The Economic Geography of Talent

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The distribution of talent, or human capital, is an important factor in economic geography. This article examines the economic geography of talent, exploring the factors that attract talent and its effects on high-technology industry and regional incomes. *Talent* is defined as individuals with high levels of human capital, measured as the percentage of the population with a bachelor's degree and above. This article advances the hypothesis that talent is attracted by diversity, or what are referred to as low barriers to entry for human capital. To get at this, it introduces a new measure of diversity, referred to as the diversity index, measured as the proportion of gay households in a region. It also introduces a new measure of cultural and nightlife amenities, the coolness index, as well as employing conventional measures of amenities, high-technology industry, and regional income. Statistical research supported by the findings of interviews and focus groups is used to probe these issues. The findings confirm the hypothesis and shed light on both the factors associated with the economic geography of talent and its effects on regional development. The economic geography of talent is highly concentrated. Talent is associated with the diversity index. Furthermore, the economic geography of talent is strongly associated with high-technology industry location. Talent and high-technology industry work independently and together to generate higher regional incomes. In short, talent is a key intermediate variable in attracting high-technology industries and generating higher regional incomes.
Key Words: amenities, diversity, human capital, high-technology industry, talent.

> 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, S98)

The distribution of talent, or human capital, is an important factor in economic geography. Geographers have paid considerable attention to the geography of labor, suggesting that key factors in the location decisions of firms include labor costs and labor quality. Jacobs (1961) long ago called attention to the role of cities in attracting and mobilizing talented and creative people. Ullman (1958) also recognized the role of talent or human capital in his classic work on regional development and the geography of concentration. Lucas (1988) has argued that the driving force behind the growth and development of cities and regions is the productivity gains associated with the clustering of talented people or human capital. Research by Glaeser (1998, 1999, 2000) and others (Glaeser, Sheinkman, and Sheifer 1995; Glendon 1998; Simon 1998) provides empirical evidence of the association between human capital or talent and regional economic growth (see Mathur 1999 for a review). Florida (2002a, 2002b; Florida and Gates 2001) argues that regional innovation and economic growth are associated with regional openness to creativity and diversity.

There has been less research on the factors that attract talent and shape its economic geography. For the most part, geographers and social scientists have viewed the economic geography of talent as a function of employment opportunities and financial incentives. A growing stream of research suggests that amenities, entertainment, and lifestyle considerations are important elements of the ability of cities to attract both firms and people (Glaeser, Kolko, and Saiz 2001; Lloyd 2001; Lloyd and Clark 2001; Florida 2002a, 2002b).

This article explores the economic geography of talent, focusing in particular on the factors that attract human capital or talent. It advances the main hypothesis that the economic geography of talent is associated with diversity or openness—what I refer to as *low barriers to entry for human capital*. It also explores the effect of the economic geography of talent on high-technology industry and regional incomes, suggesting that concentrations of talent are associated with both.

To shed light on these issues, this article summarizes the results of both qualitative and quantitative research on the factors associated with the economic geography of talent and its effects on high-technology industry location and regional income. As a proxy for human capital, it measures talent as percentage of the population with a bachelor's degree and uses two supplementary measures: percentage of total persons employed that are scientists and engineers, and similarly, percentage that are professional and technical workers. The article introduces a

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new measure of diversity: the diversity index, based on the proportion of coupled gay households in a region's population. Another new measure, the coolness index, is introduced to account for cultural and nightlife amenities.

The findings of the research shed considerable light both on the factors associated with the economic geography of talent and on the effects of that geography on regional development. The economic geography of talent is highly concentrated at the regional level. Talent is associated with the diversity index, confirming the hypothesis that talent is attracted to places with low entry barriers for human capital. In contrast to much of the recent literature on amenities and city growth, this study finds that talent is more attracted to diversity than to measures of climate, recreational, and cultural amenities. Furthermore, talent is strongly associated with high-technology industry location. Talent and high-technology industry work independently and together to generate higher regional incomes. In short, talent is a key intermediate variable in attracting high-technology industries and generating higher regional incomes.

Concepts and Theory

The literature on the roles of employment, labor, and human capital in geography is vast (see Mathur 1999 and Hanson 2000 for reviews of aspects of this literature). Below I offer a brief review of this literature, focusing on the following: talent and regional growth; the location of talent; and the role of diversity.

Talent and Regional Growth

Jacobs (1961, 1969) 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. Ullman (1958) also noted the role played by human capital or talent in the process of regional development and the geography of concentration. Andersson (1985) and Desrochers (2001) noted that the ability to incubate and nurture creativity and to attract creative people is a central factor in regional development. The *new growth theory* associated with Romer (1990) formally highlights the connection between knowledge, human capital, and economic growth.

Building upon these insights, Lucas (1988) essentially argued that cities function to collect and organize human capital, giving rise to strong external economies, which he refers to as external human capital. These economies 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 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, 38–39)

Empirical studies support the human capital-regional growth connection. Eaton and Eckstein (1997) and Black and Henderson (1999) have suggested that given spillovers in the accumulation of human capital, 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. Rauch (1993) found that both wages and housing rents were higher in cities with higher average education levels. Glaeser, Sheinkman, and Sheifer (1995) found a strong relationship between human capital and city growth. They found that cities that begin with more educated populations exhibit higher rates of population growth as time goes on. Simon and Nardinelli (1996) examined the connection between human capital and city growth in the United States and Great Britain, finding that the level of human capital in 1880 predicted city growth in subsequent decades. Glaeser (2000) found that access to common pools of labor or talent is what underpins the tendency of firms to cluster together in regional agglomerations, rather than interfirm linkages. Simon (1998) and Glendon (1998) found a strong relationship between the average level of human capital and regional employment growth over a considerable time frame. Florida (2002a) found a positive relationship between technological creativity (measured as regional innovation and high-technology industry) and cultural creativity (measured by a "bohemian index," the regional share of artists, musicians, and cultural producers). Florida and Gates (2001) found a

positive relationship between regional concentrations of high-technology industry and several measures of diversity, including the percent of the population that is foreign-born, the percent that is gay, and a composite diversity measure. Florida (2002b) argued that regional economic outcomes are tied to the underlying conditions that facilitate creativity and diversity.

The Location of Talent

The literature suggests that places attract human capital or talent through two interrelated mechanisms. The traditional view offered by economists is that places attract people by matching them to jobs and economic opportunity. More recent research suggests that places attract people by providing a range of lifestyle amenities (see Gottlieb 1995). This is particularly true of highly educated, high human-capital individuals who possess resources, are economically mobile, and can exercise considerable choice in their location. Lloyd and Clark (2001; Lloyd 2001) argue that amenities are a key component of modern cities, referring to this lifestyle-oriented city as an "Entertainment Machine." Kotkin (2000) argues that high-technology industries and workers are attracted to a range of lifestyle amenities. Glaeser, Kolko, and Saiz (2001, 48) found a significant relationship between amenities and city growth. They suggest not only that high human-capital workers increase productivity, but that high human-capital areas are pleasant places to live in, concluding 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." In a review of the literature, Glaeser (1999) notes that cities attract people as well as firms through the interplay of both market and nonmarket forces at work in cities.

The Role of Diversity

A central argument of this article is that diversity plays an important role in attracting talent or human capital. Urban and regional economists have long argued that diversity is important to regional economic performance. In the main, the term "diversity" is used to refer to the diversity of firms or regional industrial structures. In a major review of the field, Quigley (1998) suggests that regional economies benefit from the location of a diverse set of firms and industries.

The argument advanced here is different. It suggests that diversity plays a key role in the attraction and retention of the kinds of talent required to support high-technology industry and generate regional growth. Jacobs (1961) called attention to the role of diversity and immigration in powering innovation and city growth. Following Jacobs, Desrochers (2001) notes the relationships between diversity, creativity, and regional innovation. Zachary (2000) argues that openness to immigration is a key factor in innovation and economic growth. He notes that the United States' competitiveness in high-technology fields is directly linked to its openness to outsiders, while the relative stagnation of Japan and Germany is tied to "closedness" and relative homogeneity. In an empirical study of Silicon Valley, Saxenian (1999) found that roughly one-quarter of new business formations had a Chinese- or Indian-born founder and that roughly one-third of the region's scientists and engineers were foreign-born. Florida and Gates (2001) found a positive relationship between high-technology industry concentration and diversity.

This article suggests that diversity—or low entry barriers for talent—increase a region's ability to compete for talent. At any given time, regions, like firms, compete with one another for talent. To support high-technology industries or a wide range of economic activity in general, regions compete for a variety of talent across a wide variety of fields and disciplines. Regions that are open to diversity are thus able to attract a wider range of talent by nationality, race, ethnicity, and sexual orientation than are those that are relatively closed. Simply put, regions that are open and possess low barriers to entry for human capital gain distinct economic advantage in the competition for talent or human capital and, in turn, in their ability to generate and attract high-technology industries and increase their incomes. Figure 1 outlines the structure of these relationships.

Research and Methods

This article reports on an empirical analysis of the economic geography of talent, the factors that attract

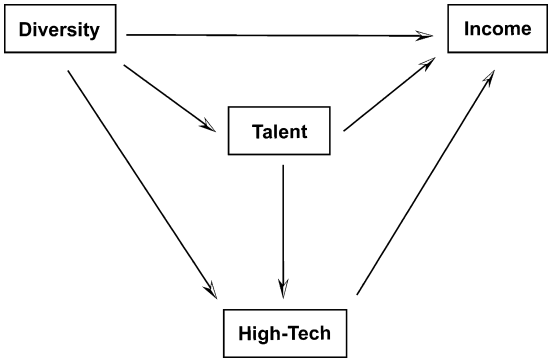

Figure 1. Structure of relationship between diversity, talent, and high technology.

talent, and talent's effects on high-technology industry location and growth, and regional income. Qualitative research, including interviews and focus groups, was initially conducted to better understand the structure and mechanics of these relationships and to generate testable hypothesis. Unstructured, open-ended interviews were conducted with more than 100 people who were making or had recently made location decisions. Structured focus groups were conducted to further assess the factors involved in personal location decisions. The original focus groups were conducted in March 1999 in Pittsburgh, with the assistance of a professional focus group organization. The author and the research team worked together with the focus group organization to screen focus group participants and develop the instrument. The focus group instrument probed respondents who were in the process of making location decisions or had recently made such decisions about the key factors that mattered to them in the choice of particular locations. It also probed respondents about the key economic, cultural, and lifestyle factors that affected their choices of particular locations in which to live and work. Four structured groups were conducted involving graduating undergraduate students in technical fields, graduating undergraduate students in nontechnical fields, graduating graduate students in business and technical fields, and professionals who had recently made location decisions. The focus groups took place over the course of a week and were conducted in a specialized facility with a one-way mirror for observation. Florida (1999) summarizes the results of the focus groups. Subsequent field research and personal interviews were conducted with individuals making location decisions in various cities and regions across the United States. The qualitative research was exploratory in nature and designed to shed light on and help structure the quantitative research, which was confirmatory in nature and approach.

Data, Variables, and Methods

Statistical analysis examined the geography of talent, the factors associated with that observed geography, and the effect of talent on characteristics of regional economies. It included descriptive statistics, correlation or bivariate analysis, multivariate regression analysis, and path analysis. Table 1 provides descriptive statistics for the various measures used in this research.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
Diversity index	50	1.32	0.87	0.19	5.39
Tech-Pole Index	50	1.40	1.88	0.06	8.24
Talent index	50	0.24	0.05	0.14	0.42
Coolness index	43	6.35	1.51	1.00	10.00
Median house-value ($000)	48	84.65	30.60	51.39	186.20
Cultural amenities	50	1,804.76	1,458.98	482.00	9,375.56
Recreational amenities	50	2,275.82	727.94	933.00	4,390.00
Climate	50	579.91	116.79	293.00	903.00
Per-capita income ($)	50	24,350.10	3,264.02	19,412.92	34,751.28
Per-capita income change ($)	50	2,881.09	982.89	297.38	4,682.39

Talent Index

The basic talent index is a measure of highly educated people, defined as those with a bachelor's degree and above. This index is normalized on a percentage basis or per thousand people and based on the 1990 decennial census Public-Use Microdata Sample (U.S. Bureau of the Census 1993, 1995). Two additional measures of talent are also used: professional and technical workers, and scientists and engineers. Both of these are normalized on a percentage basis or per thousand people and based on the 1990 decennial census Public-Use Microdata Sample.

Amenity Measures

Several measures of amenities are used. These are based on traditional indicators of climate, cultural, and recreational amenities adapted from the 1989 *Places Rated Almanac* (Boyer and Savageau 1989).

Coolness Index

This measure is adapted from the so-called coolness factor used by *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, nightclubs, and the like per capita) and culture (number of art galleries and museums per capita).

Diversity Index

The research employs a unique measure of openness or diversity—the diversity index, which is also known as the gay index. It is a measure of the fraction of the population that is gay (see Black et al. 2000 for a discussion of this measure). The gay index is a good proxy for diversity, defined as lower barriers to entry for human capital. The reason for this is that the gay population is a

segment of the population that has long faced discrimination and ostracism. The presence of a relatively large gay population thus functions as a signal indicator of a region that is very open to various other groups. The diversity or gay index is based on data from the 1990 decennial census (5-percent sample), 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 number of gay households compared to the national population of gay households divided by the population in the city compared to the total national population.

Median House-Value

Median house-value is used to examine the effects of talent on housing costs. Furthermore, since Rosen (1974), researchers have argued that amenities are at least partially capitalized in land rents. This measure is also adapted from the 1990 decennial census.

Tech-Pole Index

The analysis examines the effect of talent on the location of high-technology industry. The measure of high-technology concentration is based on the Milken Institute's Tech-Pole Index. The Tech-Pole Index is a composite measure based on the percent of national high-technology real output multiplied by the high-technology real-output location quotient for each metropolitan statistical area (MSA) (see DeVol et al 1999).

Regional Income

The research also examines the effect of talent on regional income. 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 from 1991 to 1997. These data are from the U.S. Bureau of Economic Analysis.

Statistical and Econometric Analysis

Both bivariate and multivariate analyses are conducted to examine the factors associated with the economic geography of talent and the effect of that geography (controlling for other factors) on high-technology industry location and regional income. Path analysis is used to better understand the structure of relationships among these variables. Path analysis can help to discern the path of relationships in a model with multiple competing paths of causality. It should be pointed out that path analysis does not prove the direction of causality, but can provide support for a certain path of causality.

The analysis is based on the fifty largest metropolitan regions, each with populations of 700,000 and above in 1990. For most regions, the MSA is employed as the unit of analysis. MSAs that are part of a consolidated metropolitan statistical area (CMSA) are combined into their CMSA as a single unit of analysis. MSA-level variables are weighted by their proportion of the CMSA and then summed at the CMSA level. The CMSA is used as the unit of analysis for the five largest regions: San Francisco,

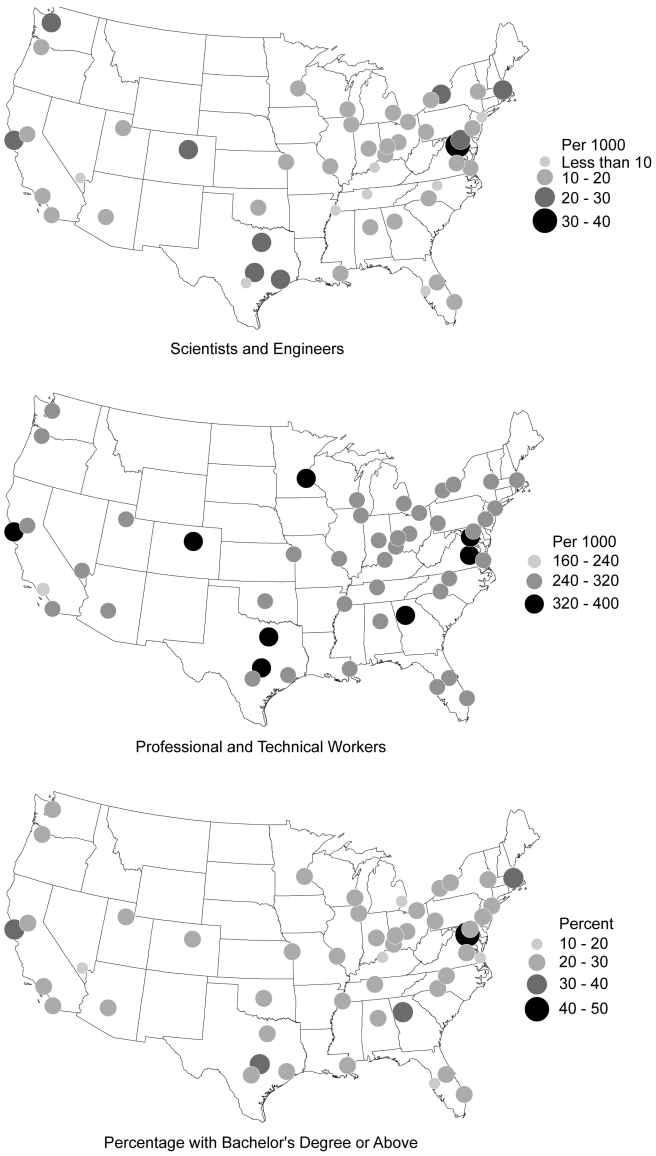

Figure 2. The geography of talent. *Source*: U.S. Bureau of the Census 1993, 1995.

Table 2. Correlation Analysis Results

	Diversity Index	Tech-Pole Index	Talent Index	Coolness Index	Median House-Value	Culture	Recreation	Climate	Income	Income Change
Diversity index	1									
Tech-Pole Index (98)	0.7677***	1								
Talent index	0.7181***	0.723***	1							
Coolness index	0.3769**	0.4285***	0.4687***	1						
Median house-value	0.4464	0.5064***	0.5384***	0.3552**	1					
Culture	0.2886**	0.4933***	0.4298***	0.5693***	0.4446***	1				
Recreation	0.1568	0.1587	−0.0482	0.2464	0.3983***	0.2494*	1			
Climate	0.4466***	0.4641***	0.2198	0.1458	0.432***	0.2049	0.2907**	1		
Income	0.4983***	0.6014***	0.5882***	0.4167	0.3597**	0.5209***	0.0977	0.2171	1	
Income change	0.1991	0.3205**	0.2916**	0.2368	−0.1263	0.1817	−0.1865	−0.1192	0.5165***	1

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level.

Los Angeles, Miami-Fort Lauderdale, New York, and Dallas-Fort Worth.

Findings

The findings of the research are presented in three sections. The first provides a descriptive overview of the economic geography of talent. The second examines the factors that attract talent and shape that geography. The third turns to the effect of talent on high-technology industry location and regional incomes.

The Economic Geography of Talent

The economic geography of talent is uneven, as Figure 2 shows. Roughly 42 percent of the population of the top-ranked region, Washington, DC, had a bachelor's degree or above in 1990. Washington, DC was followed by Boston, San Francisco, Austin, Atlanta, and Seattle, in all of which more than 30 percent of the population held a bachelor's degree or above. However, in more than thirty of the top fifty regions, less than 25 percent of the population had a bachelor's degree or above in 1990. Just 14 percent of the population of the region ranked fiftieth, Las Vegas, had a bachelor's degree or above. Similar patterns hold for scientists and engineers and professional and technical workers. Table 2 presents the results of a correlation analysis. Figure 3 shows maps for cultural amenities, the coolness index, and the diversity/gay index. The graphs in Figure 4 plot the relationships between talent, amenities, the coolness index, and the diversity index.

Amenities. The results of the correlation analysis indicate that talented individuals appear to be attracted

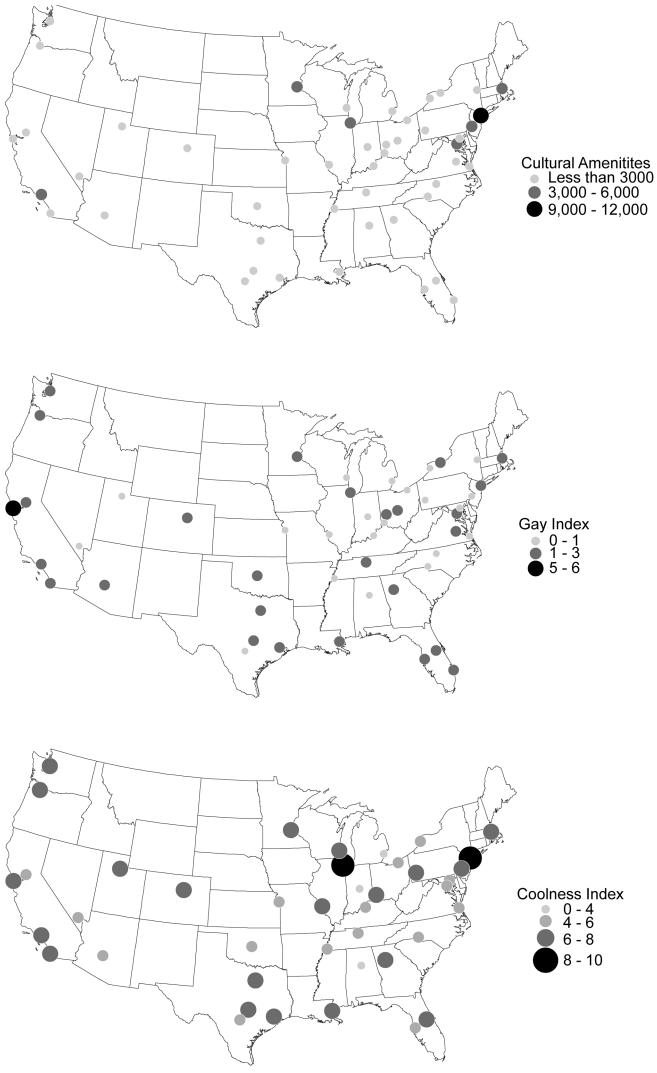

Figure 3. Quality of place. *Sources: Money Magazine* (http://pathfinder.com/money/bestplaces/); U.S. Bureau of the Census 1993, 1995; *POV Magazine*.

Figure 4. Talent versus amenities, coolness, and diversity. *Sources*: U.S. Bureau of the Census 1993, 1995; *POV Magazine*.

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 (0.429; see Table 2). The same is true for professional and technical workers, but not for scientists and engineers, where the correlation coefficient is negative and insignificant. These relationships are in line with the findings of the interviews and focus groups, which indicate that high human-capital individuals exhibit a strong preference for cultural amenities. The correlations between talent and measures for both recreational amenities and climate are weak and mixed.

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 no reliable measures for such active outdoor recreation could be identified for the sample MSAs, the statistical research is unable to address the direct effect of active outdoor recreation.

Coolness. The correlation coefficient between the coolness measure and the talent index is 0.469. This finding is in line with the interview and focus group results, which indicate that highly educated, talented people—particularly younger workers who are active and those in knowledge-industry labor markets—are attracted to energetic and vibrant places. The focus group and interview subjects strongly emphasized the importance of visual and audio cues such as outdoor dining, active outdoor recreation, a thriving music scene, active nightlife, and bustling street scene as important attractants.

Median House-Value. Median house-value is positively associated with talent, the correlation being 0.538. The focus groups and interviews suggest that high human-capital individuals are willing to pay more for higher levels of lifestyle and amenities. Indeed, median house-value is correlated with coolness (0.355), the diversity index (0.446), and cultural amenities (0.445). This stands in some contrast to conventional wisdom on the subject, which suggests that lower costs of living (reflected in lower median house-values) may comprise an advantage in attracting people to a location.

Diversity. Talent is strongly associated with the diversity index. The correlation coefficient is 0.718, making it the highest correlation coefficient among this group of measures. This is also reflected in the scatterplot for talent and diversity (Figure 4). These results reflect the findings of the focus groups and interviews, which found that talented people are attracted to locations that have a high degree of demographic diversity and are distinguished by a high degree of openness and relatively

low barriers to entry. The diversity index can be thought of as a leading indicator of these characteristics. Places that are open to and supportive of a gay population, our proxy measure for diversity, are likely to be open and supportive of other groups. Simply put, the diversity index reflects an environment that is characterized by low entry barriers to human capital.

Multivariate Analysis

Multivariate regressions were used to further probe the factors associated with the economic geography of talent. Several models were run to gauge the effects of amenity measures (climate, culture, and recreation), coolness, and diversity on the location of talent. The results of the various models generated *R*-squared values between 0.65 and 0.75, suggesting a robust relationship (see Table 3).

The most consistent finding is for diversity. The coefficient for the diversity index is consistently positive and highly significant (at the 0.001 level) in all permutations of the model. These include both basic models and more complex ones where it is included alongside an array of other variables. This suggests that diversity (measured by the gay index) is strongly associated with the location of talent. The interviews and focus group findings are in line with this result. The focus groups and interview participants report that diversity is particularly important in the location decisions of high human-capital individuals. Talented people making location decisions report a clear preference for places with a high degree of demographic diversity. The findings for the diversity index suggest that talented people prefer 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 with low barriers to entry for human capital.

The coolness measure is also associated with the location of talent. While it sometimes has significance in models where it is run alongside the diversity index, it is typically significant in models that do not include that index. The focus group and interview findings also suggest that high human-capital individuals, particularly younger ones, are drawn to places with vibrant music scenes, street-level culture, active nightlife, and other signifiers of being "cool."

The results for the amenity measures suggest that these cultural factors are not associated with the location of talent. The coefficients for cultural amenities are positive but never significant. The coefficients for climate are typically negative and are significant (at the 0.10 level) in only one permutation of the model. The coefficients for recreational amenities are negative and significant. These findings suggest that talent is not necessarily drawn to warmer climates, greater recreational amenities, or cultural amenities. These findings, in part, can be attributed to shortcomings with existing measures of amenities. For example, available measures of culture and recreation take into account only certain types of amenities. The interview and focus group findings suggest that talented people are drawn to cultural and recreational amenities that are more broad-based, open, and participative, such as active outdoor recreation or a vibrant music scene, which these measures do not reflect.

In addition, the focus group and interview findings suggest that these nonmarket or lifestyle factors work in concert with economic opportunity in shaping the economic geography of talent. Clearly, people need to make a living and thus require jobs and gainful employment. Furthermore, the field research results indicate that high human-capital people have many employment options and change jobs relatively frequently, and thus they strongly favor locations that possess thick labor markets (see Florida 2002b). Simply put, high-paying, challeng-

Table 3. Regression Model Findings: Talent, Diversity, and Amenities

	Dependent Variable: Talent (BA and above)							
	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	*P*-value	Coef.	*P*-value	Coef.	*P*-value	Coef.	*P*-value
Diversity index	0.033	0.00***	0.036	0.00***	0.029	0.00***	0.033	0.00***
Coolness index			0.008	0.01***	0.008	0.01**	0.005	−0.17
Median house-value	0.000	−0.14			0.001	0.04**	0.001	0.02**
Culture							0.000	−0.2
Recreation					0.000	0.00***	0.000	0.00***
Climate							0.000	−0.13
Observations	48		43		42		42	
R-squared	0.58		0.58		0.72		0.75	

* Significant at 0.1; ** Significant at 0.05; *** Significant at 0.01.

ing employment is a necessary but insufficient condition to attract talent. Because high human-capital individuals are mobile and have many options, all of these conditions—particularly diversity—must be in place to attract them.

Talent and High-Technology Industry

I now turn to the relationship between talent and high-technology industry. A number of trends are readily apparent. Talent is quite closely correlated with high-technology industry, as measured by the tech-pole index—a coefficient of 0.723 (see Table 2). High-technology industry is positively correlated with cultural amenities (0.493), climate (0.464), coolness (0.429), and median house-value (0.506), but not with recreational amenities. But high-technology industry is even more closely correlated with the diversity index—a correlation coefficient of 0.768. Figure 5 provides scatterplots of high-technology industry and talent, and high-technology industry and diversity.

Multivariate regressions and path analysis were used to further probe the relationships between talent, diversity, and high-technology industry (see Table 4). The adjusted *R*-squared values for these models range from 0.64 to 0.68, which suggests 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 amenity variables or coolness. The coefficients for these variables are insignificant in most permutations of the model.

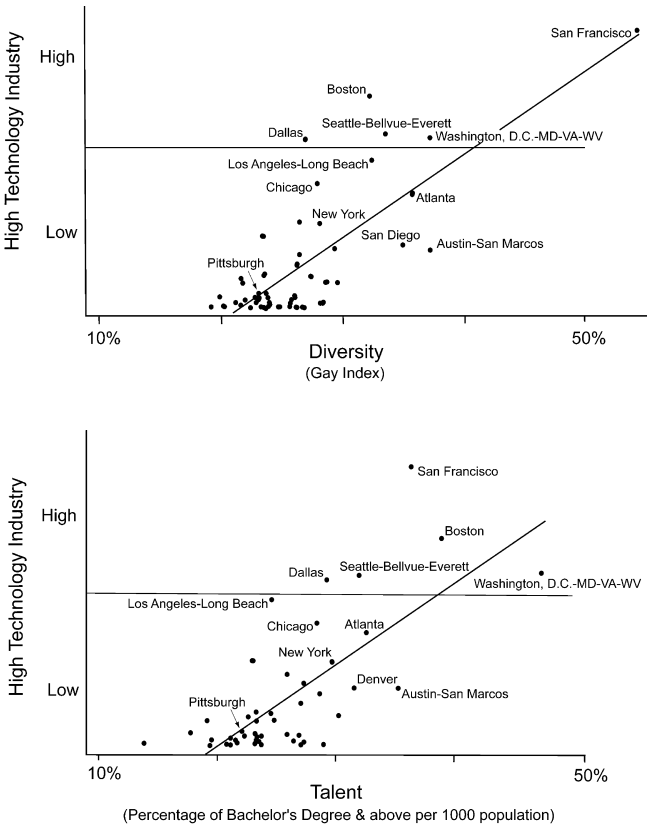

Figure 5. High-technology industry, talent, and diversity. *Sources*: U.S. Bureau of the Census 1993, 1995; DeVol 1999.

The results of the field research support these statistical findings. The interviews suggest that the availability of talent is an increasingly important location factor for these firms. They indicate that firms in knowledge-based industries are less concerned with traditional factors, such as land costs, labor costs, tax rates, or government incentives. Such firms report that they 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.

Path analysis was used to further explore the path of causality among these variables. Figure 6 provides a schematic depiction of the key variables in the path analysis. A number of paths are of note. First, talent is strongly associated with high-technology industry: the direct effect of talent on high-technology industry location is 0.42. Second, diversity is associated both with talent and high-technology industry: the direct effect of diversity on talent is 0.59. Diversity also works indirectly on high-technology industry via its effect on talent. This indirect effect is 0.25.[1] In addition, diversity has a direct effect on high-technology industry of 0.35. When combined, the total effect of diversity on high-technology industry is 0.60. Third, the path analysis suggests that the effects of other variables, such as coolness or other amenity measures, are weak and frequently negative (not shown in Figure 6). For example, coolness has a weak positive effect (0.15) on talent but a negative effect (−0.024) on high-technology industry. Cultural amenities have a weak positive effect on both talent (0.14) and high-technology industry (0.16). Recreational amenities have a weak negative effect (−0.34) on talent and a weak positive effect (0.05) on high-technology industry. Climate has a weak negative effect (−0.17) on talent and a small positive effect (0.20) on high-technology industry.

Taken as a whole, the findings suggest the following relationship between diversity, talent, and high technology. Talent is attracted to regions with low entry barriers as

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

	Dependent Variable: Tech-Pole Index							
	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	*P*-value	Coef.	*P*-value	Coef.	*P*-value	Coef.	*P*-value
Diversity index	1.1070	0.000***	0.857	0.009***	1.0816	0.000***	1.3074	0.000***
Talent index	13.8415	0.006***	13.2809	0.027**	11.7028	0.028**		
Coolness index			−0.0225	0.881				
Median house-value					0.0074	0.256	0.0055	0.431
Culture			0.0002	0.104			0.0003	0.012**
Recreation			0.00002	0.947			−0.0002	0.517
Climate			0.0025	0.133			−2.2359	0.015**
R-squared	0.6502		0.7281		0.6720		0.6958	
Adjusted *R*-squared	0.6354		0.6828		0.6497		0.6596	
Observations	50		43		48		48	

* Significant at 0.1; ** Significant at 0.05; *** Significant at 0.01.

measured by the diversity index. In turn, high-technology industries are attracted to places with high levels of talent.

Talent and Regional Income. A large and influential body of research 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 (Simon 1998). The research presented here builds upon this line of work by examining the effects of human capital or talent on income while controlling for the effects of high-technology industry, diversity, and other factors. The analysis employs two income measures: (1) per-capita income and (2) absolute change in per-capita income from 1991 to 1997.

Per-Capita Income Level. There is substantial variation in per-capita income among the top 50 MSAs. The top-ranked MSAs are San Francisco and New York, with per-capita income levels exceeding U.S.$30,000. But thirty-six of the top fifty MSAs have per-capita incomes below $25,000, and eight of these have per-capita income levels below $20,000.

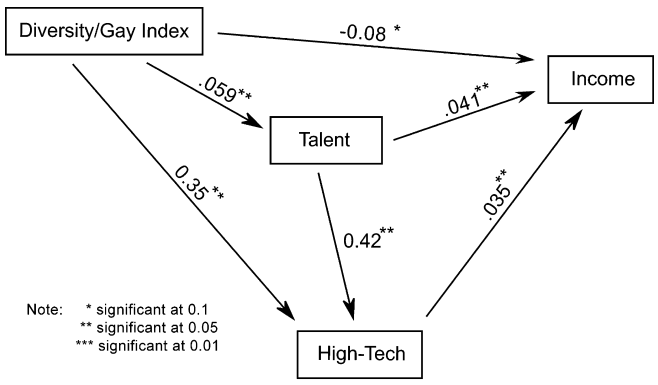

Figure 6. Path-analysis results.

Talent is positively correlated with per-capita income, a finding that is in line with the literature (see Table 2). 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 the diversity index (0.498). This suggests that places that are open and supportive of diversity will not only attract talent, but tend to have higher income levels as well. Based on this, one can theorize that low entry barriers to talent (represented by the diversity index) translate into higher regional incomes. 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 investigate the nature of the relationships between income, talent, and other factors (see Table 5). 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-or-the-egg question of what comes first—talent or high-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. As Table 2

Table 5. Regression Model Findings: Talent and Income Change

	Dependent Variable: Income				Dependent Variable: Income Change	
	Model 1		Model 2		Model	
Variables	Coef.	*P*-value	Coef.	*P*-value	Coef.	*P*-value
Diversity index	−640.33	0.244			−201.5561	0.3780
Tech-Pole Index	911.88	0.001***	549.60	0.048**	177.3669	0.1100
Talent index	27629.77	0.005***	24958.17	0.028**	8782.428	0.0310**
Coolness index			−236.73	0.348		
Median house-value	−9.59	0.399	−22.36	0.101	−14.3988	0.0040***
Culture			0.91	0.001***		
Recreation			0.93	0.758		
Climate			−22.36	0.101		
R-squared	0.6028		0.7114		0.2909	
Adjusted *R*-squared	0.5659		0.6520		0.225	
Observations	48		42		48	

* Significant at 0.1; ** Significant at 0.05; *** Significant at 0.01.

shows, 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 (1991–1997), and the independent variables are talent, diversity, high-technology industry, and median house-value. The adjusted *R*-squared value for the model is 0.225. Talent is the only variable in the model that is positively and significantly associated with income change.

Path analysis was used to further probe the structure of relationships among these variables (see Figure 6). Here several findings are of note. First, talent has a direct effect on income (0.41) as well as a direct effect on high-technology location (0.42). This is greater than the direct effect of high-technology industry on income (0.35). The estimated total effect of talent on income is 0.56. Furthermore, while diversity has no direct effect on income, it has a substantial indirect effect. This analysis indicates that diversity works indirectly on income through two additional paths. Working through high-technology industry, the indirect effect of diversity on income is 0.12. Working indirectly through talent and then high-technology industry, the indirect effect of diversity on income is 0.24. The estimated total effect of diversity on income is 0.37.

Taken in combination with the results of the field research, the statistical findings suggest the following set of relationships among these variables. Talent is associated with diversity, as diverse and open environments attract high-human capital individuals. Diversity is directly associated with talent and also with concentrations of high-technology industry. High-technology industry is attracted to places with high levels of human capital and high levels of diversity. Talent and high-technology industry work independently and in concert to generate higher regional incomes. Talent is thus a key intermediate variable in attracting high-technology industries and generating higher regional incomes.

Summary and Discussion

This article set out to examine the economic geography of talent and to explore the factors that shape that geography and its effects on the location of high-technology industry and regional income. Talent was defined as individuals with high levels of human capital, measured as the percentage of the population with a bachelor's degree or above. It advanced the hypothesis that talent is attracted by diversity, defined as low barriers to entry for human capital. To get at this, it introduced a new measure of diversity, the gay index, as a proxy for these low entry barriers. This article also used a new measure of cultural or nightlife amenities, the coolness index, as well as conventional measures of amenities, high-technology industry, and regional income. Statistical research supported by the findings of interviews and focus groups was used to probe the factors associated with the economic geography of talent and the its effects on regional development.

The findings of the research confirm the hypothesis and shed light on both the factors associated with the economic geography of talent and its effects on regional development. The economic geography of talent is highly

concentrated by region. Talent is associated with high levels of diversity. Talent is more closely associated with diversity than with conventional measures of climate, cultural, and recreational amenities. Taken together, the findings suggest that talent is not only associated with economic opportunity, as conventional theory allows, but is drawn to places with low entry barriers for human capital. It turns out that low entry barriers of this sort are not just important to the location of talent but are also directly associated with concentrations of high-technology industry.

Furthermore, the research indicates that the economic geography of talent exerts considerable effects on the location of high-technology industries and regional incomes. Talent is strongly associated with high-technology industry location. These findings support the human capital-growth connections noted by Lucas (1988), Glaeser (1998, 1999, 2000) and Simon (1998) and suggest that human capital works both directly and indirectly through high-technology industry to affect regional income. In short, talent is a key intermediate variable in attracting high-technology industries and generating higher regional incomes.

The findings have a number of implications for regional development. Taken together with the work of Jacobs (1961, 1969) and Lucas (1988) and the empirical findings of Glaeser (1998, 1999, 2000), and others (Glaeser, Sheinkman, and Sheifer 1995; Glendon 1998; Simon 1998), they suggest that talent, or human capital, is a driving factor in regional development. Going beyond this literature, however, they further suggest that talent is not just an endowment or stock that is in place in a given region, but that certain regional conditions are required to attract talent. In other words, talent does not simply show up in a region; rather, certain regional factors appear to play a role in creating an environment or habitat that can attract and retain talent or human capital. Paramount among these factors, the findings suggest, is openness to diversity or low barriers to entry for talent. This, in turn, suggests that a more efficacious approach to regional development may be to emphasize policies and programs to attract human capital, as opposed to conventional approaches that focus on the attraction of firms and the formation of industrial clusters. Regions may have much to gain by investing in a "people climate" as a complement to their more traditional "business climate" strategies (see Florida 2002b). It also appears that diversity has a significant impact on a region's ability to attract talent and to generate high-technology industries. Thus, regions would appear to have much to gain by introducing measures to support and enhance diversity. This suggests that diversity is more than just a social goal—it may have direct economic benefits as well.

This article has tried to illustrate the importance of the relationship between talent, diversity, and regional development. It is clear that diversity helps to attract talent, and that talent is in turn related to high-technology industry and regional growth. More research is encouraged to delineate the precise nature of causality among these factors.

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Note

1. This indirect effect is calculated by multiplying the effect of diversity on talent (0.59) and the effect of talent on high-technology industry (0.42).

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