented individuals. The characteristics also are reflective of places that efficiently deliver a wide range of consumer services.

The focus groups and interviews also indicate that diversity is particularly important in the location decisions of high human capital individuals. Talented people making location decisions exhibit a clear preference for places with a high degree demographic diversity. They desire locations where anyone from any background, race, ethnicity, gender, or sexual orientation can easily plug in. In formal terms, this preference for diversity can be interpreted as reflective of places where barriers to entry are relatively low.

The findings of this aspect of the research can be summarized as follows. Both market and non-market factors affect the location choices of high human capital individuals. High paying employment is a necessary but insufficient condition. High human capital individuals are attracted by a combination of employment opportunities, a thick labor market, lifestyle or quality of place characteristics, and diversity. Because such individuals are mobile and have many options, the qualitative research suggests, all of these conditions must be in place to attract high levels of talent.

The statistical research examined the effects of these various market and non-market forces in shaping the economic geography of talent. Figure 2 helps orient this analysis, providing maps of 3 quality-of-place measures. These include: (1) a measure of arts and cultural amenities, (2) the "coolness" measure, and (3) a measure of diversity. As Figure 2 indicates, the distribution of these factors is clearly uneven.

To get a better handle on this issue, Figure 3 presents a series of scatterplots that portray the relationships between talent and the measures noted above. Table 2 presents the results of a correlation analysis that examined the statistical association between the various measures of talent and these place-based measures. The key findings here are as follows.

Amenities: The focus groups and interviews suggest that talented, high human capital individuals prefer location with high levels of amenities. The findings of the correlation

analysis suggest that certain kinds of amenities matter more than others. The results of the correlation analysis indicate that talented individuals appear to be attracted more by cultural amenities than by recreational amenities or climate. The correlation coefficient for the basic talent index and cultural amenities is positive and significant (.429). The same is true for professional and technical workers, but not for scientists and engineers (where the correlation coefficient is negative and insignificant). The correlations between talent and measures for both recreational amenities and climate are weak and mixed.

Table 2: Results of Correlation Analysis

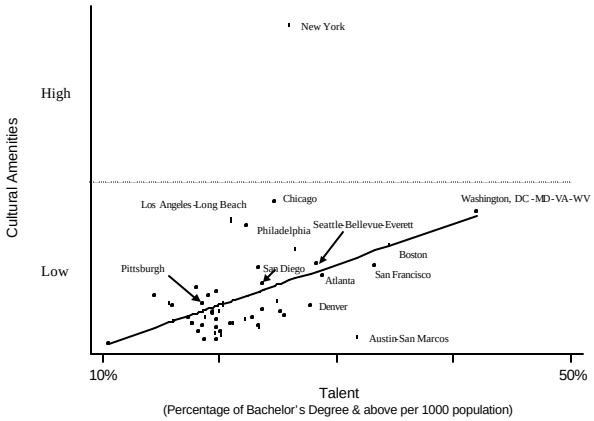
	Talent	Diversity	Hightech	Cultural Amenities	Recreational Amenities	Climate	Coolness	Median House Value	Per Capita Income	Absolute Per Capita Income Change
Talent	1.000									
Diversity	.7181 ***	1.000								
Hightech	.723 ***	.768 ***	1.000							
Cultural Amenities	.430 ***	.289 **	.493 ***	1.000						
Recreational Amenities	-.048	.157	.159	.249 *	1.000					
Climate	.220	.447 ***	.464 ***	.205	.291 **	1.000				
Coolness	.469 ***	.377 **	.429 ***	.569 ***	.246	.146	1.000			
Median House Value	.538 ***	.446 **	.506 ***	.445 ***	.398 ***	.432 ***	.355 **	1.000		
Per Capita Income	.588 ***	.498 ***	.601 ***	.521 ***	.098	.217	.417 ***	.360 **	1.000	
Absolute Per Capita Income Change	.292 **	.199	.321 **	.182	-.187	-.119	.237	-.126	.517 ***	1.000

Note

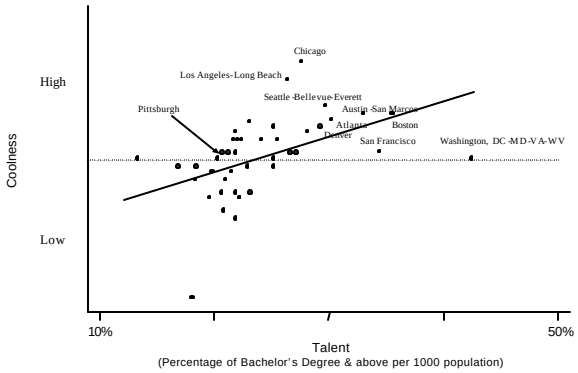
*: significant at 0.1

**: significant at 0.05

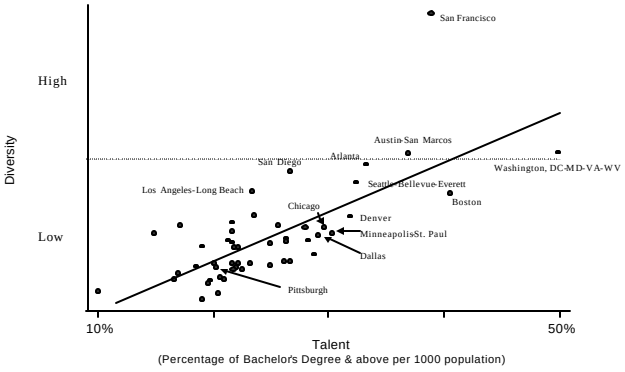
***: significant at 0.01



Source: 1990 Decennial Census



Source: 1990 Decennial Census and POVMAGS, Dec/Jan, 1999



Source: 1990 Decennial Census

Figure 3: Talent vs Amenities, Coolness, and Diversity

It is important to interpret these results with the following caveat in mind. The participants in the focus groups and interviews drew a sharp distinction between active outdoor recreation and spectator sports such as professional baseball and football. The focus groups and interviews clearly indicate that talented individuals are attracted to places with high levels of active outdoor recreation. Here, it is important to note that the recreation measure is biased toward spectator sports. Since there are no reliable measures for such active outdoor recreation that could be identified for the sample MSAs, the statistical research is unable to address the direct effect of active outdoor recreation.

Coolness: The focus groups and interviews suggest that high human capital individuals are attracted to energetic and creative places that are colloquially referred to as "hip" or "cool." The focus group and interview subjects strongly emphasized the importance of visual and audio cues like outdoor dining, active outdoor recreation, a thriving music scene, active nightlife, and bustling street scene as important attractants. This reflects aspects of what has been termed "experiential consuming."

The findings of the correlation analysis bear this out to some degree. The correlation coefficient between the coolness measure and the basic talent index is 0.469, which suggests a reasonably close association. This finding reflects the interview and focus groups results that indicate that highly educated talented people (particularly younger workers who are active and knowledge industry labor markets) are drawn to these sorts of amenities.

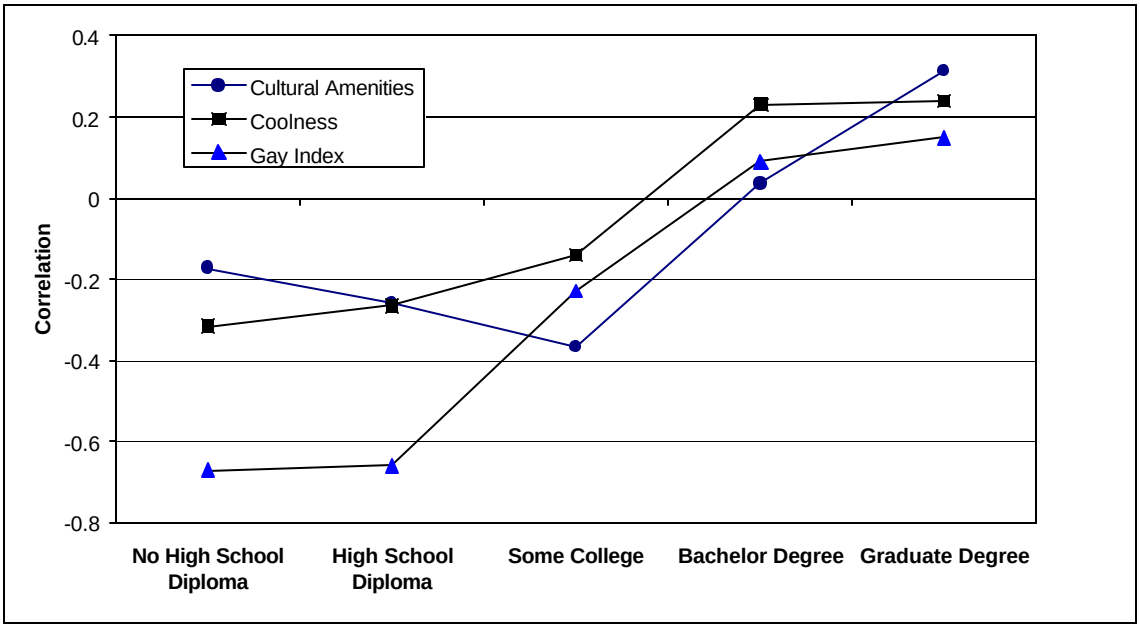
Median House Value: Median house value provides another way to measure amenities. It comprises a basic price measure. In other words, higher median housing prices reflect higher levels of quality of place. Indeed, median house value is significantly correlated with other measures of amenities: coolness (0.355), amenities (0.330) and diversity (0.446).

The findings of the correlation analysis suggest that talent tends to locate in places with higher median house values. Median house value is positively associated with talent, the correlation being (0.538). It is also correlated with professional and technical workers, but not scientists and engineers. Talent thus appears to exhibit a distinct preference for higher cost locations. Essentially, talent is wiling to pay for quality of place. This stands in some contrast to conventional wisdom on the subject (at least among economic development practitioners), which suggests that lower costs of living (reflected in lower median house values) may comprise an advantage in attracting talent.

Diversity: The focus group and interview findings suggest that talented high human capital individuals strongly prefer places with high levels of diversity – where people from different backgrounds can easily fit in. The importance of diversity was strongly emphasized in the qualitative research. Diversity was valued as both an amenity and characteristic of quality of place, and as reflecting a high degree of openness. The gay index can be thought of as a leading indicator of these characteristics. Places that are open to and supportive of a gay population are likely to be open and supportive of other groups. Indeed, the focus groups and interviews suggest that this assumption is reasonable. Focus group and interview subjects noted that they often use domestic partner benefits as a gauge of the openness of potential employers. Simply put, the gay index reflects an environment that is open to diversity, high in urban oriented amenities, and characterized by low entry barriers.

The findings of the correlation analysis suggest that this measure of diversity is strongly associated with talent. The correlation coefficient between the basic talent measure and the diversity measure or gay index is 0.718 suggesting a considerable association between these two variables. In fact, it is the highest correlation coefficient among this group of measures. This is also reflected in the scatterplot for talent and diversity (Figure 3). Again, these results reflect the findings of the focus groups and

interviews which found that talented people are attracted to locations with a high degree of demographic diversity and which are distinguished by a high degree of openness and relatively low barriers to entry.



Source: Gary Gates, Ashish Arora, Richard Florida, Mark Kamlet, "Amenities and the Location of Knowledge Workers," Carnegie Mellon University, H. John Heinz III School of Public Policy and Management, January 2000.

Figure 4: Correlation: Talent and Quality of Place

Figure 4 is a graph which plots the correlation coefficients between several measures of amenities and various levels of talent, measured as percentage of the population the various levels of educational attainment. As this Figure shows, there is striking relationship between quality of place and talent. The correlation coefficients between the various measures of quality of place and talent rise sharply alongside level of education. Furthermore, the correlation coefficients between various quality-of-place measures and talent tend to be highly positive for highly educated individuals (measured as the percentage the population was bachelors of graduate degrees) and negative for

other segments of population (measured as the percentage the population with a high school degree or less).

To get better handle on the relationship between talent and various measures of quality of place, the research employed multivariate regressions to probe the relationships among these variables. The regressions examined the relationships between talent, quality of place (i.e. amenities, coolness, and diversity), and also a measure of high-technology industry location (to account for the demand for talent.) The results of these regression models are presented in Table 3. Generally speaking, the findings here are robust and suggest a close relationship between talent and the various dimensions of quality of place. The results of the various models generated adjusted R-squared values that are all above 0.5, suggesting a robust and positive relationship.

Table 3: Regression Model Findings: Talent and Quality of Place

Dependent Variable: Talent

	Model 1		Model 2		Model 3		Model 4	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Diversity	0.0329	0.000***	0.0219	0.009***	0.0241	0.006***	0.021	0.007***
Hightech			0.0107	0.006***	0.0097	0.027**	0.0093	0.019**
Coolness Score (POV)	0.0049	0.196			0.0049	0.224	0.0044	0.211
Median House Value	0.0006	0.002***					0.0005	0.004***
Cultural Amenities	4.7400E-06	0.197			3.9900E-06	0.319	2.1E-06	0.552
Recreactional Amenities	-2.3000E-05	0.002***			-1.4400E-05	0.047*	-2E-05	0.003***
Climate	-7.3100E-05	0.098*			-5.2600E-05	0.250	-9E-05	0.030**
R-square	0.7499		0.5875		0.7067		0.7878	
Adjusted R-square	0.7070		0.5700		0.6578		0.7442	
# of Obs.	42		50		43		42	

Note
*: significant at 0.1
**: significant at 0.05
***: significant at 0.01

The most consistent finding is for diversity. The coefficient for diversity is consistently positive and significant in virtually every permutation of the model. These include basic models where it is the only variable, to more complex structures where it is include alongside other quality of place measures and a measure of high-technology industry demand. These results suggest that diversity is positively and significantly associated with talent. Furthermore, diversity appears to be most important dimension of quality of place when it comes to affecting the location of talented, high human capital individuals.

The results for the other quality of place variables are mixed. The coefficients for coolness and culture measures are rarely significant. The coefficient of recreation is significant but negative. The findings also indicate that high-technology industry demand plays an important role in the location highly talented individuals. Like diversity, the coefficient for high-technology industry it is positive and significant in virtually every permutation of the model.

These results inform a basic conclusion concerning the mechanisms that act to shape the economic geography of talent. Talent is found to be located in places with both high technology and diversity. High concentrations of high-technology industry generate the demand and thick labor markets talented high human capital individuals prefer. Diversity (i.e. the gay index) reflects a place that is open, possesses low entry barriers, and is distinguished by a high level of urban amenities. These two factors appear to work together in shaping the economic geography of talent.

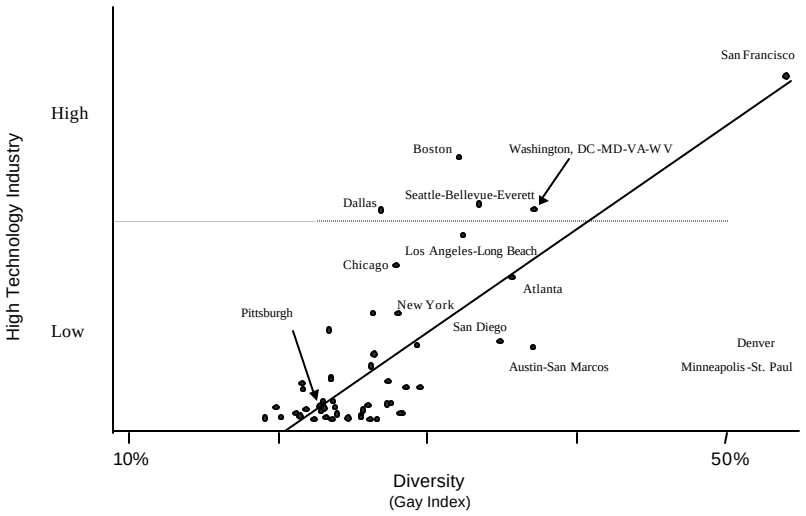
Talent and High Technology Industry

It is now important to examine the ways that the distribution of talent effects various regional economic outcomes. This section looks at the effect of the distribution of talent on the location of high-technology industry. It presents the findings of a variety of bivariate

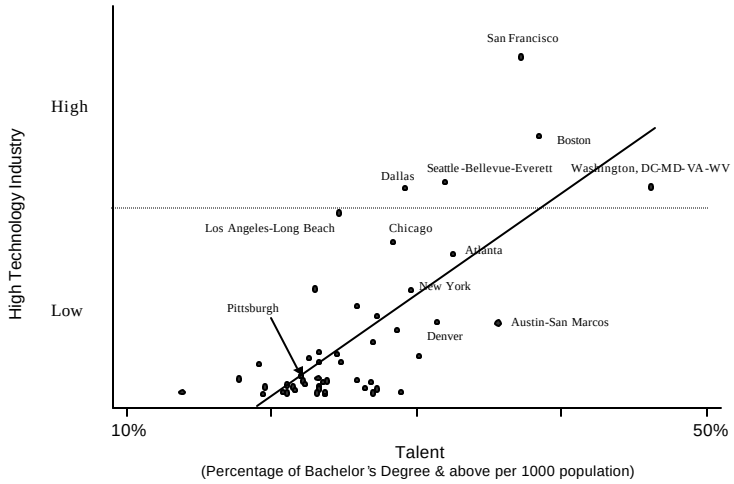
and multivariate analysis. It then turn to the effects of talent on income.

The field research and interviews with high-technology business leaders suggest that high technology firms are attracted by talent. In particular, the interviews suggest that the availability of talent is an increasingly important location factor for high technology firms. These interviews indicate that traditional costs factors emphasized in the location theory literature are far less important for firms in knowledge-based industries. The interviews strongly suggest that these firms orient their location decisions to attract and retain talent. Places with large available talent pools reduce the costs associated with search and recruitment of talent. This is particularly important in highly competitive and highly innovative industries where speed to market is a critical success factor. For these reasons, such firms are far less concerned with traditional factors such as land costs, labor costs, tax rates, or government incentives. They are willing to pay what is required to be in a location where they can more easily attract the kinds of human capital they require. Numerous high technology executives noted in the interviews that they will essentially "go where the highly skilled people are."

The correlations for high-technology industry, talent, diversity, and measures of quality of place are reported in Table 2. Figure 5 presents scatterplots which examine the relationship between high-technology industry and talent, and high-technology industry and diversity. These data suggest a close association. The correlation coefficient between talent (percent of population with BA and above) and high-technology industry is quite high 0.723. This relationship is also clearly reflected in the scatterplot of high-technology industry and talent presented in Figure 5. This suggests a particularly close association between talent and high-technology industry.



Source: 1990 Decennial Census and Milken Institute



Source: 1990 Decennial Census and Milken Institute

Figure 5: High Technology Industry and Talent & Diversity by MSA/CMSA

The research also examined the relationship between high-technology industry and various measures of quality of place. As Table 2 shows, high technology industry is positively correlated with: cultural amenities (0.493), climate (0.461), coolness (0.428), and median house value (0.506), but not recreational amenities. But, the most significant relationship is between high-technology industry and diversity. The correlation between these two measures it is 0.768. This is also clearly reflected in the scattrerplot of these two variables (see Figure 5). These findings suggest that these two variables are very closely associated.

To better understand these relationships, the research employed a series of multivariate regression analyses to probe the relationships between talent, diversity and high-technology industry. The results of these analyses are presented in Table 4.

Table 4: Regression Model Findings: Talent and High-Technology Industry

Dependent Variable: HighTech Industry

	Model 1		Model 2		Model 3		Model 4	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Diversity	1.1070	0.000***	0.857	0.009***	1.0816	0.000***	1.3074	0.000***
Talent	13.8415	0.006***	13.2809	0.027**	11.7028	0.028**		
Coolness Score (POV)			-0.0225	0.881				
Median House Value					0.0074	0.256	0.0055	0.431
Cultural Amenities			2.0000E-04	0.104			0.0003	0.012**
Recreational Amenities			1.8000E-05	0.947			-0.0002	0.517
Climate			2.5000E-03	0.133			-2.2359	0.015**
R-square	0.6502		0.7281		0.6720		0.6958	
Adjusted R-square	0.6354		0.6828		0.6497		0.6596	
# of Obs.	50		43		48		48	

Note

*: significant at 0.1

**: significant at 0.05

***: significant at 0.01

The results here are again consistent and robust. The adjusted R-squared values for these models range from 0.64 to 0.68, which suggest a considerable relationship among these variables. High-technology industry is associated with talent and diversity in virtually all versions and permutations of the model. In the basic structure of the model where talent and diversity are included as the only independent variables both are positive and significant. The adjusted R-squared for this model is 0.635. Interestingly, while high-technology industry is associated with diversity and talent, it does not appear to be associated with other quality of place measures such as amenities or coolness. These variables are insignificant in most permutations of the model.

Taken as a whole, the findings suggest a triangular relationship between high-technology, talent, and diversity with all three variables exhibiting high levels of association in the various permutations of the models. Taken in combination with the insights from the interviews and focus group research, these results suggest the following structure to this set of relationships. The focus groups and interview findings suggest that talented, high human capital individuals are attracted to places that possess thick labor markets, high levels of diversity, and low entry barriers. The interviews with high technology executives suggest that their location is shaped by the availability of talent. In light of this, the structure and mechanics of this set of relationships can be outlined as follows. Talent is attracted to places with high levels of opportunity, low entry barriers and diversity. High technology industries are in turn attracted to places with high levels of talent. Future research is required to more carefully delineate the precise nature of relationships and direction of causality among these factors.

Income Effects

This section examines the effect of talent on regional income. A large and influential body of work notes the close relationship between human capital and income.

This work has focused on the direct effects of human capital on income at the regional level (see Simon 1998). The research presented here build upon this influential and important line of work by examining the effects of human capital or talent on income, while controlling for the independent effects of industry mix (i.e. high technology industry), diversity, and other measures of quality of place. To do so, this section presents the results of bivariate and multivariate analyses that examined the effects of talent, and these types of factors on regional income. The analysis employs two income measures: (1) per capita income level and (2) absolute change in per capita income from 1991-97.

Per Capita Income Level: There is substantial variation in 1997 per capita income level among the top 50 MSAs. The top-ranked MSA's are San Francisco and New York with per capita income levels exceeding $30,000. They are followed by Washington DC, Seattle, Boston, Denver, and Chicago - all with per capita incomes in excess of $27,500. An additional six MSA have per capita income levels in excess of $25,000. Interestingly 36 out of the top 50 MSAs have per capita incomes below $25,000; and eight of these have per capita income levels below $20,000.

The human capital literature predicts a strong positive correlation between talent and income. The correlations between income, talent/ human capital and other factors are summarized in Table 2. As these data show, talent is positively correlated with per capita income. The correlation coefficient between talent and per capita income level (1997) is 0.588. More interesting however is the strong positive correlation between income and diversity. The correlation coefficient between diversity and per capita income is 0.498. Recall that the diversity measure is for 1990. That is, the level of diversity (based on the gay index) for 1990 and is positively and significantly associated with 1997 per capital income. This suggests that places that are open and supportive of diversity will only attract talent, but will tend to realize income gains as well. Based on this, one can theorize

that low entry barriers to talent (represented by diversity/ the gay index) translate into income gains at the regional level. Income is also positively correlated with cultural amenities, coolness, and median house values as well as high-technology industry.

Multivariate regression models were used to further probe the nature of the relationships between income, talent, and other factors. Table 4 presents the findings of these models. The adjusted R-squared values for these models are 0.57 and 0.65 respectively, suggesting a reasonably positive and robust relationship. The talent coefficient is positively and significantly associated with per capita income level in all permutations of the model. The coefficient for cultural amenities is also positively and significantly associated with per capita income. Per capita income level is also associated with high-technology industry. This suggests that talent and technology work together in creating regional income effects. While this analysis does not address the chicken-and-egg question of what comes first -talent or technology jobs-, it does suggest that talent is an important factor in its own right.

Income Change: It is also useful to examine the relationship between talent and income change. The correlations between talent, other factors, and income change between 1991 and 1997 are summarized in Table 2. Here again, the human capital literature would predict a positive relationship between income change and talent, and this is indeed what the findings suggest. The correlation coefficient for absolute income change (1991-1997) and talent (1990) is 0.337. That is, the level of talent in 1990 predicts the absolute dollar change in income between 1991 and 1997. The results of the regression analysis suggest that this relationship is robust (see Table 5). The dependent variable in the model is absolute change in income (1991-97) and the independent variables are talent, diversity, high-technology industry, and median house value. The adjusted R-squared for the model

is .225. Talent is the only variable in the model that is positively and significantly associated with income change.

Table 5: Regression Model Findings: Talent and Income Change

Dependent Variable:

Per Capita Income **Per Capita Income Change**

	Model 1		Model 2		Model	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Diversity	-640.33	0.244			-201.5561	0.3780
Hightech	911.88	0.001***	549.60	0.048**	177.3669	0.1100
Talent	27629.77	0.005***	24958.17	0.028**	8782.428	0.0310**
Coolness Score (POV)			-236.73	0.348		
Median House Value	-9.59	0.399	-22.36	0.101	-14.3988	0.0040***
Cultural Amenities			0.91	0.001***		
Recreational Amenities			0.93	0.758		
Climate			-22.36	0.101		
R-square	0.6028		0.7114		0.2909	
Adjusted R-square	0.5659		0.6520		0.225	
# of Obs.	48		42		48	

Note
*: significant at 0.1
**: significant at 0.05
***: significant at 0.01

Summary and Discussion

This paper has explored the economic geography of talent. To do so, the research examined the relationship between talent, high-technology industry, quality of place and regional economic outcomes. The research is based upon a combination of qualitative research (interviews, focus groups and field studies) and quantitative statistical research.

The findings of the research shed light on the geography of talent, the factors that shape that geographic distribution, and the effects of talent and the location of high-technology industry and other regional outcomes. Despite the seminal work of Jacobs and important, recent work by Lucas, Glaeser, and others, it is still safe to say that on balance scholars have continued to focus attention on firms and underestimated the importance of human capital in economic geography and regional development. This is not to say that firms are not important – of course they are, but rather to focus attention on the relationship between talent and attributes of quality of place in structuring geographic processes and effecting outcomes.

Taken together, the findings of the qualitative and quantitative aspects of the research shed light on the structure of relationships between talent, technology, quality of place and regional economic outcomes. Talent is associated with opportunity, diversity (low entry barriers) and quality of place. Talent in turn attracts high-technology industry. Together, talent and technology based industries generate positive regional economic outcomes in the form of higher per capita incomes.

These findings support the human capital-growth connection noted by Lucas (1988), Glaeser, Simon and others, and further suggest that place based characteristics matter in the attraction of high human capital individuals. The findings further suggest that the ability to attract talent is the fundamental dimension of city and regional growth. This contrasts with the preoccupation in much of the academic literature and in economic development practice that emphasizes the attraction of firms and the formation of industrial clusters. It is talent that orients the location decisions of firms and which underpins the formation and evolution of industrial clusters.

Furthermore, the research presented here suggests that places certainly matter in the economic geography of talent and in the attraction of high human capital individuals on which growth depends. Places provide the infrastructure required to generate, attract, and

retain talent. The findings suggest that these place-based advantages stem in turn from two underlying economic factors: low entry barriers to human capital and efficiencies in the delivery of consumer services. Taken together, I suggest, these two characteristics increase the attractiveness of places to high human capital, talented individuals. In other words, it is not simply observed characteristics such as diversity or amenities that matter in the economic geography of talent. These observed characteristics reflect real economic advantages in the location of talent. Simply put, there is an economic rationale behind what may be perceived as "nice" places to live.

This paper has hoped to illustrate the importance of the relationship between human capital, place-based characteristics, and growth. More research is required to delineate the precise nature of causality among these factors.

These findings have a number of important practical implications for firms and for economic development policy and practice. The basic implication for firms is that location or place matters a great deal in the ability to attract and retain high human capital individuals. Indeed, the ability to attract talent can more than offset low costs. The costs of searching for and attracting talent in remote locations can more than offset the advantages to low costs. Thus, firms in knowledge based or high-technology industries would do well to orient their search to high human capital locations with high levels of quality of place and low entry barriers to talent.

The implication for economic development policy and practice is that cities and regions should place less emphasis on firm based strategies, and focus instead on developing strategies to generate and attract talent, improves their quality of place, and reduce barriers to entry for talent. This is likely to pay far greater dividends in the creation of high technology industries and improvement of regional incomes than traditional strategies to attract firms or building industrial clusters.

The aim of the research was to illuminate the importance of talent and place based characteristics in high-technology industry location and regional outcomes. It has only begun to scratch the surface of this important set of relationships. A good deal more research is needed on these important subjects. I hope however that this paper will stimulate both researchers and policy makers to think about the determinants of regional growth in a new light, and especially to place less emphasis on attracting firms and more importance on attracting talent and improving quality of place.

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