Software, Creativity and Economic Geography

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Introduction

Software is an industry of vital importance. The industry is large, with over $200 billion in revenues in the United States alone (U.S. DOC, 2000). The software industry in the U.S. employs about 1.5 million people directly, and counting those employed in other types of firms it is estimated that some 2.5 million or more people work as software developers or in software production in some capacity (US DOC 2000). Indeed, software now employs more people than the automobile, computer, semiconductor, and steel industries.

Moreover, despite the oft-repeated comment of the Nobel Prize winning economist Robert Solow (1987) that "computers can be found everywhere except in the productivity statistics," recent research suggests that information technology in general, and software in particular, have played a major role in U.S. productivity gains and overall economic growth in the past decade (DeVol, 1999, Jorgenson et al, 2000). But while the economic impact of software has come to be widely studied and debated, the growth dynamics of the industry itself have gotten relatively little attention and are surprisingly under-studied.

For instance, it is well known that the software industry in the U.S. is clustered much more densely in some regions than in others. Many economic developers and policy makers have tried to build large Silicon Valley-style clusters in their own regions, with mixed results at best. There is a lack of understanding—and of systematic research—on the factors that underpin and shape the regional distribution of software activity.

This report is intended to help fill that gap. First, we paint a detailed picture of the regional distribution, using both occupational and firm-level data to determine where the greatest concentrations of software activity can, in fact, be found. Some well-known regions (like the San Francisco Bay Area) lead the list but many lesser known and smaller metro areas score high as well. Then, using statistical correlations and regression analysis, we test and compare several theories that might be used to explain the patterns of concentration.

We are particularly interested in testing the "creative capital" model developed by Richard Florida and others (Florida 2001, 2002a, 2002b; Florida and Gates 2001). Our central hypothesis is as follows:

We expect software activity to arise and concentrate in places that have a broadly creative habitat that attracts creative and diverse people of all sorts. These places will have the underlying conditions – as well as the requisite talent and the market – for producing software.

The analysis presented here is highly exploratory and preliminary. We do, however, find evidence that tends to confirm the hypothesis. We also find evidence to suggest there is merit in the "industry-clustering" model advanced by Michael Porter and others and in the "human capital" model of Robert Lucas, Edward Glaeser and others. While it hard to isolate any single casual factor that determines the concentration of software jobs and firms, it appears that regions that have a confluence of technology, talent and an overall creative habitat also do well in attracting software activities and jobs.

For those working in regional economic development, however, the key implication is that many regions would do well to re-think their current strategies. Focusing on university technology transfer, or on building up specific high-tech industry sectors, may not be sufficient ways (or even the best ways) of promoting software-related economic growth. Software is ubiquitous, used by — and developed by — people in all walks of life. Regions that can cultivate a broadly creative social and business environment may thus maximize their chances of breeding, and sustaining, innovation in software and all the fields that it touches.

The Nature of the Software Industry

Software differs from most other industries in fundamental ways. For one thing, the basis for competitiveness is different. In older industries such as automobiles and steel — and even in many newer high-technology industries such as electronics — manufacturing productivity and quality are important, as are cost factors such as plant and equipment, materials and transportation. In software, however, competitiveness revolves principally around design. Software can be thought of as an "industry of the mind"—where knowledge, intelligence and human creativity are the crucial inputs, and people are the crucial asset.

It thus is not surprising that traditional regional economic advantages, such as natural resources or access to transportation routes, count for little in software. And many regions, well aware of this, have tried new development strategies. The most common strategy is using a variety of business incentives and programs to attract, or develop, software *firms*. But not all software activity occurs within those firms. Because software is a ubiquitous, general-purpose technology that affects virtually every sector of the economy, from farming and textile production to business services, entertainment, and medical care, software workers work across many sectors of the economy. In fact, recent research indicates that as many as three-quarters of software developers — the people who do the actual creating of software, as distinct from administrative and support people — work outside "the software industry" *per se*.

Furthermore, other studies indicate that only a minority of software workers actually has degrees in computer science, software engineering, or related disciplines. Thus software appears to be a field in which *"creativity matters more than credentials."*

Theories of Regional Growth

Older theories of economic growth and development emphasized the role of natural resources and physical assets. In recent years, several more robust theories have emerged. The first, associated with the work of Michael Porter (1998) and others, emphasizes the role of *clusters* of related and supporting industries. According to this view, clusters operate as geographic concentrations of interrelated firms in which local sophisticated customers, along with strong competition from other firms in the same industry, drive innovation and growth. A second view associated with Robert Lucas (1988) and Edward Glaeser (1998) focuses on the role of human capital – that is, *highly educated people*. It argues that places with higher levels of human capital are more innovative and grow more rapidly and robustly over time.

A third view, associated with Richard Florida (2002), emphasizes the role of creative capital. It argues that certain underlying conditions of places — such as their ability to attract *creative people* (not just highly educated people) and to be open to diversity — inform innovation and growth. In their analyses of U.S. metropolitan areas, Florida and Gates have found that the social character of these regions appears to a very large influence over their economic competitiveness. (Florida 2001, 2002a, 2002b; Florida and Gates 2001) In particular, they found that those places that offer a high quality of life and best accommodate diverse population groups enjoy the greatest success in talent attraction/retention and in the growth of their technology industries. Further independent research by Robert Cushing (2001) of the University of Texas at Austin provides a good deal of support for the creative capital view (See Florida 2002a, chapter 15).
From this basic premise, we therefore argue that the creative capacities and talent required for the software industry will tend to concentrate in places that attract creative talent, and serve to mobilize and harness creativity, more generally.

Data and Methods

This report introduces a variety of data to test our hypothesis along with others. For software employment, we use not only traditional establishment-level (or firm-level) measures, but develop new measures to capture people who work in software occupations across many industries. In the past, analysts have measured industry employment by counting employees in firms or business establishments within that industry. But recent research by Markusen et al (2001) notes the problems of using establishment-level data to estimate high-tech employment. They find that occupation-level data (that is, counting workers by occupational classification regardless of employer) gives a much fuller and richer perspective — and as already noted, we would expect this to be especially true for software.

Our establishment-level data are taken from the Census County Business Patterns (CBP) dataset for 1998, the most recent year available. Our occupation-level data comes from the Bureau of Labor Statistics, Occupation and Employment Survey (OES) dataset for 2000. We also develop location quotients based on these data. This study examines these trends at the metropolitan level and uses both CMSA and PMSA classifications in different analyses (see Appendix A).

After describing the regional concentration of the software industry, we then turn to factors that may condition this economic geography. We explore the role of factors including the presence of technology-based industry generally, commercial innovation (i.e., patenting), university presence, university R&D spending, human capital, and various new measures of creativity and diversity: the relative presence in a region of "creative class" and "super-creative" workers, artists, gays, foreign-born people and others.

We frame our analysis in terms of the "3 Ts" model of economic growth introduced by Florida (2002). The 3 Ts model posits that technology, talent and tolerance are interrelated, and that all three must be present in a region for strong growth to occur. We employ both bivariate and multivariate models to test the relative effect of technology concentration, human capital, creativity and diversity on the regional distribution of software employment. (Appendix A provides a full description of all variables and data sources.

The Economic Geography of the Software Industry

We now examine the economic geography of the software industry, looking first at employment in software occupations across all industrial sectors before turning to the regional distribution of software-industry establishments.

Total Software Employment

Table 1 shows the top 25 regions in terms of total employment in software occupations across all sectors of the economy. We believe occupation data better captures the level of software activity across regions.

Table 1: Software Employment, by Occupation

Rank	Region	Total Software Employment	Percent Software
1	New York, NY	186,430	2.3%
2	San Francisco, CA	173,420	5.5%
3	Washington DC-Baltimore, MD	145,800	4.1%
4	Los Angeles-Long Beach, CA	102,400	1.7%
5	Boston, MA-NH	93,380	3.5%
6	Chicago, IL	88,840	2.3%
7	Dallas, TX	77,370	3.1%
8	Seattle, WA	61,320	3.9%
9	Atlanta, GA	59,730	3.1%
10	Philadelphia, PA	58,070	2.2%
11	Denver, CO	56,050	4.5%
12	Detroit, MI	43,560	2.1%
13	Minneapolis-St. Paul, MN-WI	42,680	2.8%
14	Houston, TX	41,230	2.2%
15	Phoenix-Mesa, AZ	35,790	2.5%
16	San Diego, CA	29,590	2.8%
17	Austin-San Marcos, TX	27,270	4.7%
18	St. Louis, MO-IL	26,810	2.2%
19	Raleigh-Durham-Chapel Hill, NC	25,990	4.4%
20	Kansas City, MO-KS	23,610	2.7%
21	Tampa-St. Petersburg-Clearwater, FL	22,840	2.1%
22	Portland, OR-WA	22,500	2.3%
23	Columbus, OH	20,900	2.8%
24	Miami, FL	19,770	1.4%
25	Orlando, FL	18,690	2.4%

- As Table 1 shows, New York has the greatest absolute number of software workers (186,430) followed by San Francisco (173,420), greater Washington DC (145,800) and Los Angeles (102,400).

- Four regions (above) have more than 100,000 software workers, while an additional seven have more than 50,000. Boston, Chicago, Dallas, Seattle and Philadelphia round out the top 10.

- While there are few surprises among the top 10 software regions, the top 25 is not a listing of high-tech hotspots. As Table 1 shows, several Midwest regions, including Kansas City, St. Louis and Columbus number among the top 25, as well as two Florida regions, Miami and Orlando.

Percent Software Employment by Occupation

It is also useful to examine the share of software workers as a percent of total employment. Table 2 shows the top 25 regions by the percent of the workforce employed in software occupations (Appendix B provides the full listing for all regions).

Table 2: Percent Software Employment, by Occupation

Rank	Region	Percent Software	Total Software Employment
1	San Francisco, CA	5.5%	173,420
2	Colorado Springs, CO	5.2%	10,000
3	Huntsville, AL	4.8%	6,480
4	Austin-San Marcos, TX	4.7%	27,270
5	Denver, CO	4.5%	56,050
6	Raleigh-Durham-Chapel Hill, NC	4.4%	25,990
7	Washington DC-Baltimore, MD	4.1%	145,800
8	Provo-Orem, UT	4.0%	4,530
9	Seattle, WA	3.9%	61,320
10	Sioux Falls, SD	3.6%	3,460
11	Fort Collins-Loveland, CO	3.5%	3,250
12	Madison, WI	3.5%	7,920
13	Boston, MA-NH	3.5%	93,380
14	Omaha, NE-IA	3.5%	12,640
15	Cedar Rapids, IA	3.3%	3,210
16	Dallas, TX	3.1%	77,370
17	Atlanta, GA	3.1%	59,730
18	Hartford, CT	3.0%	16,820
19	San Diego, CA	2.8%	29,590
20	Columbus, OH	2.8%	20,900
21	Minneapolis-St. Paul, MN-WI	2.8%	42,680
22	Richmond-Petersburg, VA	2.7%	12,560
23	Albuquerque, NM	2.7%	7,610
24	Kansas City, MO-KS	2.7%	23,610
25	Charlottesville, VA	2.5%	1,410

- As this Table indicates, the San Francisco Bay Area is now in the top position, Austin 4th, the Research Triangle 6th, Greater Washington 7th, Seattle 9th and Boston 13th. The leading regions have more than 5 percent of their total employment in software occupations, while most of the top ten have in the range of 4 percent.

- On the percent measure, 14 of the top 25 regions are large, with populations of one million or above.

- But here again, we observe some interesting surprises. Huntsville, Alabama; Provo, Utah and Sioux Falls, South Dakota make the top 10. Omaha, Nebraska; Cedar Rapids, Iowa; Hartford and Kansas City also make the top 25.

- Seven metros have populations under 500,000, while 3 of these have fewer than 250,000.

Percent Software Industry Employment, by Establishment

Table 3 shows the top 25 regions in terms of software establishment employment based on our analysis of all 276 regions (MSAs and CMSAs) nationwide (see Appendix B for full rankings for all regions.) To control for differences in population size, we simply look at software establishment employment as a percentage of total employment.

Table 3: Percent Software Employment, by Establishment

Rank	Region	Percent Software	Total Software Employment
1	Washington DC-Baltimore, MD	4.4%	136,065
2	Bryan-College Station, TX	3.9%	1,667
3	Provo-Orem, UT	3.3%	4,374
4	Huntsville, AL	2.9%	3,990
5	Omaha, NE-IA	2.7%	9,790
6	Columbia, SC	2.6%	6,168
7	Denver, CO	2.5%	29,024
8	Columbus, GA-AL	2.5%	2,520
9	Melbourne-Titusville-Palm Bay, FL	2.3%	3,549
10	Austin-San Marcos, TX	2.2%	10,537
11	San Francisco, CA	2.2%	68,489
12	Atlanta, GA	2.1%	39,493
13	Dallas, TX	2.0%	46,709
14	Colorado Springs, CO	1.9%	3,727
15	Lawton, OK	1.9%	523
16	Burlington, VT	1.9%	1,664
17	Raleigh-Durham-Chapel Hill, NC	1.9%	10,122
18	Boston, MA-NH	1.8%	51,437
19	Little Rock-North Little Rock, AR	1.7%	4,621
20	Minneapolis-St. Paul, MN-WI	1.7%	26,409
21	Iowa City, IA	1.7%	770
22	Detroit, MI	1.7%	38,997
23	Hartford, CT	1.7%	9,185
24	Tallahassee, FL	1.7%	1,596
25	Kansas City, MO-KS	1.7%	13,821

- The Greater Washington DC region (including Baltimore) is the leading region with 4.4 percent of total employment in software establishments

- The 2nd and 3rd place regions may come as something of a surprise: Bryan-College Station, Texas and Provo, Utah, where software establishments account for more than 3 percent of total employment.

- Nor are these the only surprises: Huntsville, Alabama; Omaha, Nebraska; Columbia, South Carolina and Melbourne, Florida also make the top 10, while Lawton, Oklahoma; Detroit, Michigan and Little Rock, Arkansas are among the top 25.

- Two regions typically thought of as software and IT hotbeds, Austin, Texas and the San Francis Bay Area, rank 10th and 11th. The Research Triangle ranks 17th and the greater Boston region ranks 18th.

- Interestingly, 9 of the top 25 regions have populations under 500,000, while Bryan-College Station, Texas has fewer than 250,000 residents.

- The top 25 regions are widely distributed across the country and do not conform to a so-called bi-coastal pattern. This finding is consistent with Markusen et al's finding (2001) that overall, high-tech is not coastally isolated or found solely in sunbelt cities.

It is useful and interesting to compare across these two definitions of software employment (Tables 2 and 3).

- Three of the top 5, six of the top 10, and 15 of the top 25 regions are shared by both lists. But there are considerable differences, as noted above.

- While large regions are somewhat over-represented in both lists, it is clear that regions of all sizes exhibit relatively high concentrations of software employment defined both in terms of establishments and occupations.

Location Quotients for Software Employment

To get a better handle on the geography of software employment we employ location quotients. As opposed to simply looking at percentages, location quotients allow us to more fully explore the concentration of software activity at the regional level, observing whether or not software employment is over-or under-represented with respect to the national average. A location quotient of 1 equals the national average. A location quotient of 2 means that a region has double the expected national average, whole 0.5 means that it has half.

We also shift the unit of analysis to get a more fine-grained sense of the geography of software industry employment. We now use the PMSA (or primary metropolitan statistical area) instead of the CMSA (or consolidated metropolitan statistical area). This enables us to zero in on sub-units of broader regions. For example, the San Francisco Bay Area region is made up of three smaller regions—San Francisco, San Jose/ Silicon Valley, and Oakland-Berkeley. Table 4 shows the top 25 regions by location quotient (see Appendix C for the full listing).

Table 4: Software Employment Centers: Location Quotients

Rank	Region	Location Quotient
1	Boulder-Longmont, CO	5.73
2	San Jose, CA	4.68
3	San Francisco, CA	3.17
4	Lowell, MA-NH	2.82
5	Colorado Springs, CO	2.69
6	Washington, DC	2.66
7	Dutchess County, NY	2.56
8	Huntsville, AL	2.51
9	Austin-San Marcos, TX	2.46
10	Seattle-Bellevue-Everett, WA	2.39
11	Raleigh-Durham-Chapel Hill, NC	2.31
12	Middlesex-Somerset-Hunterdon, NJ	2.23
13	Boston, MA-NH	2.16
14	Provo-Orem, UT	2.09
15	Trenton, NJ	2.00
16	Denver, CO	1.97
17	Sioux Falls, SD	1.87
18	Fort Collins-Loveland, CO	1.84
19	Madison, WI	1.83
20	Dallas, TX	1.83
21	Omaha, NE-IA	1.81
22	Nashua, NH	1.74
23	Cedar Rapids, IA	1.74
24	Wilmington-Newark, DE-MD	1.66
25	Atlanta, GA	1.62

The main findings are as follows.

- Three regions have location quotients over 3: Boulder, San Jose/ Silicon Valley and San Francisco.

- An additional 12 regions have location quotients over 2, including well-known high-tech centers like Washington DC, Austin, Boston, and Seattle.

- Here again there are some surprises: Omaha, Cedar Rapids, Sioux Falls and Wilmington, Delaware all rank in the top 25.

- The regional distribution again defies the bi-coastal myth. Software regions are widely distributed across the country, with places like Sioux Falls and Omaha doing quite well. Again, while large regions are somewhat over-represented, small and medium-sized regions show an ability to compete.

Explaining the Economic Geography of the Software Industry

We now turn our attention to trying to explain these observed geographic patterns. As noted earlier, there are several competing theories that might be used. Some would say

that software activity is related to overall levels of economic activity, or more precisely to levels of high-technology economic activity. According to this view, software employment would tend to concentrate and grow in places with relatively high levels of innovation, strong universities, or high concentrations of high-tech firms overall. Others would argue that as a knowledge-driven industry, software employment would tend to cluster in places with high levels of human capital, especially where supplies of professional and technical labor are abundant. They might further contend that this human capital effect would be enhanced by the well-documented "talent shortage" in the software industry and furthermore, as recent research shows, that the software talent pool is not drawn from specific disciplines and fields but is drawn broadly from the ranks of highly skilled people in general.

Our perspective is somewhat different. We contend that software employment will tend to be concentrated in broadly creative centers—that is, places that are open to creative people across the board and that also have low barriers to entry and thus are characterized by high levels of demographic diversity. In this section, we organize our findings along the lines of the "3 T" model of economic growth outlined in Florida (2002). This model suggests that three factors – talent, technology, and tolerance – all need to be simultaneously present in a region for growth to occur. We thus examine the relationships between software activity and indicators of each of the three T's. Our analysis is based on occupational data organized at the sub-region or PMSA level. (Appendix A provides a full description of all indicators and data).

Technology

This section examines the relationship between software employment and various indicators of technology intensity. We consider the relationships between software employment and information technology industry, high-technology industry, innovation and university strength respectively.

Software and Information Technology

There is good reason to expect that the software industry will be concentrated in areas with large information technology industries in general, and not surprisingly this is what we find (see Fig. 1). Our measure of IT employment is based on people who work in the hardware, telecommunications, IT management and software occupations. It is no surprise that IT and software employment are almost perfectly correlated. In part, this arises because the IT employment variable is constructed by adding together software, hardware, IT management, and telecommunications employment data, and thus clearly will be highly correlated with software. But it also demonstrates the degree to which occupations related to software are co-located with it.

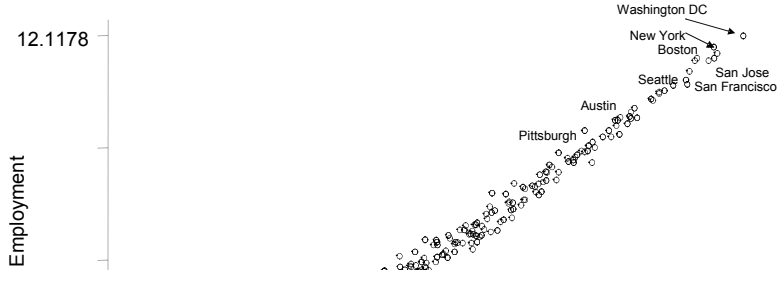

Figure 1: Software versus IT Employment

Software and High-tech Industry

It is also likely that software industry employment will be concentrated in places that are high-technology centers more broadly. Here we use the High-Tech Index, originally called the "Tech-Pole" and developed at the Milken Institute (DeVol et al 1999) as a measure of relative high-tech industry presence. Again it is not surprising that we find a positive relationship between the High-Tech Index and software employment (see Fig. 2). Clearly, software is an important component of a regional technology presence.

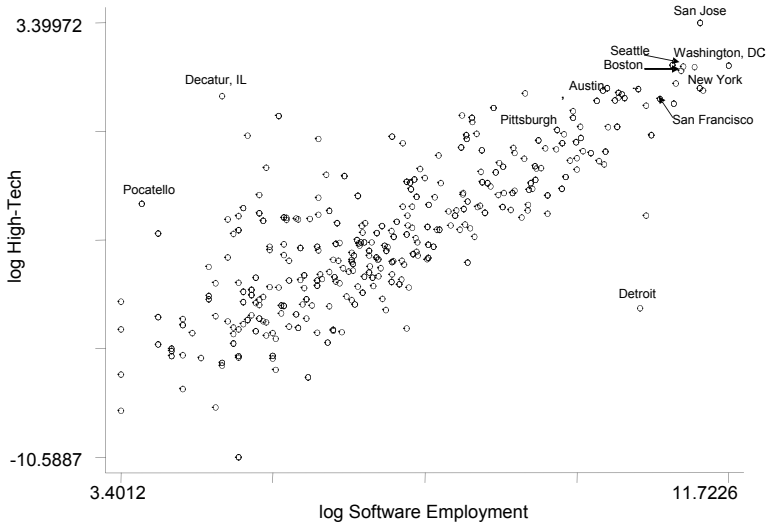

Figure 2: Software and High-Tech Industry

Software and Technological Innovation

According to many leading social theorists and economists, innovation and innovative activity contribute to regional growth. Thus, we are interested in how the regional presence of innovation (as measured by patents) relates to - software employment. As Fig.3 shows, there appears to be a positive relationship between software employment and simple patent counts.

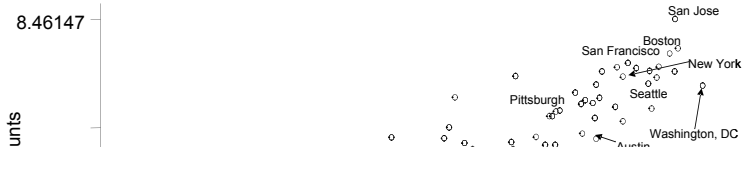

Figure 3: Software and Innovation

Software and the University

Increasingly, universities are credited with playing a central role in economic development broadly, and in technology-fueled growth more specifically. This growth is related both to the research and development capabilities of universities, and also to their capacity to produce and to attract high human capital people. It might also be thought that university strength would be positively related to software employment, given the high skill requirements and knowledge intensity of most software occupations. We employ a rather straightforward measure of university presence based on students and faculty per capita. As Fig. 4 shows, there is no discernible relationship between metro area software employment and per-capita university students and faculty. This could arise from the university measure, which is admittedly crude.

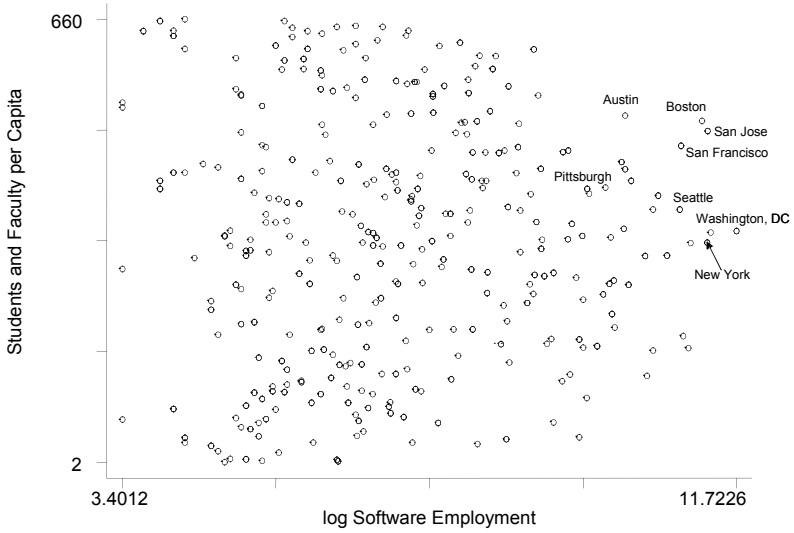

Figure 4: Software and University Presence

Talent

We now turn to the relationship between talent levels and software employment. Glaeser, Lucas, and Romer have all recently discussed the importance of human capital

in promoting growth. Florida also includes it as one of his "3 Ts" of economic development – the "talent" of technology, talent, and tolerance. Therefore, we anticipate a positive relationship, since knowledge and skills are prerequisites for software development.

Software and Human Capital

We examine the effects of two widely used measure of human capital—a basic Talent Index, measured as the percent of the population with a bachelor's degree or above, and a more specialized measure of professional and technical workers. As Figure 5 shows, we find a strongly positive relationship between software employment and professional and technical workers. In fact, it is almost possible to detect a slight curvilinearity. We also observe a positive correlation between degree holders and software employment. Not surprisingly, software employment is closely associated with both a broad human capital base and the availability of more specialized human capital in the form of professional and technical workers. This is likely due to the combined effects of the talent pool and the increased market for software products and services that develops in regions with such a human capital profile.

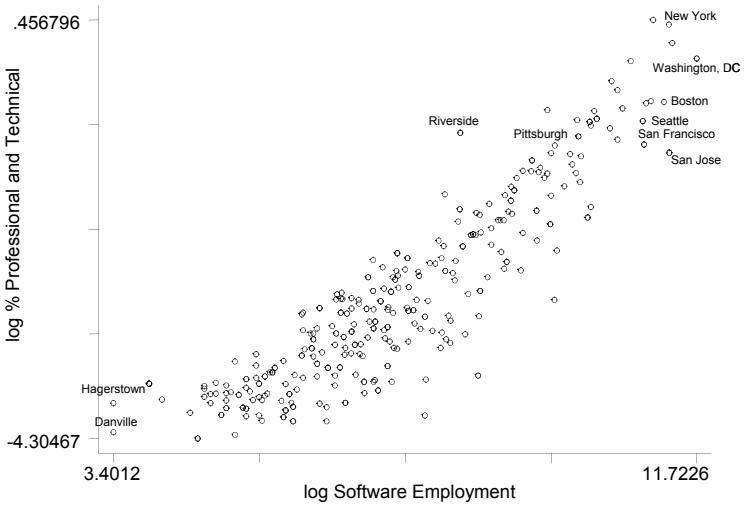

Figure 5: Software versus Professional and Technical Employment

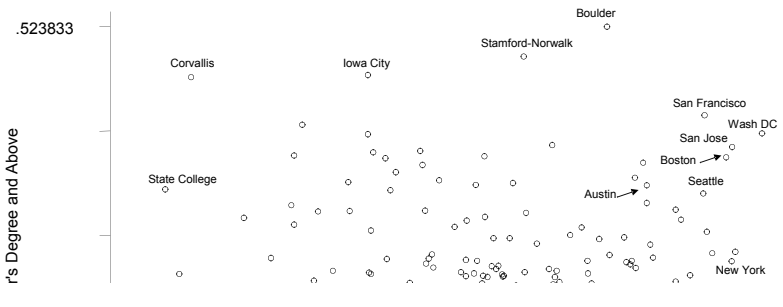

Figure 6: Software versus Talent (BA and above)

Tolerance

Tolerance is the third "T". Florida and Gates (2002, Florida 2002) have found a strong connection between high-technology industry and various measures of demographic diversity, such as their Melting Pot Index (percent of the population that is foreign born) and Gay Index (percent of gay couples, expressed as a location quotient). Florida (2001, 2002) has also found a strong relationship between high-technology industry and innovation and places that are open to artistic and cultural creativity, measured by the Bohemian Index—the percent of the population principally employed in artistic and cultural fields (again expressed as a location quotient). Places that are accepting of various lifestyles, races, and ethnicities are also places where new ideas will be welcome and will be likely to grow into innovations. Individuals whose livelihoods are centered on ideas will thus seek out tolerant places in an attempt to increase their productivity.

Software and Diversity

We now examine the relationship between software employment and four measures of diversity: the Bohemian Index, Gay Index, Melting Pot Index, and a Composite Diversity Index, which combines these three measures into an overall index (see Figs 7 through 10). We observe positive relationships between software employment and all four. These relationships align with recent theories about the role of tolerance in promoting growth.

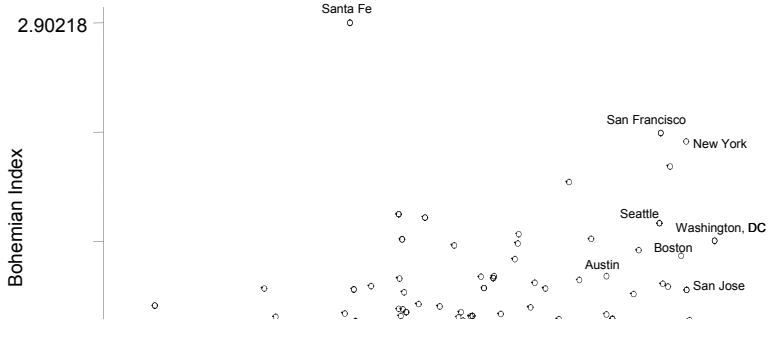

Figure 7: Software and the Bohemian Index

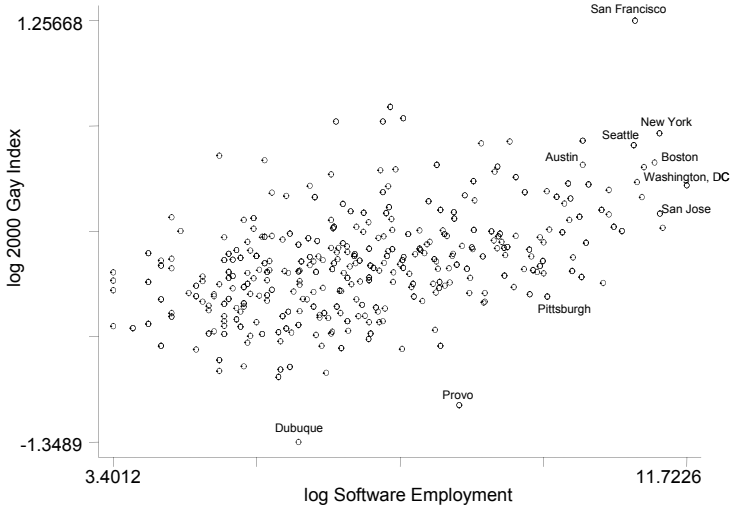

Figure 8: Software and the Gay Index

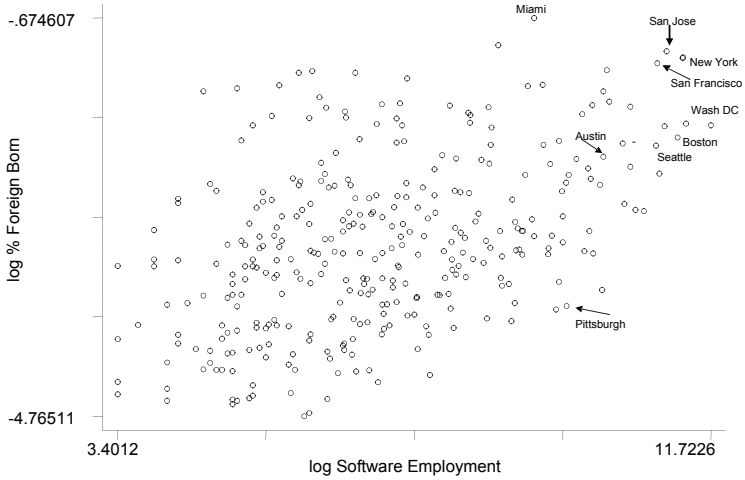

Figure 9: Software and the Melting Pot Index (Percent Foreign Born)

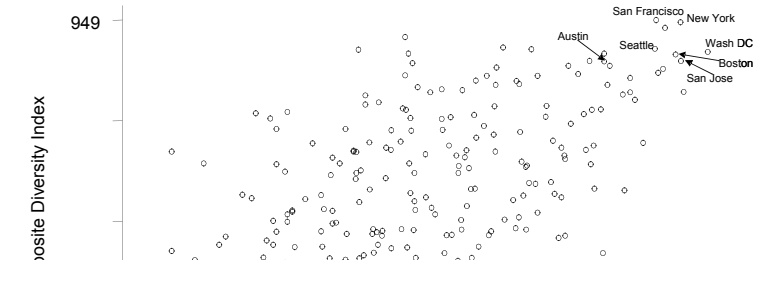

Figure 10: Software and the Composite Diversity Index

The Role of Creativity

Software is a creative industry—an industry of the mind. Florida (2002) claims that creativity has become the most important economic force. He finds that the creative sector (which includes all creative professions) now accounts for roughly half the wages and salaries paid in the U.S., and that the creative class (those who work in the creative sector) account for roughly 30 percent of all employment. In this section, we explore the relationship between software employment and regional concentrations of the creative class.

Software and the Creative Class

Florida (2002) separates the creative class into two sub-groups—the super-creative core (composed of scientists and engineers, artistic and cultural creatives, and educators), and a surrounding group of creative professionals who make up the rest of the class. Figure 11 shows the relationship between software employment and the super-creative core. The relationship is extremely positive and robust—almost perfectly linear. Figure 12 shows the relationship between software employment and the broader creative class. The relationship is also positive—but not as strong as for the super-creatives.

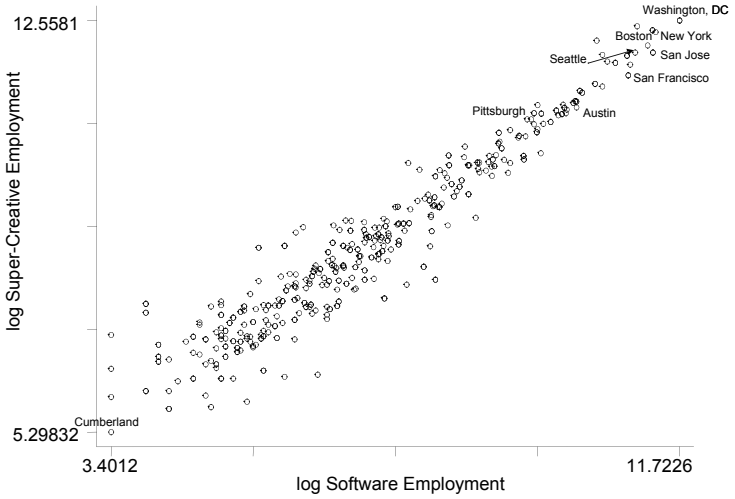

Figure 11: Software and Super-Creative Employment

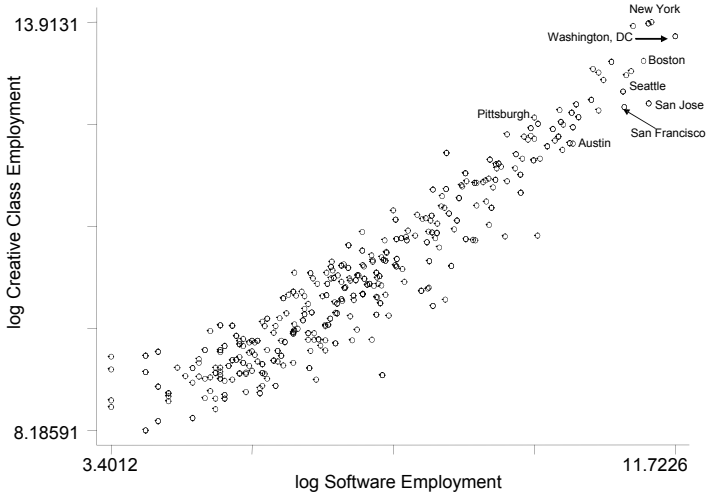

Figure 12: Software and Creative Class Employment

Putting It All Together: Statistical Findings

We have found that software employment is associated with a range of possible factors having to do with technology, talent and tolerance. In this section we try to determine the relative importance of these factors in accounting for regional concentrations. We begin by calculating the statistical correlations between regional software employment and the various measures and indicators outlined above (see Table 5). A correlation of 1.0 indicates a perfectly linear, fixed relationship — one in which all the points on an x-y plot would fall along a rising straight line —while a correlation of 0.0 indicates no relationship. Generally speaking correlations above 0.5 suggest a reasonably strong relationship. Negative values indicate inverse relationships.

.

Table 5: Correlations for Software Employment

	Software Employment (log)
IT Employment (log)	0.9877
Super-Creative Core (log)	0.9584
Creative Class (log)	0.9475
Professional & Technical (log)	0.9030
Patents 1999 (log)	0.8262
High-Tech Index 2000 (log)	0.7927
Composite Diversity Index	0.6864
Talent Index (% BA and above)	0.5971
Bohemian Index	0.5857
Gay Index (log)	0.4656
Melting Pot Index (log % Foreign Born)	0.3957
University Presence	0.0276

Note: All correlations except that with University Presence are *significant* at p = 0.0001. (This means the probability that such a relationship would occur randomly, due to mere chance, is no more than 0.0001, or 1 in 10,000). The correlation with University Strength is not significant at p = 0.05.

The main findings of this analysis are as follows.

- Not surprisingly, the strongest correlation is between software and IT employment (0.988).

- The correlations between software employment and the two creativity measures (the super-creatives and the creative class generally) are also very strong, in the range of 0.95.

- The correlation between software employment and professional and technical workers is only slightly less than that for the creative class measures (.90). The correlation with talent — the raw human-capital measure — is not as high (0.597), but still fairly strong.

- Overall high-tech industry output and commercial innovation are both strongly associated with software employment. The correlations between software employment and the High-Tech Index and Patents are in the range of 0.80.

- Diversity is positively and significantly correlated with software employment. The highest correlation is with the Composite Diversity Index (0.69) followed by the Bohemian Index (0.59), the Gay Index (0.47) and the Melting Pot Index (0.40).

- Software employment is not significantly correlated with University Presence. This tends to agree with other research we have conducted, in which we find that the economic benefits of a university do not necessarily accrue locally. The students educated at a university, and the technologies developed there, can migrate elsewhere, and in fact some regions appear to serve as net "donors" or "breeders" of university talent and technology while other regions reap the harvest (Florida et al 2003, in process).

But here it must be noted that our University Presence measure is a fairly crude one, capturing only the overall numbers of students and faculty per capita. It does not reflect whether the university has a strong computer science program, with a high level of related research — and many believe that these factors play a large role in driving software industry growth and employment in a region. Thus in the next step of our analysis we introduce a new measure, University R&D, which is sponsored research and development dollars at universities in a particular PMSA. Although this measure does not isolate software-intensive R&D, most university R&D dollars go into scientific and technical fields, and the measure may serve as at least a rough proxy for relative levels of software research.

Regression Analyses

To get a more precise handle on the factors that affect the economic geography of the software industry, we conducted several regression analyses. Regression analysis is a complex tool used to estimate, or confirm, functional cause-and effect relationships between a dependent variable and one or more independent variables that are thought to be driving it. The idea is to try to capture the contribution of *each* independent variable, while holding the others constant and thus "controlling for" them.

Our dependent variable is software employment (expressed as a percent of overall regional employment). Our independent variables are all the factors examined thus far. We also include a measure of regional population to account for market size, plus the University R&D measure just discussed.

An important cautionary note is that our regressions are intended to be *exploratory*. Our goal here is not to arrive at actual equations for expressing (and thus predicting) the movement of software employment in response to the independent variables. We are simply trying to better gauge the effects of creativity and diversity variables.

Recall that we contend a region's ability to generate and/or attract software employment is related to its underlying creative capabilities and its openness to diversity. We thus believe that our creativity and diversity measures should complement measures like market size, technology, and/or human capital in explaining the economic geography of software employment.

Table 6 summarizes our regression results. The table needs a bit of explanation beforehand. Always using software employment as our *dependent* variable, we examined its relationship to each of the various independent factors under each of three different models.

- In model (1), we included the overall Creative Class measure among our independent variables.
- In model (2), we left this out and included only the Super-Creative Core.
- In model (3), we left out the Creative Class altogether — in order to try to isolate the effects of diversity variables, which we believe affect Creative Class concentrations in the first place.
- In model (4), we substitute the Composite Diversity Index (CDI) for our three individual diversity measures. The CDI is a combination of these three measures.

Each entry in the table shows whether the relationship between software employment and a given independent variable was found to be POSITIVE (i.e., one increases along with the other) or NEGATIVE (software employment *decreases* as the other increases); and whether the relationship is statistically SIGNIFICANT.

Lay readers should disregard the numbers in smaller type that appear below this information in the table entries. These numbers are the actual regression coefficients that were calculated, and they can vary greatly depending on the units of measure used for the independent variables. (Thus you will see, for instance, that a coefficient of .002 shows a "significant" relationship with one independent variable, while with another, a seemingly higher score of .007 is *not* significant. That is because the units of measure in each case were different.) Lay readers also need not concern themselves with the last two rows in Table 6, "Constant" and "Adjusted R-Squared."

Finally, the findings presented in Table 6 are based on 164 metro areas, that being the number for which all desired data were available. Many of the nation's 331 MSAs, especially smaller ones, do not have a major research university for which we could obtain University R&D spending figures. Our sample of 164 is thus somewhat tilted to larger regions, although it does include a good number MSAs of all sizes.

Table 6: Regression Results

Dependent Variable:
Regional Software Employment
(as % of total employment)

	Regression Model (1)	Regression Model (2)	Regression Model (3)	Regression Model (4)
Independent Variables:				
High-Tech Index (Milken 2000)	POSITIVE & SIGNIFICANT 0.002***	POSITIVE & SIGNIFICANT 0.001***	POSITIVE & SIGNIFICANT 0.002***	POSITIVE & SIGNIFICANT 0.002***
Creative Class	POSITIVE & SIGNIFICANT 0.105***	—	—	POSITIVE & SIGNIFICANT 0.095***
Super-Creative Core	—	POSITIVE & SIGNIFICANT 0.324***	—	
Gay Index (location quotient, gay couples)	NEGATIVE -0.001	POSITIVE 0.002	NEGATIVE -0.001	
Bohemian Index (artists, writers etc)	POSITIVE 0.004	POSITIVE 0.001	POSITIVE 0.004	
Melting Pot Index (% Foreign Born)	POSITIVE 0.008	POSITIVE 0.003	NEGATIVE -0.005	
Composite Diversity Index	—	—	—	NEGATIVE -0.000002
Talent Index (% Bachelor's Degree +)	POSITIVE & SIGNIFICANT 0.105***	POSITIVE & SIGNIFICANT 0.074***	POSITIVE & SIGNIFICANT 0.142***	POSITIVE & SIGNIFICANT 0.122***
Scientists and Engineers	NEGATIVE & SIGNIFICANT -0.199**	NEGATIVE & SIGNIFICANT -0.175***	NEGATIVE & SIGNIFICANT -0.173*	NEGATIVE & SIGNIFICANT -0.179*
University Presence (Students & Faculty Per Cap)	NEGATIVE & SIGNIFICANT -0.00002***	NEGATIVE & SIGNIFICANT -0.00001***	NEGATIVE & SIGNIFICANT -0.00002***	NEGATIVE & SIGNIFICANT -0.00002
University R&D ($ 2000)	NEGATIVE -0.0002	NEGATIVE -0.0002	NEGATIVE -0.0001	NEGATIVE -0.0002
Metro Population	POSITIVE 0.001	POSITIVE 0.001	POSITIVE 0.003	POSITIVE 0.002
Constant	-0.042***	-0.026***	-0.048***	-0.046***
Adjusted R-Squared	0.7505	0.8302	0.7158	0.7483

* significant at 0.05
** significant at 0.01
*** significant at 0.005

N = 164 metro areas, all three models

The main findings of the regression analyses are as follows.

- The creative class variables are significantly associated with software employment. Most noticeable is the effect of super-creative employment on software employment (Model 2 above).

- Talent also appears to also be a statistically significant predictor of software employment. The basic Talent Index (percent BA and above) enters positive and significant into all four regressions. Somewhat surprisingly, the role of scientists and engineers in explaining software employment is negative in all four models. "Scientists and Engineers" is a significant variable in all four models as well.

- The role of diversity is mixed. The coefficient for the Bohemian Index is positive in all three models but insignificant, while the coefficient for the Gay Index is positive in model 2, negative in models 1 and 3, but also insignificant. The Melting Pot Index is positive in models 1 and 2, but insignificant. The CDI appears to be negatively, but insignificantly related to software employment.

- Overall high-tech industry output (as measured by the High-Tech Index) is positively and significantly associated with software employment.

- Neither University Presence nor University R&D is positively associated with software employment. In fact, for University Presence, the association is *significantly* negative.

- Market size (measured as 1990 population) has a negligible effect on software employment.

Conclusions

Altogether, the work done for this report has led us to a number of interesting findings. Using occupational data along with establishment-level data — a method that allows us to capture people working in software outside software firms — we find that the economic geography of the software industry defies simple patterns or imagery. On the one hand, regions like Silicon Valley, the broader San Francisco Bay Area, Austin, Seattle, Boston and Washington DC are clearly important centers of software employment. But places like Omaha, Nebraska; Sioux Falls, South Dakota and Cedar Rapids, Iowa are significant centers as well. The economic geography of this industry does *not* conform to the stereotype of sunbelt and bicoastal high-tech hot-spots. Regions throughout the country—small and large alike—have shown an ability to compete as centers of software employment.

Our statistical analyses also inform some deeper findings that are perhaps more interesting. First, our results support the conventional wisdom that software employment is associated with regional concentrations of high-technology industry generally. This lends credence to the clustering theory of Porter and others, which says that similar or related firms tend to cluster and thus gain productive efficiencies and spur innovation.

But our analyses add to, and enrich, this view. They indicate that software employment is also associated with the presence of a broad regional talent base, thus also lending

support to the human capital theory of regional development associated with Lucas and Glaeser. Here we observe that software workers, who are skilled high-human-capital people, tend to locate in places with many other educated, professional workers.

We find, further, that software employment is indeed related to regional creativity. Regions with high concentrations of creative workforce tend to also have high levels of software employment. This, we believe, stems from their broader creative milieu or habitat which functions to attract software workers along with other creative people. The process of creating software, as mentioned earlier, is unlike production processes in other industries. Most of the value created in this process stems from the skill, knowledge, and creativity of the workers. Thus, as Florida (2002) concludes, people who incorporate creativity into their employment will also seek out creative environments in which to live and play. Places that are broadly creative will consequently tend to experience higher rates of software employment, along with higher rates of innovation and growth.

Taken together, our findings suggest that the economic geography of the software industry is driven by the broad talent base and creative capacities of regions in addition to technology. The overall results strongly support the creativity thesis. They suggest that creativity is an important factor in the economic geography of software employment; and also that human capital is very important. Thus, our findings suggest that the economic geography of software employment is a function of a broad talent base and/ or underlying creative capacity, as opposed to being solely a function of a more specialized scientific and engineering base.

These findings have several implications for those who wish to stimulate software clusters as part of a regional economic development strategy. They suggest that there is good reason to question conventional approaches which seek to invest in and promote specific high-tech sectors and clusters, or which seek to increase the volume of university technology transfer and commercialization as a mechanism for tech-based economic development. The findings indicate, rather, that regional competitiveness in software stems from broader capacities to generate, attract and mobilize talented and creative people across the board. This in turn suggests that regional development may be better served by broader approaches to developing a habitat or ecosystem that can feed these underlying human creative capabilities. This habitat can then provide the talent base, capacities, user-base, and market demand, in turn stimulating technological innovation, new firm formation, and business growth not just in the software industry but also across the emerging creative economy.

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Appendix A:
Indicators and Data Sources

This appendix provides a brief description of the major variables and data sources used in this study.

Unit of Analysis

The Census identifies two regional units of analysis and this study uses both of them. The broadest unit is the Consolidated Metropolitan Statistical Area (or CMSA). For large regions, like New York and San Francisco, for example, the CMSA groups together a series of smaller sub-regions referred to as Primary Statistical Area or PMSAs. For the descriptive data on software employment we use the CMSA. In addition to wanting to see broad region trends, this was required to compare the occupational and establishment level data sets. The establishment level data for New England is based on New England County Metropolitan Areas (NECMA) that are not strictly comparable to PMSAs. In order to accurately compare the two datasets, we combined the PMSAs and NECMAs in the establishment dataset and the PMSAs in the occupation dataset to CMSAs. We use the PMSA that provide more fine-grained geographical detail for large regions, for the location quotients and statistical analysis.

Software Industry Employment

Establishment-Level Employment: Establishment-level data for the software industry is from the 1998 County Business Patterns (see U.S. Dept. of Commerce, Bureau of the Census. COUNTY BUSINESS PATTERNS, 1998 [UNITED STATES]: U.S. SUMMARY, STATE, AND COUNTY DATA [CD-ROM]). The firm level categories (NAICS codes) used for the software industry are: 5415 – Computer Systems Design and Related Services; 514191 – On-line information services; 5142 – Data Processing Services; 334611 – Software Reproducing. We make use of both absolute establishment software employment, as well as the percentage of total PMSA employment in software establishments.

Occupation-Level Software Employment: Occupation-level data for software is from the Bureau of Labor Statistics' Occupational Employment and Wages, 2000. This survey was released in April 2002, in Bulletin 2549. The following occupation categories are utilized for the software industry: 15-1021 – Computer Programmers; 15-1031 – Computer Software Engineers, Applications; 15-1032 – Computer Software Engineers, Systems Software; 15-1041 – Computer Support Specialists; 15-1051 – Computer Systems Analysts; 15-1061 – Database Administrators; 25-1021 – Computer Science Teachers, Post-secondary; 43-9031 – Desktop Publishers. Again, we make use of both absolute occupation software employment, as well as the percentage of total PMSA employment in software occupations.

Information Technology

Establishment-Level IT Employment: This data is again from County Business Patterns. The measure consists of adding total employment from software, hardware, IT management, and telecommunications establishments.

Occupational Level IT Employment: This measure is again taken from the OES 2000 survey, and also consists of an aggregation of total employment of software, hardware, IT management, and telecommunications occupations.

High Technology

High-Tech Index: This measure, developed by DeVol et al of the Milken Institute and called by them the "Tech-Pole," gauges the concentration of high-tech industry in a metropolitan area. They start by collecting, for each metro area, dollar-output figures across a range of high-tech industries from electronics to pharmaceuticals. They then form their "Tech-Pole" by multiplying together two separate measures of concentration: (1) a high-tech location quotient and (2) the metro area proportion of national high-tech output. The location quotient (LQ) is calculated by dividing high-tech output as a percentage of *total* metro output by the high-tech percentage of total national output. An LQ of 1.0 means a metro's concentration of high-tech output is equal to the nation's concentration, while greater than 1.0 means a metro's concentration is higher than the nation's concentration. The location quotient effectively measures the importance of high-tech industry to a local economy, but unfortunately does not adjust for the size of the metro. Therefore, on this measure, the national impact of small metros with high local concentrations of high-tech industry may be exaggerated (DeVol, p.55). Likewise, large metros may rank highly on the measure of metro area proportion of national high-tech output simply due to their size. To alleviate these concerns, DeVol et al formed a composite index that combines the two measures by multiplying them. They called their composite measure the "tech-pole" because it is intended to measure the technological "gravitational pull" that a metro exerts (DeVol, p.65).

Innovation

Patents: This variable measures innovation by using simple utility patent count data available from the NBER Patent Citations Data File. This data file was constructed by Hall, Jaffe, and Trajtenberg, and is described in the paper: Hall, B. H., A. B. Jaffe, and M. Tratjenberg (2001). "The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools." NBER Working Paper 8498. They note that all patent count data in their dataset comes from the U.S. Patent Office.

University Measures

University Presence/Per-Capita Students and Faculty: This measure is the sum of inverse rankings of college students per capita and faculty members per capita, and it covers all 331 MSAs. Faculty per capita comes from the IPEDS (Integrated Postsecondary Education Dataset) from the Department of Education (2000 numbers). Students per capita come from the 2000 Census. IPEDS also has student numbers (they correlate at 0.98 with the Census numbers), but that count is based on the number of students attend

institutions within the MSA so people who attend the school and commute from outside the MSA are counted in the IPEDS data, but not in the Census data.

University R&D: This measure is taken from the National Science Foundation's Science Resource Statistics.

Human Capital

Talent Index: Percent Bachelors Degree: This variable measures the percentage of PMSA residents 25 years of age and above with a bachelor's degree or above. It is taken from the 2000 Census.

Professional and Technical Workers: This variable measures the percentage of PMSA employment in professional and technical occupations. It was calculated using the 1990 Decennial 5 percent Census Public Use Microdata Sample (PUMS).

Scientists and Engineers: This variable measures the percentage of PMSA employment in science and engineering occupations. It was calculated using the 1990 Decennial 5 percent Census Public Use Microdata Sample (PUMS).

Diversity

Bohemian Index: This variable, based upon the 1990 PUMS, is a location quotient of the number of "bohemians" in an MSA. It includes people who report their occupations as authors, designers, musicians, composers, actors, directors, painters, sculptors, craft-artists, artist printmakers, photographers, dancers, artists, and performers.

Gay Index: This variable, originally calculated by Black et al (2000) and later updated for 2000 by Gates, is based on the 1990 PUMS data, and is a location quotient measuring the over- or under-representation of coupled gays and lesbians in an MSA. See Black et al (2000) for more information on this measure.

Melting Pot Index/ Percent Foreign Born: This variable measures the percentage of foreign – born residents in a PMSA. It was taken from the 2000 Census.

Composite Diversity Index (CDI):

The CDI is the sum of the inverse ranks of the 2000 Gay Index, 2000 Percent Foreign Born, and the Bohemian Index.

Creativity

These are measures are from the 2000 Bureau of Labor Statistics Occupational Employment Statistics Survey (see Florida 2002a).

Super-Creative Core:
Percentage of the employed population in the region in occupations in the following categories:

- Computer and mathematical occupations
- Architecture and engineering occupations

- Life, physical and social science occupations
- Education, training and library occupations
- Arts, design, entertainment, and media occupations

Creative Class:

Percentage of the employed population in the region in the Super Creative occupations or occupations in the following categories:

- Management occupations
- Business and financial operations occupations
- Legal occupations
- Healthcare practitioners and technical occupations (does not include Healthcare support)
- High-end sales and sales management

Appendix B:
Percent Software Employment by Occupation

More than 1 million people

Rank	Region	Software Percent	Occupation Employment per 100,000	Establishment Employment per 100,000	Establishment Employment Rank
1	San Francisco, CA	5.5%	2463.6	972.9	10
2	Austin-San Marcos, TX	4.7%	2182.0	843.1	17
3	Denver, CO	4.5%	2171.2	1124.3	7
4	Raleigh-Durham-Chapel Hill, NC	4.4%	2187.8	852.1	16
5	Washington DC-Baltimore, MD	4.1%	1916.4	1788.4	1
6	Seattle, WA	3.9%	1725.0	471.3	50
7	Boston, MA-NH	3.5%	2741.0	1509.8	2
8	Dallas, TX	3.1%	1481.7	894.5	13
9	Atlanta, GA	3.1%	1452.5	960.4	11
10	Hartford, CT	3.0%	1421.7	776.3	20
11	San Diego, CA	2.8%	1051.6	538.1	40
12	Columbus, OH	2.8%	1357.0	623.0	30
13	Minneapolis-St. Paul, MN	2.8%	1437.6	889.5	14
14	Kansas City, MO-KS	2.7%	1329.3	778.2	19
15	Phoenix-Mesa, AZ	2.5%	1100.6	383.0	65
16	Orlando, FL	2.4%	1136.5	388.9	61
17	Salt Lake City-Ogden, UT	2.4%	1144.0	639.5	28
18	Portland, OR-WA	2.3%	993.3	377.4	66
19	New York, NY	2.3%	935.0	549.0	38
20	Chicago, IL	2.3%	970.1	535.4	41
21	St. Louis, MO-IL	2.2%	1029.7	573.6	33
22	Philadelphia, PA	2.2%	938.4	619.2	31
23	Houston, TX	2.2%	883.0	345.3	75
24	Jacksonville, FL	2.1%	937.8	492.6	48
25	Detroit, MI	2.1%	798.3	714.7	24
26	Tampa, FL	2.1%	953.3	514.9	43
27	Charlotte, NC	2.0%	1031.2	557.7	37
28	Indianapolis, IN	1.9%	913.8	504.2	46
29	Sacramento, CA	1.9%	684.5	434.5	55
30	Rochester, NY	1.9%	793.1	561.8	35
31	Cincinnati, OH-KY-IN	1.8%	785.7	439.1	54
32	Los Angeles-Long Beach, CA	1.7%	625.4	363.6	72
33	Pittsburgh, PA	1.7%	690.2	374.7	67
34	Louisville, KY-IN	1.6%	765.4	296.3	89
35	Milwaukee, WI	1.6%	816.8	511.5	44
36	San Antonio, TX	1.5%	571.5	394.1	59
37	Memphis, TN-AR-MS	1.5%	638.4	318.9	81
38	Norfolk, VA	1.5%	558.8	348.8	73

39	Greensboro, NC	1.5%	707.1	182.2	123
40	Cleveland, OH	1.4%	629.4	459.9	52
41	Miami, FL	1.4%	510.0	237.8	103
42	Buffalo-Niagara Falls, NY	1.4%	563.2	211.3	112
43	Oklahoma City, OK	1.4%	591.7	227.3	105
44	Nashville, TN	1.4%	650.5	364.7	70
45	New Orleans, LA	1.1%	417.1	147.9	141
46	West Palm Beach, FL	1.1%	372.2	277.0	92
47	Grand Rapids, MI	1.0%	484.1	207.2	114
48	Las Vegas, NV-AZ	0.9%	363.3	111.1	159
49	Providence, RI	0.7%	290.3	183.3	120

500,000 to 1 million people

Rank	Region	Software Percent	Occupation Employment per 100,000	Establishment Employment per 100,000	Establishment Employment Rank
1	Colorado Springs, CO	5.2%	1934.5	721.0	23
2	Omaha, NE	3.5%	1762.9	1365.4	3
3	Richmond, VA	2.7%	1260.4	368.5	68
4	Albuquerque, NM	2.7%	1067.7	248.5	100
5	Harrisburg, PA	2.2%	1045.4	543.4	39
6	Albany, NY	2.2%	957.1	566.9	34
7	Birmingham, AL	1.9%	815.3	584.7	32
8	Tucson, AZ	1.7%	583.1	366.5	69
9	Syracuse, NY	1.5%	598.3	237.4	104
10	Wichita, KS	1.5%	627.3	96.1	165
11	Tulsa, OK	1.5%	632.4	483.5	49
12	Honolulu, HI	1.4%	469.1	124.3	149
13	Allentown, PA	1.4%	507.9	246.9	102
14	Dayton-Springfield, OH	1.3%	558.6	658.4	27
15	Columbia, SC	1.3%	553.4	1149.3	6
16	Knoxville, TN	1.2%	486.0	147.4	143
17	Fort Wayne, IN	1.2%	529.7	304.7	84
18	Baton Rouge, LA	1.2%	456.1	215.6	109
19	Sarasota-Bradenton, FL	1.1%	367.8	118.0	152
20	Scranton, PA	1.0%	376.1	210.0	113
21	Springfield, MA	0.9%	341.3	82.1	180
22	Greenville, SC	0.9%	411.5	160.1	136
23	Bakersfield, CA	0.9%	244.8	308.0	83
24	Charleston, SC	0.8%	309.6	147.9	142
25	El Paso, TX	0.8%	256.0	102.1	164
26	Toledo, OH	0.7%	321.9	166.3	129
27	Little Rock, AR	0.7%	328.9	791.5	18
28	Youngstown-Warren, OH	0.6%	205.1	111.3	158
29	Mobile, AL	0.6%	185.1	122.2	150
30	Stockton-Lodi, CA	0.5%	129.5	39.4	223
31	Fresno, CA	0.4%	132.2	64.7	194
32	McAllen-Edinburg-Mission, TX	0.4%	80.8	17.0	247

250,000 to 500,000 people

Rank	Region	Software Percent	Occupation Employment per 100,000	Establishment Employment per 100,000	Establishment Employment Rank
1	Huntsville, AL	4.8%	1892.7	1165.4	5
2	Provo-Orem, UT	4.0%	1229.2	1186.9	4
3	Fort Collins, CO	3.5%	1292.3	219.9	108
4	Madison, WI	3.5%	1856.9	630.7	29
5	Tallahassee, FL	2.3%	1022.7	560.9	36
6	Lansing, MI	2.2%	851.0	299.3	86
7	Boise City, ID	2.0%	853.5	182.5	122
8	Lincoln, NE	1.9%	879.0	517.4	42
9	Melbourne, FL	1.7%	489.3	745.2	21
10	Columbus, GA-AL	1.7%	557.1	917.6	12
11	New London-Norwich, CT-RI	1.7%	541.6	423.8	57
12	Montgomery, AL	1.6%	606.5	460.9	51
13	Lexington, KY	1.6%	747.1	363.7	71
14	Des Moines, IA	1.6%	859.6	855.9	15
15	Eugene-Springfield, OR	1.5%	501.6	250.8	98
16	Anchorage, AK	1.5%	584.0	263.9	93
17	Killeen-Temple, TX	1.4%	335.5	163.9	132
18	Jackson, MS	1.3%	542.2	160.8	135
19	Spokane, WA	1.3%	485.7	165.6	130
20	Santa Barbara, CA	1.2%	393.1	297.7	87
21	South Bend, IN	1.2%	463.2	433.4	56
22	Appleton-Oshkosh-Neenah, WI	1.1%	552.5	144.3	144
23	Macon, GA	1.0%	387.5	108.2	160
24	Chattanooga, TN-GA	1.0%	376.2	222.5	106
25	Reno, NV	1.0%	441.8	189.7	115
26	York, PA	1.0%	356.3	155.9	137
27	Naples, FL	0.9%	294.4	117.4	153
28	Savannah, GA	0.9%	320.8	56.3	205
29	Saginaw, MI	0.9%	312.6	154.3	138
30	Davenport, IA-IL	0.9%	342.6	259.3	96
31	Kalamazoo, MI	0.9%	313.6	116.2	155
32	Pensacola, FL	0.9%	240.2	85.9	176
33	Fayetteville, AR	0.9%	347.1	52.1	210
34	Charleston, WV	0.9%	337.8	94.6	167
35	Utica-Rome, NY	0.8%	300.1	417.5	58
36	Reading, PA	0.8%	297.1	122.0	151
37	Corpus Christi, TX	0.8%	244.2	88.5	173
38	Biloxi-Gulfport, MS	0.8%	277.5	72.3	187
39	Evansville-Henderson, IN-KY	0.8%	344.4	150.6	140
40	Lancaster, PA	0.8%	301.7	188.5	116
41	Johnson City, TN	0.8%	241.6	60.4	202
42	Daytona Beach, FL	0.7%	182.5	81.3	182
43	Salinas, CA	0.7%	209.1	124.9	148
44	Peoria-Pekin, IL	0.7%	259.1	261.1	95

45	Fayetteville, NC	0.7%	181.5	26.7	236
46	Fort Pierce-Port St. Lucie, FL	0.7%	162.8	23.5	239
47	Erie, PA	0.6%	242.1	88.7	172
48	Fort Myers-Cape Coral, FL	0.6%	179.2	165.3	131
49	Binghamton, NY	0.6%	198.2	322.2	80
50	Rockford, IL	0.6%	207.4	281.5	91
51	Springfield, MO	0.6%	245.6	170.4	127
52	Augusta-Aiken, GA-SC	0.5%	163.4	50.5	211
53	Visalia-Tulare-Porterville, CA	0.5%	138.6	23.1	241
54	Lakeland-Winter Haven, FL	0.5%	159.1	31.4	230
55	Canton-Massillon, OH	0.5%	176.9	117.2	154
56	Lafayette, LA	0.5%	153.0	126.3	146
57	Huntington, WV	0.4%	129.9	21.2	243
58	Shreveport-Bossier City, LA	0.4%	145.3	53.3	209
59	Hickory-Morganton-Lenoir, NC	0.4%	184.3	17.6	246
60	Beaumont-Port Arthur, TX	0.4%	116.9	56.1	207
61	Modesto, CA	0.4%	98.4	30.4	232
62	Brownsville, TX	0.3%	86.5	6.0	263
63	Ocala, FL	0.3%	65.7	12.4	258

Less than 250,000 people

Rank	Region	Software Percent	Occupation Employment per 100,000	Establishment Employment per 100,000	Establishment Employment Rank
1	Sioux Falls, SD	3.6%	2006.8	297.0	88
2	Cedar Rapids, IA	3.3%	1674.5	687.5	26
3	Charlottesville, VA	2.5%	883.6	285.8	90
4	Portland, ME	2.4%	1342.7	257.5	97
5	Burlington, VT	2.2%	1062.6	982.3	9
6	Great Falls, MT	2.1%	771.6	48.5	215
7	Bloomington-Normal, IL	1.8%	631.5	49.2	213
8	Champaign-Urbana, IL	1.7%	567.7	495.9	47
9	Iowa City, IA	1.7%	639.6	693.7	25
10	Bismarck, ND	1.6%	696.8	172.1	126
11	Gainesville, FL	1.6%	665.3	168.4	128
12	Topeka, KS	1.6%	724.1	187.2	117
13	Santa Fe, NM	1.5%	514.8	262.1	94
14	Columbia, MO	1.4%	524.2	113.0	157
15	Altoona, PA	1.4%	441.4	393.4	60
16	Richland, WA	1.3%	333.6	61.5	201
17	Green Bay, WI	1.3%	683.5	325.0	79
18	Bryan-College Station, TX	1.3%	360.9	1093.7	8
19	Amarillo, TX	1.3%	376.4	84.0	179
20	St. Cloud, MN	1.2%	489.9	187.0	118
21	Dubuque, IA	1.2%	493.6	387.0	62
22	Roanoke, VA	1.2%	555.2	186.5	119
23	Eau Claire, WI	1.2%	478.6	213.7	110
24	Wilmington, NC	1.2%	458.3	65.1	192
25	La Crosse, WI-MN	1.2%	473.0	345.3	74
26	Fort Walton Beach, FL	1.2%	351.9	246.9	101
27	Fargo-Moorhead, ND-MN	1.1%	521.9	212.8	111
28	Lawrence, KS	1.1%	300.1	78.0	185

29	San Angelo, TX	1.0%	269.2	94.2	168
30	Springfield, IL	1.0%	357.4	250.2	99
31	Lawton, OK	1.0%	191.3	454.8	53
32	Elmira, NY	0.9%	307.5	60.4	203
33	Duluth-Superior, MN-WI	0.9%	332.2	54.5	208
34	Parkersburg-Marietta, WV-OH	0.9%	290.9	95.2	166
35	Pittsfield, MA	0.9%	318.8	329.4	77
36	Rapid City, SD	0.9%	372.6	89.2	171
37	Sheboygan, WI	0.9%	301.8	106.5	162
38	Wausau, WI	0.9%	309.9	62.0	199
39	Missoula, MT	0.9%	281.8	336.1	76
40	Bloomington, IN	0.9%	223.9	115.3	156
41	San Luis Obispo, CA	0.8%	235.1	151.2	139
42	Lafayette, IN	0.8%	246.1	85.9	177
43	Sherman-Denison, TX	0.7%	189.9	40.7	221
44	Athens, GA	0.7%	241.1	38.5	224
45	Rochester, MN	0.7%	209.2	730.6	22
46	Laredo, TX	0.7%	196.8	30.0	233
47	Terre Haute, IN	0.7%	234.6	35.5	226
48	Bellingham, WA	0.7%	209.8	163.7	133
49	Bangor, ME	0.7%	330.2	80.3	184
50	Waterloo-Cedar Falls, IA	0.7%	289.0	182.8	121
51	Las Cruces, NM	0.7%	148.8	81.9	181
52	Lynchburg, VA	0.7%	209.4	85.6	178
53	Alexandria, LA	0.7%	190.0	56.2	206
54	Lake Charles, LA	0.6%	196.1	10.9	260
55	Panama City, FL	0.6%	188.9	88.4	174
56	Waco, TX	0.6%	206.1	64.6	195
57	Sumter, SC	0.6%	152.9	11.5	259
58	Fort Smith, AR-OK	0.6%	226.7	106.1	163
59	Decatur, AL	0.6%	171.4	13.7	255
60	Benton Harbor, MI	0.6%	178.5	67.7	190
61	Florence, SC	0.6%	198.8	182.1	124
62	Asheville, NC	0.6%	230.1	63.7	196
63	Albany, GA	0.6%	182.1	16.6	248
64	Kokomo, IN	0.6%	147.7	509.2	45
65	Clarksville, TN	0.6%	115.9	14.5	253
66	Abilene, TX	0.6%	158.0	30.8	231
67	Hattiesburg, MS	0.5%	170.1	36.7	225
68	Tyler, TX	0.5%	171.7	41.2	220
69	Mansfield, OH	0.5%	187.7	45.5	217
70	Lubbock, TX	0.5%	185.5	77.1	186
71	Odessa-Midland, TX	0.5%	160.2	44.3	218
72	Williamsport, PA	0.5%	166.6	33.3	228
73	Flagstaff, AZ-UT	0.5%	163.4	0.0	273
74	Johnstown, PA	0.5%	146.2	58.9	204
75	Grand Junction, CO	0.5%	146.2	34.4	227
76	St. Joseph, MO	0.5%	156.1	0.0	272
77	Wichita Falls, TX	0.5%	128.1	71.2	189
78	Jacksonville, NC	0.5%	79.8	20.6	244
79	Corvallis, OR	0.4%	89.6	317.3	82
80	Tuscaloosa, AL	0.4%	145.6	46.1	216
81	Grand Forks, ND-MN	0.4%	143.6	65.7	191
82	Chico-Paradise, CA	0.4%	113.2	126.0	147
83	Dothan, AL	0.4%	152.3	87.0	175

84	Medford-Ashland, OR	0.4%	126.9	62.9	198
85	Cheyenne, WY	0.4%	122.5	90.7	170
86	Steubenville-Weirton, OH	0.4%	113.6	0.0	274
87	Florence, AL	0.4%	104.9	28.0	235
88	Jackson, TN	0.4%	130.4	18.6	245
89	Elkhart-Goshen, IN	0.4%	218.8	91.9	169
90	Merced, CA	0.4%	76.0	2.4	266
91	Longview-Marshall, TX	0.4%	134.1	43.6	219
92	Pueblo, CO	0.4%	106.0	14.1	254
93	Wheeling, WV-OH	0.4%	124.0	26.1	237
94	Decatur, IL	0.4%	104.6	81.1	183
95	Casper, WY	0.4%	105.2	0.0	268
96	Joplin, MO	0.4%	133.5	12.7	256
97	Sharon, PA	0.4%	116.4	64.8	193
98	Glens Falls, NY	0.4%	104.5	16.1	251
99	Rocky Mount, NC	0.4%	111.9	0.0	269
100	Greenville, NC	0.4%	112.1	63.5	197
101	Lima, OH	0.3%	129.0	40.6	222
102	Janesville-Beloit, WI	0.3%	98.5	328.9	78
103	Yakima, WA	0.3%	89.9	9.0	262
104	Yuma, AZ	0.3%	62.5	12.5	257
105	Jamestown, NY	0.3%	93.0	61.5	200
106	Pine Bluff, AR	0.3%	71.2	15.4	252
107	Monroe, LA	0.3%	101.9	126.3	145
108	Punta Gorda, FL	0.3%	49.4	23.3	240
109	Barnstable-Yarmouth, MA	0.3%	86.1	163.0	134
110	Billings, MT	0.3%	100.5	385.0	63
111	Anniston, AL	0.3%	80.2	0.0	276
112	Sioux City, IA-NE	0.3%	96.7	16.1	250
113	Texarkana, TX-AR	0.3%	77.1	0.0	270
114	Jackson, MI	0.3%	69.4	29.0	234
115	Jonesboro, AR	0.3%	85.2	48.7	214
116	Lewiston-Auburn, ME	0.3%	88.1	222.4	107
117	Myrtle Beach, SC	0.2%	91.5	21.9	242
118	Auburn-Opelika, AL	0.2%	52.1	174.6	125
119	Goldsboro, NC	0.2%	61.8	24.7	238
120	Victoria, TX	0.2%	59.5	33.3	229
121	Pocatello, ID	0.2%	52.9	0.0	275
122	Owensboro, KY	0.2%	65.5	16.4	249
123	Houma, LA	0.2%	56.6	10.3	261
124	Muncie, IN	0.2%	50.5	304.0	85
125	State College, PA	0.1%	36.8	383.0	64
126	Cumberland, MD-WV	0.1%	29.4	0.0	267
127	Danville, VA	0.1%	27.2	2.7	265
128	Redding, CA	0.1%	30.6	49.6	212
129	Dover, DE	0.1%	23.7	107.3	161
130	Enid, OK	0.0%	0.0	0.0	271
131	Yuba City, CA	0.0%	0.0	71.9	188
132	Gadsden, AL	0.0%	0.0	3.9	264

Appendix C:
Location Quotients for Software Employment by Region

More than 1 million people		
Rank	**Region**	**Location Quotient**
1	San Jose, CA	4.68
2	San Francisco, CA	3.17
3	Washington, DC	2.66
4	Austin, TX	2.46
5	Seattle-Bellevue-Everett, WA	2.39
6	Raleigh-Durham-Chapel Hill, NC	2.31
7	Middlesex-Somerset-Hunterdon, NJ	2.23
8	Boston, MA-NH	2.16
9	Denver, CO	1.97
10	Dallas, TX	1.83
11	Atlanta, GA	1.62
12	Oakland, CA	1.61
13	Hartford, CT	1.58
14	San Diego, CA	1.48
15	Columbus, OH	1.45
16	Minneapolis-St. Paul, MN-WI	1.44
17	Kansas City, MO-KS	1.40
18	Portland-Vancouver, OR-WA	1.32
19	Phoenix-Mesa, AZ	1.31
20	Orlando, FL	1.27
21	Salt Lake City-Ogden, UT	1.27
22	Chicago, IL	1.26
23	New York, NY	1.22
24	Orange County, CA	1.22
25	Newark, NJ	1.22
26	Houston, TX	1.18
27	St. Louis, MO-IL	1.16
28	Philadelphia, PA-NJ	1.15
29	Jacksonville, FL	1.12
30	Detroit, MI	1.10
31	Tampa-St. Petersburg-Clearwater, FL	1.10
32	Baltimore, MD	1.08
33	Bergen-Passaic, NJ	1.07
34	Charlotte-Gastonia-Rock Hill, NC-SC	1.06
35	Fort Worth-Arlington, TX	1.03
36	Sacramento, CA	1.01
37	Indianapolis, IN	0.98
38	Rochester, NY	0.97
39	Los Angeles-Long Beach, CA	0.96
40	Cincinnati, OH-KY-IN	0.94

41	Fort Lauderdale, FL	0.89
42	Pittsburgh, PA	0.86
43	Milwaukee-Waukesha, WI	0.86
44	Louisville, KY-IN	0.84
45	San Antonio, TX	0.80
46	Cleveland-Lorain-Elyria, OH	0.78
47	Memphis, TN-AR-MS	0.78
48	Norfolk VA	0.76
49	Greensboro, NC	0.76
50	Buffalo-Niagara Falls, NY	0.72
51	Nassau-Suffolk, NY	0.72
52	Oklahoma City, OK	0.72
53	Nashville, TN	0.72
54	Miami, FL	0.63
55	Monmouth-Ocean, NJ	0.59
56	New Orleans, LA	0.56
57	West Palm Beach, FL	0.55
58	Grand Rapids, MI	0.53
59	Las Vegas, NV-AZ	0.45
60	Providence, RI-MA	0.39
61	Riverside-San Bernardino, CA	0.25

500,000-1 million people

Rank	Region	Location Quotient
1	Colorado Springs, CO	2.69
2	Omaha, NE	1.81
3	Wilmington, DE	1.66
4	Jersey City, NJ	1.58
5	Richmond-Petersburg, VA	1.42
6	Albuquerque, NM	1.41
7	Ann Arbor, MI	1.19
8	Harrisburg-Lebanon-Carlisle, PA	1.16
9	Albany, NY	1.15
10	Birmingham, AL	0.97
11	Tucson, AZ	0.91
12	New Haven-Meriden, CT	0.90
13	Syracuse, NY	0.78
14	Wichita, KS	0.76
15	Tulsa, OK	0.76
16	Honolulu, HI	0.72
17	Allentown, PA	0.72
18	Ventura, CA	0.70
19	Dayton-Springfield, OH	0.69
20	Worcester, MA-CT	0.68
21	Columbia, SC	0.66
22	Akron, OH	0.62
23	Knoxville, TN	0.62
24	Fort Wayne, IN	0.61
25	Baton Rouge, LA	0.61
26	Sarasota-Bradenton, FL	0.55
27	Scranton, PA	0.51
28	Springfield, MA	0.48

29	Greenville, SC	0.47
30	Bakersfield, CA	0.44
31	Charleston, SC	0.44
32	Tacoma, WA	0.44
33	El Paso, TX	0.43
34	Vallejo-Fairfield-Napa, CA	0.43
35	Toledo, OH	0.38
36	Little Rock, AR	0.38
37	Gary, IN	0.33
38	Youngstown-Warren, OH	0.31
39	Mobile, AL	0.30
40	Stockton-Lodi, CA	0.24
41	Fresno, CA	0.22
42	McAllen-Edinburg-Mission, TX	0.19

250,000-500,000 people

Rank	Region	Location Quotient
1	Boulder-Longmont, CO	5.73
2	Lowell, MA-NH	2.82
3	Dutchess County, NY	2.56
4	Huntsville, AL	2.51
5	Provo-Orem, UT	2.09
6	Trenton, NJ	2.00
7	Fort Collins-Loveland, CO	1.84
8	Madison, WI	1.83
9	Stamford-Norwalk, CT	1.56
10	Tallahassee, FL	1.19
11	Lansing-East Lansing, MI	1.16
12	Santa Cruz-Watsonville, CA	1.05
13	Galveston-Texas City, TX	1.03
14	Boise City, ID	1.02
15	Lawrence, MA-NH	1.01
16	Lincoln, NE	0.99
17	Bridgeport, CT	0.96
18	Flint, MI	0.95
19	Melbourne, FL	0.91
20	Columbus, GA-AL	0.86
21	New London-Norwich, CT-RI	0.86
22	Montgomery, AL	0.86
23	Lexington, KY	0.83
24	Des Moines, IA	0.83
25	Hamilton-Middletown, OH	0.78
26	Eugene-Springfield, OR	0.76
27	Anchorage, AK	0.76
28	Killeen-Temple, TX	0.75
29	Jackson, MS	0.68
30	Spokane, WA	0.68
31	Santa Barbara, CA	0.64
32	South Bend, IN	0.61
33	Atlantic-Cape May, NJ	0.61

34	Appleton-Oshkosh-Neenah, WI	0.59
35	Macon, GA	0.54
36	Santa Rosa, CA	0.54
37	Chattanooga, TN-GA	0.54
38	Reno, NV	0.53
39	York, PA	0.50
40	Naples, FL	0.49
41	Savannah, GA	0.48
42	Saginaw-Bay, MI	0.48
43	Davenport, IA-	0.45
44	Kalamazoo, MI	0.45
45	Pensacola, FL	0.45
46	Fayetteville, AR	0.45
47	Charleston, WV	0.44
48	Utica-Rome, NY	0.44
49	Reading, PA	0.43
50	Corpus Christi, TX	0.43
51	Biloxi-Gulfport-Pascagoula, MS	0.42
52	Brockton, MA	0.42
53	Evansville-Henderson, IN-KY	0.41
54	Newburgh, NY-PA	0.40
55	Lancaster, PA	0.40
56	Johnson City, TN	0.39
57	Daytona Beach, FL	0.37
58	Salinas, CA	0.36
59	Peoria-Pekin, IL	0.35
60	Fayetteville, NC	0.35
61	Fort Pierce-Port St. Lucie, FL	0.35
62	Erie, PA	0.34
63	Fort Myers-Cape Coral, FL	0.31
64	Binghamton, NY	0.30
65	Rockford, IL	0.30
66	Springfield, MO	0.30
67	Augusta-Aiken, GA-SC	0.28
68	Salem, OR	0.28
69	Visalia-Tulare-Porterville, CA	0.27
70	Lakeland-Winter Haven, FL	0.26
71	Canton-Massillon, OH	0.25
72	Lafayette, LA	0.25
73	Huntington, WV	0.22
74	Shreveport-Bossier City, LA	0.21
75	Hickory-Morganton-Lenoir, NC	0.20
76	Beaumont-Port Arthur, TX	0.19
77	Modesto, CA	0.18
78	Brownsville, TX	0.17
79	Ocala, FL	0.15

Less than 250,000 people

Rank	Region	Location Quotient
1	Sioux Falls, SD	1.87
2	Nashua, NH	1.74
3	Cedar Rapids, IA	1.74

4	Charlottesville, VA	1.32
5	Olympia, WA	1.31
6	Portland, ME	1.27
7	Burlington, VT	1.14
8	Great Falls, MT	1.11
9	Bloomington-Normal, IL	0.96
10	Champaign-Urbana, IL	0.88
11	Iowa City, IA	0.88
12	Bismarck, ND	0.84
13	Manchester, NH	0.84
14	Gainesville, FL	0.84
15	Topeka, KS	0.81
16	Santa Fe, NM	0.75
17	Columbia, MO	0.72
18	Altoona, PA	0.71
19	Richland, WA	0.69
20	Green Bay, WI	0.68
21	Bryan-College Station, TX	0.68
22	Bremerton, WA	0.68
23	Amarillo, TX	0.66
24	Danbury, CT	0.66
25	St. Cloud, MN	0.64
26	Dubuque, IA	0.64
27	Roanoke, VA	0.63
28	Eau Claire, WI	0.62
29	Wilmington, NC	0.62
30	La Crosse, WI-MN	0.61
31	Fort Walton Beach, FL	0.61
32	Yolo, CA	0.58
33	Fargo-Moorhead, ND-MN	0.57
34	Lawrence, KS	0.55
35	San Angelo, TX	0.52
36	Springfield, IL	0.51
37	Lawton, OK	0.51
38	Elmira, NY	0.49
39	Duluth-Superior, MN-WI	0.49
40	Parkersburg-Marietta, WV-OH	0.48
41	Pittsfield, MA	0.46
42	Rapid City, SD	0.46
43	Sheboygan, WI	0.45
44	Wausau, WI	0.45
45	Missoula, MT	0.44
46	Bloomington, IN	0.44
47	Racine, WI	0.44
48	Portsmouth-Rochester, NH-ME	0.44
49	San Luis Obispo, CA	0.42
50	Lafayette, IN	0.40
51	Sherman-Denison, TX	0.39
52	Athens, GA	0.39
53	Rochester, MN	0.39
54	Laredo, TX	0.39
55	Terre Haute, IN	0.38
56	Bellingham, WA	0.37
57	Bangor, ME	0.36
58	Waterloo-Cedar Falls, IA	0.36

59	Las Cruces, NM	0.34
60	Lynchburg, VA	0.34
61	Alexandria, LA	0.34
62	Lake Charles, LA	0.34
63	Kankakee, IL	0.33
64	Kenosha, WI	0.33
65	Panama City, FL	0.33
66	Waco, TX	0.33
67	Sumter, SC	0.32
68	Fort Smith, AR-OK	0.32
69	Decatur, AL	0.31
70	Benton Harbor, MI	0.30
71	Florence, SC	0.30
72	Asheville, NC	0.29
73	Albany, GA	0.29
74	Waterbury, CT	0.29
75	Kokomo, IN	0.29
76	Clarksville, TN	0.29
77	Abilene, TX	0.29
78	Fitchburg-Leominster, MA	0.28
79	Hattiesburg, MS	0.28
80	Tyler, TX	0.28
81	Mansfield, OH	0.27
82	Lubbock, TX	0.27
83	Odessa-Midland, TX	0.27
84	Williamsport, PA	0.27
85	Flagstaff, AZ-UT	0.27
86	Johnstown, PA	0.27
87	Grand Junction, CO	0.26
88	St. Joseph, MO	0.26
89	Wichita Falls, TX	0.25
90	Vineland-Millville-Bridgeton, NJ	0.25
91	Jacksonville, NC	0.25
92	Brazoria, TX	0.25
93	Corvallis, OR	0.23
94	Tuscaloosa, AL	0.23
95	Grand Forks, ND-MN	0.22
96	Chico-Paradise, CA	0.22
97	Dothan, AL	0.22
98	Medford-Ashland, OR	0.22
99	Cheyenne, WY	0.22
100	Steubenville-Weirton, OH-WV	0.21
101	Florence, AL	0.21
102	Jackson, TN	0.21
103	Elkhart-Goshen, IN	0.21
104	Merced, CA	0.21
105	Longview-Marshall, TX	0.20
106	Pueblo, CO	0.20
107	Wheeling, WV-OH	0.20
108	Decatur, IL	0.20
109	New Bedford, MA	0.19
110	Casper, WY	0.19
111	Joplin, MO	0.19
112	Sharon, PA	0.19
113	Glens Falls, NY	0.19

114	Rocky Mount, NC	0.19
115	Greenville, NC	0.18
116	Lima, OH	0.18
117	Janesville-Beloit, WI	0.17
118	Yakima, WA	0.16
119	Yuma, AZ	0.16
120	Jamestown, NY	0.16
121	Pine Bluff, AR	0.16
122	Monroe, LA	0.16
123	Punta Gorda, FL	0.15
124	Barnstable-Yarmouth, MA	0.15
125	Billings, MT	0.15
126	Anniston, AL	0.14
127	Sioux City, IA-NE	0.14
128	Greeley, CO	0.14
129	Texarkana, TX-AR	0.14
130	Jackson, MI	0.14
131	Jonesboro, AR	0.13
132	Lewiston-Auburn, ME	0.13
133	Myrtle Beach, SC	0.13
134	Auburn-Opelika, AL	0.13
135	Goldsboro, NC	0.13
136	Victoria, TX	0.12
137	Pocatello, ID	0.12
138	Owensboro, KY	0.11
139	Houma, LA	0.10
140	Muncie, IN	0.09
141	State College, PA	0.08
142	Cumberland, MD-WV	0.07
143	Danville, VA	0.06
144	Redding, CA	0.06
145	Dover, DE	0.05
146	Hagerstown, MD	0.04
147	Yuba City, CA	0.00
148	Gadsden, AL	0.00
149	Enid, OK	0.00