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LivingCities CensusSeries

Center on Urban and Metropolitan Policy

Labor Supply Pressures and the "Brain Drain": Signs from Census 2000

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Findings

An analysis of the location and migration patterns of younger and older workers, especially those with college degrees, for the 100 most populous metropolitan areas in Census 2000 finds that:

- **The proportion of workers who are young and educated is highest in the Northeast region, followed by the Midwest, the South, and the West.** This counters notions that a "brain drain" has depleted the Midwest of its younger, talented workers. The South and West regions actually have higher proportions of 25-to-34-year-old residents, but fewer of these workers hold bachelor's degrees.

- **Young and educated workers represent a larger part of the workforce in metropolitan areas with high populations, strong arts scenes, significant international immigration, and large numbers of high-tech jobs.** Whether a particular metro area has a large or small proportion of these workers depends more on the educational attainment of its 25-to-34 year olds than on the actual size of that age group.

- **Metro areas that captured the largest number of new 25-to-34-year-old residents between 1990 and 2000 are located almost exclusively in the South and West.** Net migration of this age group to metro areas in the South and West was double that to metro areas in the Midwest, and four times that to metro areas in the Northeast. Growth in the size of this age cohort over the decade relates closely to job growth at the metropolitan level.

- **Compared to older workers (aged 35-to-64), young workers migrated more often to high-amenity, high-human-capital metropolitan areas during the 1990s.** San Francisco, Denver, Seattle, and Atlanta ranked among the metro areas with the largest net growth in young workers relative to older workers.

- **Metropolitan areas in the Northeast have the highest proportions of workers between the ages of 55 and 64.** Those nearing retirement age make up at least one in nine workers in several metro areas throughout greater New York and Pennsylvania. Older workers in these areas generally possess above-average levels of educational attainment, signaling the potential for future declines in skilled labor across the Northeast region.

Ultimately, state and local economic development policy makers should consider shifting their emphasis from increasing the *quantity* of certain types of workers, toward embracing human capital development as a longer-term goal. Paired with amenity strategies for younger workers and more workplace flexibility for older workers, policies to raise the stock of knowledge in a region can "split the difference" between demand-side and supply-side labor market interventions.

Introduction

Policy-makers in metropolitan areas like Cleveland, Pittsburgh, and Des Moines worry about the state of the local workforce. Interestingly, they worry not only about the quality of workers, but also about their quantity. During the recent tech-driven economic boom, young people with advanced degrees were reported to have left Midwestern cities for places with higher perceived amenities and a critical mass of exciting jobs.[2] At the same time, many of these same metropolitan areas had a large number of workers in the 55-to-64-year-old age bracket, causing policy-makers to worry that impending retirements will further diminish the available quantity of labor.[3]

From an economic standpoint, these demographic shifts could have two main effects. First, if people choose not to live or work in a location for reasons that are independent of the demand for labor, wages will rise. If higher wages do not attract workers back to the region, a vicious spiral could ensue in which locally-produced goods are priced out of global markets, and firms move to places where skilled workers are happier and more abundant.

A second, probably more serious effect relates to the s*pecialized human capital* that different cohorts of workers may be expected to bring to a metropolitan economy. College-educated young people, in particular, are more likely to have mastered newer technologies and ideas. In a world of rapid technological change, a large cohort of young workers can be a significant economic asset, as Richard Florida and others have recently argued.[4] Many view these younger workers, who typically have fewer family responsibilities, to be more entrepreneurial and risk-taking than older workers. A lack of this specialized human capital may hinder a metropolitan area's economic growth and competitiveness.

Due in part to this emphasis on educated young people as an economic asset, many states and metropolitan areas have implemented "brain drain" programs designed to retain or attract college graduates, especially natives of their own regions. A large body of research on the economic payoff from college-educated workers of all ages provides further impetus for such programs.[5]

Notwithstanding this focus on youth, any effective business community requires a range of age levels and associated skills. Businesses require not only a taste for risk-taking, for example, but also worldly experience and even some outright conservatism. Older workers bring their own specialized human capital to complement that of the young. The Great Lakes region, for example, worries that its skilled machinists are about to retire *en masse*. While this might not create problems in the short run, metro areas like Detroit and Toledo could, over the longer term, find their stock of industry-specific skills deteriorating. Many skilled manufacturing trades require lengthy apprenticeships—positions cannot be refilled on short notice—and have had difficulty attracting today's high school graduates.

The new policy emphasis on "industry clusters" further amplifies the need for specialized human capital.[6] These clusters are sets of specialized industries and technical skills concentrated in a particular place, which gives that place a global competitive advantage (e.g., Silicon Valley, Route 128, and for 100 years, Detroit). In cluster thinking, critical mass—especially of applied knowledge—is everything. As a result, some economic models hypothesize that a regional technology complex can collapse like a house of cards if the stock of local knowledge falls below a certain level.[7]

Development officials in the broad middle of the country, then, face a two-fold dilemma. They worry that they will lose specialized skills in traditional manufacturing at the same time they fail to achieve critical mass in sectors, like information science and biotechnology, that are more youth-driven. Both worries, at least to some degree, relate to migration and labor force decisions made by members of the young and old age cohorts in these places.

This survey assesses the scale of labor market pressures in different regions of the country brought about by migration patterns and demographic change during the 1990s. It uses data from the 1990 and 2000 decennial censuses to explore threats to the labor supply posed by retirements and youth migration in particular regions. It also assesses metropolitan area characteristics that are associated with age structure and migration, such as high-tech status, cosmopolitan amenities, and Sun Belt versus Frost Belt location. The survey concludes with a discussion of the policy implications and next research steps flowing from the analysis.

Methodology

Geography

This study analyzes the dynamics of labor supply in the 100 largest metropolitan areas in the U.S. based on their population in Census 2000—those with at least 519,000 residents. These include Metropolitan Statistical Areas (MSAs) and, within larger metropolises, Primary Metropolitan Statistical Areas (PMSAs), defined by the U.S. Office of Management and Budget (OMB). Metro areas represent collections of counties surrounding an identifiable central city, after which the metropolitan area is typically named, and include urban and suburban territory with some economic connection to the central city. This study uses metropolitan area definitions that OMB introduced in 1999, which the Census Bureau used to tabulate Cen-

sus 2000 data; the definitions are applied here to 1990 and 2000 census data alike.[8] In 2000, the 100 largest MSAs and PMSAs contained 63 percent of the nation's total population, and 78 percent of its metropolitan population, thus capturing a considerable portion of the nation's urban demography.

In places where Consolidated Metropolitan Statistical Areas (CMSAs) exist—typically "super-regions" of 1 million or more people—this study uses PMSA components of CMSAs. Though in many cases CMSAs better approximate regional labor markets, PMSAs have the advantage of communicating descriptive information at a scale more relevant for policy making. In comparison to CMSAs, PMSAs represent labor submarkets that surround single cities, rather than groups of cities.

Most of the data in this report are also tabulated for census regions—Midwest, Northeast, South, and West—based on the location of its primary city. Where the report tabulates results for census regions, only the 100 largest metropolitan areas are represented.

Young, Educated Workers

This analysis focuses primarily on the cohort aged 25-to-34 in 2000. Nationally, 79 percent of this age group was in the labor force in 2000, and only 11 percent was enrolled in college or graduate school. Another advantage to focusing on this age group is that most people who will ever earn a college/university degree have done so by this age. Thus, it is appropriate to use bachelor's degree attainment for this cohort as an educational yardstick for metropolitan areas.[9] In addition, this report's analysis of labor force participants at risk of retirement focuses on individuals aged 55-to-64 in 2000.

Before proceeding with the analysis of 1990 and 2000 census data, two caveats deserve mention.

First, this study assumes that people may choose not to live or work in a location for reasons independent of local labor demand. In reality, none of the data explored below separate shifts in labor supply from shifts in labor demand; they merely reflect these two forces at equilibrium. The reader should remember that shifts in labor demand, which in turn relate to changes in the demand for locally-produced goods or services, provide an alternative explanation for the metropolitan age/education mix and migration patterns examined here. The main difference between demand- and supply-driven out-migration—beyond the different policy responses they merit—is that, theoretically, supply-induced out-migration results in rising wages, while demand-induced out-migration leads to falling wages.[10]

Second, summary files from Census 2000 confine this analysis in certain parts. Two demographic groups form natural areas for focus: (1) college-educated young people in the labor force in 2000; and (2) older workers in each metropolitan area who were in the labor force and had skilled occupations in 2000. Describing these ideal study groups, however, requires detailed cross-tabulations of decennial census data. In cases where the analysis omits a key group characteristic, such as labor force status or occupation, the relevant cross-tabulation was not available from Census 2000 at this report's writing.

Findings

A. The proportion of workers who are young and educated is highest in the Northeast region, followed by the Midwest, the South, and the West.

This analysis begins by comparing large metropolitan areas in the nation's four census regions by the proportion of their working-age population that was 25-to-34 years old *and* held at least a bachelors' degree in 2000. As noted above, in recent years cities and states in the midwestern U.S. have identified a lack of these workers as a primary obstacle to economic growth.

In that light, Table 1 yields a somewhat surprising conclusion. The Northeast and Midwest rank first and second, respectively, among the four regions in the proportion of their working-age metropolitan population that is young and educated.[11] The Midwest actually ranks first among the regions in the share of its metropolitan areas that fall into the top quarter of all large metropolitan areas on this measure. While the difference in the proportion of young, educated workers across regions does not appear large, if the West matched the Northeast on this measure, it would be home to an additional 175,000 25-to-34 year-olds with bachelor's degrees.[12]

Meanwhile, the South and West regions actually *lead* the Northeast and Midwest in the proportion of their working-age population aged 25-to-34, regardless of education. Table 1 reveals that the South and West lag other regions in their proportion of young, educated workers because the rate of bachelor's degree attainment in this group is far lower in the South and West (28 to 30 percent, versus 32 to 35 percent in the Midwest and Northeast).[13]

Lower educational attainment among the South and West's younger workers likely relates to a couple of factors. Although these regions have grown more rapidly than other parts of the country for many years, each has a relatively large number of metropolitan areas specializing in lower-wage, lower-skill industries like agriculture, mining and tourism. All three of these industries are associated with below-average educational attainment.[14] In addition, these areas have received a majority of the nation's new immigrant population in recent years, many of whom occupy the 25-to-34 year-old cohort. Seventy percent of the nation's growth in foreign-born individuals during the 1990s occurred in the South

Table 1. "Young and Educated" Metropolitan Residents by Region, 2000

	Census Region			
	Midwest	Northeast	South	West
Proportion of working-age residents aged 25 to 34	27.6%	26.8%	28.5%	29.8%
Proportion of residents aged 25 to 34 who hold a college degree	32.4%	35.0%	29.9%	27.9%
"Young and educated" residents as proportion of working-age population	8.9%	9.4%	8.5%	8.3%
Proportion of metro areas in the:				
Top 25	31.6%	22.7%	25.0%	21.7%
Second 25	21.1%	36.4%	16.7%	30.4%
Third 25	31.6%	22.7%	30.6%	13.0%
Bottom 25	15.8%	18.2%	27.8%	34.8%
Number of metro areas	19	22	36	23

Source: Census 2000

and West.[15] These immigrants typically arrive in the U.S. with lower levels of educational attainment than their native-born counterparts.[16]

B. Young and educated workers represent a larger part of the workforce in metropolitan areas with high populations, strong arts scenes, significant international immigration, and large numbers of high-tech jobs. The picture at the census region level is instructive, as it urges us to re-evaluate the extent of the "brain drain" in the Midwest. Yet the story varies much more significantly at the metro area level. A look at the top 15 and bottom 15 metro areas by their proportions of young, educated workers reveals the magnitude of inter-metropolitan differences on this measure (Table 2; Appendix A contains statistics for all 100 metro areas).[17]

It appears that the metropolitan areas with the highest proportions of young and educated contain relatively large cities near the top of America's urban hierarchy. This is consistent with a "bright lights, big city" hypothesis that educated young people are disproportionately drawn to large cities because they offer a wealth of work and recreational opportunities.

The metropolitan areas at the top of Table 2 include some of the most economically vibrant of the last twenty years: San Francisco, San Jose, Seattle, Denver, and Atlanta. Most have significant employment in technology industries.[18] Yet the appearance of New York and Washington on the list also suggests that a metro area need not be exclusively high-tech; finance, government, and diversified service economies also employ large numbers of educated younger workers.[19] Meanwhile, the presence of metro areas like Austin, Ann Arbor, Boston, and Columbus on the list suggests that older graduate students and other "hangers-on" may influence these rankings somewhat, in spite of the focus on people age 25 and over.[20]

While Atlanta, Austin, and Raleigh-Durham stand out as talent magnets in the fast-growing Sun Belt, that region as a whole is not yet the nation's main repository of human capital. For every "high-flier" Sun Belt metro area near the top of Table 2, an El Paso, Las Vegas, or Bakersfield falls near the bottom. Each of these metropolitan areas has its own strengths, of course, but they seem to fall short on certain measures of New Economy potential, like educated workers.[21]

As noted above in the discussion on census regions, both the size of the 25-to-34-year-old cohort and the educational attainment of its members influence these rankings. The right-hand side of Table 2 attempts to sort out the degree to which each of these factors accounts for a particular metropolitan area's "young and educated" worker proportion relative to the average across all metro areas (the methodology for this "decomposition analysis" is described in the Technical Appendix):

- For instance, in Jersey City, the proportion of the working-age population between the ages of 25 and 34 (34.6 percent) is above the 100-metro average (27.3 percent), as is the percentage of young residents with bachelor's degrees (37.5 percent, versus the 100-metro average of 29.2 percent). The right-hand side of the table shows that about half of the Jersey City metro area's above-average proportion of young and educated workers (13.0 percent) is attributable to their higher educational attainment, while the other half of Jersey City's performance on this measure is explained by the above-average size of its 25-to-34 year-old cohort.

- By contrast, 25-to-34 year-olds constitute an above-average share of

Table 2. Highest and Lowest Proportions of "Young and Educated" Residents, 100 Largest Metro Areas, 2000

	Metropolitan area	Residents aged 25–64	Residents aged 25–34	As proportion of residents aged 25–64	Residents aged 25–34 with a B.A.	As proportion of residents aged 25–34	As proportion of residents aged 25–64	Deviation from 100-metro average	Portion attributable to education	Portion attributable to cohort size
1	San Francisco, CA PMSA	1,038,174	323,798	31.2%	172,814	53.4%	16.6%	8.7%	85.6%	14.4%
2	Raleigh-Durham-Chapel Hill, NC MSA	659,799	207,708	31.5%	93,791	45.2%	14.2%	6.2%	78.3%	21.7%
3	San Jose, CA PMSA	949,756	298,237	31.4%	133,224	44.7%	14.0%	6.0%	78.3%	21.7%
4	Austin-San Marcos, TX MSA	675,094	227,910	33.8%	88,732	38.9%	13.1%	5.2%	59.0%	41.0%
5	Jersey City, NJ PMSA	338,836	117,232	34.6%	43,963	37.5%	13.0%	5.0%	50.7%	49.3%
6	Ann Arbor, MI PMSA	310,210	86,193	27.8%	39,292	45.6%	12.7%	4.7%	98.4%	1.6%
7	Washington, DC-MD-VA-WV PMSA	2,801,571	786,527	28.1%	349,002	44.4%	12.5%	4.5%	94.7%	5.3%
8	Middlesex-Somerset-Hunterdon, NJ PMSA	650,533	170,840	26.3%	78,628	46.0%	12.1%	4.1%	100.0%	0.0%
9	Boston MA-NH NECMA	3,296,228	903,454	27.4%	383,349	42.4%	11.6%	3.6%	98.8%	1.2%
10	Seattle-Bellevue-Everett, WA PMSA	1,373,878	391,843	28.5%	155,613	39.7%	11.3%	3.3%	89.8%	10.2%
11	Minneapolis-St. Paul, MN-WI MSA	1,616,393	456,170	28.2%	182,178	39.9%	11.3%	3.3%	92.2%	7.8%
12	Atlanta, GA MSA	2,314,756	722,617	31.2%	257,837	35.7%	11.1%	3.2%	61.4%	38.6%
13	New York, NY PMSA	5,029,476	1,517,786	30.2%	554,418	36.5%	11.0%	3.0%	68.9%	31.1%
14	Denver, CO PMSA	1,183,472	351,096	29.7%	128,193	36.5%	10.8%	2.8%	75.4%	24.6%
15	Columbus, OH MSA	828,301	246,599	29.8%	87,858	35.6%	10.6%	2.6%	72.3%	27.7%
	Average for 100 largest metro areas			**27.3%**		**29.2%**	**8.0%**			
86	Jacksonville, FL MSA	592,196	157,812	26.6%	35,435	22.5%	6.0%	-2.0%	92.2%	7.8%
87	Ventura, CA PMSA	394,629	102,853	26.1%	22,583	22.0%	5.7%	-2.3%	86.8%	13.2%
88	Scranton-Wilkes-Barre-Hazleton, PA MSA	316,74	74,572	23.6%	17,637	23.7%	5.6%	-2.4%	57.7%	42.3%
89	Mobile, AL MSA	275,956	69,646	25.2%	15,347	22.0%	5.6%	-2.4%	77.3%	22.7%
90	Tacoma, WA PMSA	370,041	100,543	27.2%	18,815	18.7%	5.1%	-2.9%	99.2%	0.8%
91	Gary, IN PMSA	325,298	78,299	24.1%	16,466	21.0%	5.1%	-2.9%	72.6%	27.4%
92	El Paso, TX MSA	324,087	97,644	30.1%	15,308	15.7%	4.7%	-3.3%	100.0%	0.0%
93	Las Vegas, NV-AZ MSA	845,149	242,131	28.6%	39,557	16.3%	4.7%	-3.3%	100.0%	0.0%
94	Sarasota-Bradenton, FL MSA	280,661	57,915	20.6%	12,326	21.3%	4.4%	-3.6%	52.4%	47.6%
95	McAllen-Edinburg-Mission, TX MSA	248,658	83,667	33.6%	10,678	12.8%	4.3%	-3.7%	100.0%	0.0%
96	Youngstown-Warren, OH MSA	305,733	70,618	23.1%	13,081	18.5%	4.3%	-3.7%	70.7%	29.3%
97	Fresno, CA MSA	436,105	126,396	29.0%	18,569	14.7%	4.3%	-3.7%	100.0%	0.0%
98	Riverside-San Bernardino, CA PMSA	1,573,469	439,230	27.9%	58,770	13.4%	3.7%	-4.3%	100.0%	0.0%
99	Stockton-Lodi, CA MSA	272,849	74,656	27.4%	9,103	12.2%	3.3%	-4.6%	100.0%	0.0%
100	Bakersfield, CA MSA	320,646	92,114	28.7%	9,562	10.4%	3.0%	-5.0%	100.0%	0.0%

Source: Census 2000

For an explanation of the three columns on the right hand side of this table, see text and appendix A.

Table 3. Correlation between Proportion of "Young and Educated" Residents and Selected Measures, 100 Largest Metro Areas, 2000

	Correlation coefficient
Proportion of jobs in high technology, 1990*	0.61
Places Rated Almanac Arts Score, 1993	0.43
Proportion of population that immigrated from overseas, 1995-2000	0.38
Proportion of jobs in finance, 2000	0.37
Metro area population (natural log), 2000	0.36
University graduations per capita, 1996*	0.16

Sources: Census 2000, NSF Caspar files, Places Rated Almanac, County Business Patterns, Bureau of Economic Analysis Regional Economic Information System.

** Due to data availability, each PMSA was assigned the value for the CMSA of which it is a part.*

population in the El Paso metro area (30.1 percent), but the proportion of these young individuals with college degrees (15.7 percent) falls far below the 100-metro average. Accordingly, a full 100 percent of El Paso's below-average performance on its proportion of workers who are young *and* educated (4.7 percent) is explained by the low educational attainment of its 25-to-34 year olds.

Overall, this decomposition analysis suggests that relative performance on the proportion of a metropolitan area's workers who are young and educated is more likely to be driven by the educational attainment of the young cohort than by its relative size. Appendix A shows that across the 100 metro areas, the educational level of 25-to-34 year olds explains about 70 percent of the variation in the proportion of the workforce that is young and educated. This reflects the fact that, for the most part, age distributions tend to be more uniform across metropolitan areas than educational attainment.[22]

The decomposition statistics reflect some general notions regarding the age of different areas of the country. The Northeast has fewer young people than many other parts of the country, so high rankings in places like Boston and Middlesex-Somerset-Hunterdon, NJ (outside New York City) owe entirely to high educational attainment among the young. On the other hand, the age distribution carries considerable weight in explaining the relatively low proportion of young and educated workers in retirement meccas like Sarasota-Bradenton, FL.

This discussion has hypothesized relationships between the concentration of young, educated workers in metropolitan areas and phenomena like city size, university presence, and industrial composition. To explore these relationships more formally, Table 3 presents correlation coefficients between the young-and-educated worker proportion and several indicators at the metropolitan level.

In short, the positive correlations displayed in Table 3 confirm these hypotheses. The relationships are particularly strong between a metropolitan area's young-and-educated worker proportion in 2000 and its proportion of jobs in high technology at the beginning of the 1990s, and its arts rating in the *Places Rated Almanac*.[23] Of course, this analysis does not hold "all else equal" to identify the unique contribution of each factor; some factors are likely highly correlated themselves (such as technology employment and university graduations). But this analysis does represent a first step toward a formal analysis of conditions that are associated with young, educated workers across metropolitan regions.

Additional analysis (not shown here) of the relationship between proportions of young, college-educated workers and technology employment reveals that the positive correlation between the two measures depends largely on overall metropolitan educational attainment, with the size of the young cohort playing only a supporting role.[24] Consequently, it would be more accurate to say that the nation's technology centers attract the better-educated, *including* those in the 25-to-34-year-old age bracket. Determining whether above-average concentrations of educated young workers actually contribute to technology-oriented economic development over time, as implied by Richard Florida's "creative class" idea, merits further research.

C. Metro areas that captured the largest number of new 25-to-34-year-old residents between 1990 and 2000 are located almost exclusively in the South and West.

This examination of where the young and educated were located in 2000, and why, offers important context for city and metropolitan attempts to

Table 4. Highest and Lowest Net Migration Indices, Cohort Aged 25-to-34 in 2000, 100 Largest Metro Areas, 1990–2000

	Metropolitan area	Net migration index*	Census region
1	Las Vegas, NV-AZ MSA	72.3%	WEST
2	Denver, CO PMSA	50.9%	WEST
3	Atlanta, GA MSA	47.6%	SOUTH
4	Fort Lauderdale, FL PMSA	47.6%	SOUTH
5	San Francisco, CA PMSA	46.5%	WEST
6	Phoenix-Mesa, AZ MSA	44.6%	WEST
7	Dallas, TX PMSA	41.7%	SOUTH
8	Portland-Vancouver, OR-WA PMSA	40.2%	WEST
9	West Palm Beach-Boca Raton, FL MSA	38.4%	SOUTH
10	Seattle-Bellevue-Everett, WA PMSA	37.5%	WEST
11	Jersey City, NJ PMSA	37.0%	NORTHEAST
12	Austin-San Marcos, TX MSA	36.8%	SOUTH
13	Raleigh-Durham-Chapel Hill, NC MSA	34.9%	SOUTH
14	Charlotte-Gastonia-Rock Hill, NC-SC MSA	34.7%	SOUTH
15	Orlando, FL MSA	31.5%	SOUTH
86	Hartford, CT NECMA	-8.5%	NORTHEAST
87	Pittsburgh, PA MSA	-8.6%	NORTHEAST
88	Gary, IN PMSA	-9.3%	MIDWEST
89	Providence-Warwick-Pawtucket, RI NECMA	-9.6%	NORTHEAST
90	Ann Arbor, MI PMSA	-9.8%	MIDWEST
91	Rochester, NY MSA	-11.1%	NORTHEAST
92	Akron, OH PMSA	-11.4%	MIDWEST
93	Youngstown-Warren, OH MSA	-11.7%	MIDWEST
94	Dayton-Springfield, OH MSA	-13.8%	MIDWEST
95	Buffalo-Niagara Falls, NY MSA	-15.4%	NORTHEAST
96	Albany-Schenectady-Troy, NY MSA	-16.5%	NORTHEAST
97	Scranton-Wilkes-Barre-Hazleton, PA MSA	-19.4%	NORTHEAST
98	Toledo, OH MSA	-20.9%	MIDWEST
99	Syracuse, NY MSA	-26.5%	NORTHEAST
100	Springfield, MA NECMA	-31.6%	NORTHEAST
Regional Metropolitan Totals			
	MIDWEST	9.7%	
	NORTHEAST	4.7%	
	SOUTH	22.4%	
	WEST	22.4%	

** (Population aged 25-to-34 in 2000 - Population aged 15-to-24 in 1990)/average of the two.*
Because of immigration from abroad, all census regions experienced net in-migration.
Source: 1990 and 2000 decennial censuses

attract or retain these workers. However, the actual movement of these workers between states and metropolitan areas presumably provides more direct evidence on the "brain gain" and "brain drain" phenomena.

To quantify the movement of young workers in the 1990s, this section analyzes net migration flows using data from the 1990 and 2000 decennial censuses. Net migration for a metropolitan area is given by the formula below:

$$P_{90} - D_{90\text{-}00} + I_{90\text{-}00} - O_{90\text{-}00} = P_{00}$$

where P_{90} = people aged 15-to-24 in the metro in 1990
$D_{90\text{-}00}$ = local deaths in this cohort between 1990 and 2000
$I_{90\text{-}00}$ = gross in-migration of this cohort between 1990 and 2000
$O_{90\text{-}00}$= gross out-migration of this cohort between 1990 and 2000
P_{00}= people aged 25-to-34 in the metro in 2000 (the same cohort as P_{90})

Note that in-migration here includes not only people entering a metropolitan area from elsewhere in the U.S., but also from abroad—that is, immigrants. Assuming death rates for this age cohort are either insignificant or equal across metropolitan areas, this formula yields the following expression:

$$\text{Net migration}_{90\text{-}00} = I_{90\text{-}00} - O_{90\text{-}00} = P_{00} - P_{90}$$

Net migration, then, is simply the difference between cohort population in a metropolitan area in the two census years. This section standardizes the measure by metropolitan area size, so that Table 4 displays an "index" of net migration, expressed as a percentage of the average size of the cohort from 1990 to 2000 for each metropolitan area.[25]

Because it measures a kind of trade balance between gross migration

flows, net migration provides a rough measure of a metropolitan area's attractiveness to migrants. Measured in this way, migrants may come from, or go to, more places than the 100 largest metropolitan areas analyzed here, including smaller metropolitan areas and rural areas in the U.S., as well as areas outside the U.S. In particular, about 13 million immigrants arrived in the U.S. between 1990 and 2000.[26] So while net migration effectively measures the attractiveness of a particular place, these 100 metropolitan areas do not constitute a "closed system."

One difference between this migration analysis and the analysis above deserves note: Because the 25-to-34 year-old cohort was aged 15 to 24 in 1990—and thus includes many individuals too young to have completed college degrees at that time—this section focuses on net migration for all 25-to-34 year-olds, not just those with bachelor's degrees.[27] Looking at the migration patterns of this age cohort, rather than people who have already earned college degrees, will inevitably: (1) capture some "life cycle" migration related to higher education, such as out-migration from university centers like Ann Arbor, Boston, and Columbus; and (2) show trends in the movement of "bodies," not necessarily educated workers, as in the younger, faster-growing places in the South and the West. Fortunately, most studies show that the propensity to migrate increases with educational attainment.[28] Therefore, it is likely that the net migration patterns identified here depict flows of workers with above-average levels of education.

The metropolitan areas that experienced the largest net in-migration during the 1990s (Table 4) include many of those with the largest proportions of young, educated workers (Table 2)—Denver, Atlanta, San Francisco, and Seattle figure prominently in both lists. Overall, though, metro areas in the South and West dominate the list of migration destinations far more than the list of "young and educated" metro areas (With the exception of the anomalous Jersey City, one must go all the way down to number 19 on the list before finding a metro area not located in either the South or West.).

The presence of tourism and retirement metros like Las Vegas, Fort Lauderdale, Phoenix, and Orlando further differentiates Table 4 from Table 2. Of these four metro areas, Phoenix is most likely to rank high as a technology center, but its 25-to-34 year old cohort is still less-educated than the national average (a common phenomenon in much of the West, as noted above). It appears that young workers—including foreign-born workers—migrated to some of these metropolitan areas in the 1990s to take local service jobs created by the demands of retirees and affluent migrants from other cohorts. A few of these cities, however—like Phoenix—may be transitioning to economies more dependent on members of the so-called "creative class."

Contrary to the "bright lights, big city" hypothesis, large cities did not necessarily attract more young workers than medium-sized or small cities, at least using a migration measure that is standardized on cohort size. Atlanta, Dallas, and San Francisco did well at attracting younger workers, but New York, Chicago, and Boston ranked lower on in-migration. Employment growth may help explain this disparity: New York, Chicago, and Boston experienced relatively sluggish employment growth over the 1990s, while Atlanta ranked third, and Dallas seventh, among the 100 metro areas on this measure.

In fact, a comprehensive statistical analysis examining determinants of net migration among younger workers during the 1990s finds that the degree of in-migration to a metropolitan area is related closely to job growth in the late 1980s, suggesting that younger workers responded to economic momentum and signals about hot job markets.[29] Other significant variables include the proportion of metropolitan jobs in high technology in 1990, and a composite measure of "cosmopolitan amenities" in each metropolitan area. Recent analysis by Robert Cushing for the *Austin American-Statesman* reported high net migration to "just a handful of…cities of ideas," including smaller tech centers like Austin that have developed a reputation for nightlife and other amenities potentially attractive to the young.[30]

In contrast to the top of Table 4, all 15 metro areas with the highest net *out*-migration of the young cohort during the 1990s are located in either the Northeast or Midwest. Upstate New York, Pennsylvania, and Ohio account for ten out of the 15. This Sun Belt/Frost Belt dichotomy holds at the regional level as well. In the 1990s, younger workers migrated into the South and West at roughly equivalent rates (bottom Table 4). That 22.4 percent net in-migration index was twice the index for the Midwest (9.7 percent), and four times that for the Northeast (4.7 percent). These regional averages mask the fact that some Frost Belt metro areas suffered even greater net losses of younger workers during the 1990s. In Toledo, OH, Syracuse, NY, and Springfield, MA, for example, migration patterns reduced the size of the young worker cohort by at least one-fifth in only a decade's time.

Of course, these results parallel the longstanding divergence in population growth between the nation's Sun Belt and Frost Belt metropolitan areas.[31] Individuals from all age cohorts and educational levels have participated in these broad trends over many decades. Yet it is particularly noteworthy that the rank order of census regions in Table 4 is exactly the opposite of that in Table 1. On concentration of young, educated workers in 2000, the Northeast leads, followed by the Midwest, the South, and the West. On youth in-

Table 5. Highest and Lowest "Youth-Specific" Net Migration, 100 Largest Metro Areas, 1990–2000

	Metropolitan area	Net migration index, cohort aged 25–34, 2000	Net migration index, cohort aged 35–64, 2000	Index difference*	Census region
1	San Francisco, CA PMSA	46.5%	-10.2%	56.7%	WEST
2	Jersey City, NJ PMSA	37.0%	-12.3%	49.3%	NORTHEAST
3	Denver, CO PMSA	50.9%	6.5%	44.4%	WEST
4	San Jose, CA PMSA	28.0%	-10.8%	38.8%	WEST
5	Dallas, TX PMSA	41.7%	2.8%	38.9%	SOUTH
6	Seattle-Bellevue-Everett, WA PMSA	37.5%	0.5%	37.0%	WEST
7	Atlanta, GA MSA	47.6%	10.9%	36.7%	SOUTH
8	New York, NY PMSA	23.7%	-8.5%	32.2%	NORTHEAST
9	Portland-Vancouver, OR-WA PMSA	40.2%	8.9%	31.3%	WEST
10	Houston, TX PMSA	29.9%	0.4%	29.5%	SOUTH
11	Washington, DC-MD-VA-WV PMSA	24.1%	-3.0%	27.0%	SOUTH
12	Los Angeles-Long Beach, CA PMSA	9.0%	-15.8%	24.8%	WEST
13	Minneapolis-St. Paul, MN-WI MSA	25.3%	-1.7%	27.0%	MIDWEST
14	Oakland, CA PMSA	23.5%	-2.8%	26.2%	WEST
15	Fort Lauderdale, FL PMSA	47.6%	18.3%	29.3%	SOUTH
86	Allentown-Bethlehem-Easton, PA MSA	-2.6%	1.8%	-4.4%	NORTHEAST
87	Providence-Warwick-Pawtucket, RI NECMA	-9.6%	-3.7%	-5.9%	NORTHEAST
88	Tucson, AZ MSA	9.0%	12.4%	-3.4%	WEST
89	Mobile, AL MSA	0.5%	5.7%	-5.1%	SOUTH
90	Gary, IN PMSA	-9.3%	-2.2%	-7.1%	MIDWEST
91	Buffalo-Niagara Falls, NY MSA	-15.4%	-6.7%	-8.6%	NORTHEAST
92	Youngstown-Warren, OH MSA	-11.7%	-2.3%	-9.3%	MIDWEST
93	Akron, OH PMSA	-11.4%	-1.2%	-10.2%	MIDWEST
94	Sarasota-Bradenton, FL MSA	23.6%	29.0%	-5.4%	SOUTH
95	Toledo, OH MSA	-20.9%	-8.8%	-12.1%	MIDWEST
96	Albany-Schenectady-Troy, NY MSA	-16.5%	-4.7%	-11.8%	NORTHEAST
97	Ann Arbor, MI PMSA	-9.8%	2.2%	-12.0%	MIDWEST
98	Syracuse, NY MSA	-26.5%	-8.4%	-18.1%	NORTHEAST
99	Scranton-Wilkes-Barre-Hazleton, PA MSA	-19.4%	-0.9%	-18.5%	NORTHEAST
100	Springfield, MA NECMA	-31.6%	-3.2%	-28.4%	NORTHEAST

Source: 1990 and 2000 decennial censuses

** Metros are ranked on the residual of 25-to-34 year-old net migration index regressed on 35-to-64 year-old net migration index. See endnote 33.*

migration (all education levels), the West leads, followed in order by the South, the Midwest, and the Northeast.

Despite the growth of the young population in the Sun Belt, however, inter-regional disparities in educational attainment across workers of all ages narrowed little in the 1990s.[32] Thus, it may be that the West and the South attracted young people in the 1990s simply because these regions were the nation's overall centers of growth. Instead of seeking out the root causes of overall growth, then, it may prove more useful to compare the migration patterns of younger workers to those of older workers, a subject to which the next section turns.

D. Compared to older workers (aged 35-to-64), young workers migrated more often to high-amenity, high-human-capital metropolitan areas during the 1990s.

High rates of youth in-migration appear to relate to employment growth, high technology jobs, and cosmopolitan amenities. This begs the question, do 25-to-34 year-olds differ

Table 6. Highest and Lowest Proportion of Labor Force Aged 55-to-64, 100 Largest Metro Areas, 2000

	Metropolitan area	Total labor force aged 16 or older	Individuals aged 55-to-64 in labor force	"Near retirement" proportion	Census region
1	Sarasota-Bradenton, FL MSA	257,741	36,302	14.1%	SOUTH
2	Bergen-Passaic, NJ PMSA	686,259	84,595	12.3%	NORTHEAST
3	Monmouth-Ocean, NJ PMSA	537,010	63,500	11.8%	NORTHEAST
4	Nassau-Suffolk, NY PMSA	1,367,434	161,479	11.8%	NORTHEAST
5	Bridgeport, CT NECMA	869,610	101,615	11.7%	NORTHEAST
6	West Palm Beach-Boca Raton, FL MSA	510,379	59,299	11.6%	SOUTH
7	Scranton-Wilkes-Barre-Hazleton, PA MSA	299,569	34,520	11.5%	NORTHEAST
8	Miami, FL PMSA	1,010,965	116,021	11.5%	SOUTH
9	Newark, NJ PMSA	1,012,470	115,009	11.4%	NORTHEAST
10	Hartford, CT NECMA	600,167	67,590	11.3%	NORTHEAST
11	Tampa-St. Petersburg-Clearwater, FL MSA	1,142,022	126,152	11.0%	SOUTH
12	Las Vegas, NV-AZ MSA	767,261	84,731	11.0%	WEST
13	Pittsburgh, PA MSA	1,142,166	125,307	11.0%	NORTHEAST
14	Allentown-Bethlehem-Easton, PA MSA	319,629	34,816	10.9%	NORTHEAST
15	Middlesex-Somerset-Hunterdon, NJ PMSA	615,282	66,530	10.8%	NORTHEAST
86	Houston, TX PMSA	2,028,751	179,010	8.8%	SOUTH
87	Riverside-San Bernardino, CA PMSA	1,389,976	122,572	8.8%	WEST
88	Grand Rapids-Muskegon-Holland, MI MSA	566,645	49,686	8.8%	MIDWEST
89	Norfolk-Virginia Beach-Newport News, VA-NC MSA	815,105	71,176	8.7%	SOUTH
90	Bakersfield, CA MSA	267,603	23,274	8.7%	WEST
91	Dallas, TX PMSA	1,829,373	158,323	8.7%	SOUTH
92	Baton Rouge, LA MSA	296,062	25,619	8.7%	SOUTH
93	San Diego, CA MSA	1,407,152	119,272	8.5%	WEST
94	El Paso, TX MSA	274,811	23,213	8.4%	SOUTH
95	Colorado Springs, CO MSA	280,574	23,390	8.3%	WEST
96	Atlanta, GA MSA	2,208,940	183,749	8.3%	SOUTH
97	Raleigh-Durham-Chapel Hill, NC MSA	655,677	53,741	8.2%	SOUTH
98	Salt Lake City-Ogden, UT MSA	685,283	56,154	8.2%	WEST
99	McAllen-Edinburg-Mission, TX MSA	204,906	14,659	7.2%	SOUTH
100	Austin-San Marcos, TX MSA	689,602	49,076	7.1%	SOUTH
	Regional metropolitan totals				
	MIDWEST	17,982,828	1,744,890	9.7%	
	NORTHEAST	20,812,605	2,242,522	10.8%	
	SOUTH	27,800,069	2,668,568	9.6%	
	WEST	22,007,327	2,056,262	9.3%	

Source: Census 2000

from other age groups in how much attention they pay to these factors? If not, then the recent emphasis that policy makers have placed on the migration patterns of younger workers may be misplaced. Perhaps a similar set of policies would attract and retain workers of all ages. In order to investigate this question, this section compares net migration indices for young workers (aged 15-to-24 in 1990, and 25-to-34 in 2000) to those for all

other workers (aged 25-to-54 in 1990, and 35-to-64 in 2000) at the metropolitan level.

It appears that some metropolitan areas do have disproportionately high or low rates of youth migration, which may indicate that they exhibit characteristics that younger workers value differently than older workers. Table 5 shows the top and bottom 15 metropolitan areas ranked on the extent to which in-migration or out-migration of young workers is greater than expected, given the migration index of the older cohort (see Appendix B for statistics on all 100 metros).[33]

In the top 15 metro areas, net in-migration of 25-to-34 year-olds either exceeded net in-migration for older workers, or older workers showed net out-migration over the decade. These metro areas closely resemble those at the top of Table 2, which contain the highest proportions of young and educated workers—nine metros appear on both lists. Thus younger workers in the 1990s disproportionately chose metro areas with many of the same characteristics as those identified earlier—namely, large city size, strong arts scenes, high technology employment, and a higher human capital stock generally, measured by the percentage of all adults with a bachelor's degree.[34] Some of the metro areas specific to Table 5, like Dallas, Houston, and Los Angeles, experienced significant in-migration of the foreign-born in the 1990s. The younger age profile of these immigrants may help account for these metro areas' higher-than-expected youth in-migration.

Many of the areas that experienced disproportionate losses of young people during the 1990s, on the other hand, were among those with the highest net out-migration indices for this cohort. Eleven of the bottom 15 metro areas in Table 5 also appear at the bottom of Table 4. Their appearance here reflects not only a "brain drain" of younger workers from these areas, but also the relative tendency of older workers to age in place there. Most exhibited only modest losses of people from older cohorts. Others like Tucson, AZ, and Sarasota-Bradenton, FL, represent retirement destinations to which younger workers did not migrate at the same rate as their older counterparts.

It therefore appears that younger workers value somewhat different metropolitan area characteristics than older workers. Metropolitan areas with larger cities and more educated workforces captured a disproportionate number of young workers compared to older workers in the 1990s. The attractive power of high technology and amenities, in particular, is consistent with Florida's "creative class" hypothesis. The lack of these characteristics, conversely, may help to explain why several rustbelt metro areas lost disproportionate numbers of young workers over the 1990s.

E. Metropolitan areas in the Northeast have the highest proportions of workers between the ages of 55 and 64.

As some metro areas lose larger numbers of young workers, and the older population "ages in place," are these areas at risk of a labor shortage over time? To answer that question, Table 6 presents the proportion of each metropolitan area's labor force aged 55-to-64 in 2000.[35] In 2010 most of these workers will be retired. The higher a metropolitan area ranks in this table, and the lower it ranks in Table 4, the more likely it is that retirement of older workers will create local labor supply pressures.

The metropolitan areas with the largest numbers of workers aged 55-to-64 (Table 6) present an interesting mix of older Frost Belt cities—especially in the Northeast—and popular retirement metros, where older workers make up at least one in nine members of the labor force. The high rankings of Sarasota, Las Vegas, Tampa, and West Palm Beach are likely explained by workers in their late 50s and early 60s who moved to these areas in anticipation of retirement, or to be near older friends or relatives. But the majority of these metros are in the greater New York area, including suburbs in Long Island, New Jersey, and Connecticut, and in regions of Pennsylvania. The metros without significant proportions of near-retirement workers are situated throughout the Sun Belt, and most have large numbers of younger families.[36]

Note that the worker population depicted in Table 6 does not have a specific level of educational attainment, or specific occupational or industry skills. They are simply people at the upper end of working age. To explore further the kind of problem that worries metro areas like Detroit, one might conduct case studies on strategic occupations held by older workers, such as skilled production. These rankings do, however, suggest the extent to which certain metro areas may experience upward wage pressures in coming years, and the level of urgency to replace retirees with younger workers. Beyond labor force issues, metro areas anticipating a large wave of retirements could experience increased stress on social services, and changes in the demand for public goods like recreation or transportation.

Perhaps the most interesting finding on workforce aging in 2000 relates not to individual metropolitan economies, but rather to the broader census regions (bottom Table 6). Viewed as a single geographic entity, the proportion of metropolitan workers in the Northeast aged 55-to-64 is a full percentage point higher than in the runner-up region, the Midwest. Because the Northeast ranks second to the West in the proportion of its older workers (age 45 to 64) who are college-educated, it may stand to lose a fair number of skilled workers to retirement in coming years.

The Midwest, relatively speaking, is

not yet at risk of losing a substantial portion of its workforce to retirement. In many ways, that region looks more like the South than it does the Northeast, with a proportion of near-retirement workers close to the national average. This same pattern—Northeast first, Midwest a distant second—holds with respect to aging *production* workers as well (not shown here).

So we may conclude that the Northeast is about to experience a disproportionate wave of retirements, putting upward pressure on wages and forcing adjustments by state and local governments. At the same time, we know little about the speed with which the system will adjust to this reality, or the level of pain that will be involved in the transition. It could be that modest increases in wages will be sufficient to coax some of these workers out of retirement, or to attract younger migrants from elsewhere, including abroad. Indeed, it is possible that this demographic transition will be so painless that firms and governments in the Northeast hardly notice it.[37]

In any case, policy makers concerned with the "demography as destiny" issues raised here should be aware that labor supply—labor force participation of older workers, or migration of skilled younger workers—responds to economic incentives, not all of which are government-provided. Northeastern states like New Jersey have drawn an increasing number of workers from abroad in recent years, providing yet another safety valve for potential labor supply problems.

If public intervention is required, however, it will be useful to understand local human resource policies in the broader context of labor supply, labor demand, and especially, the newer economic paradigm of human capital formation. This report now turns to these policy frameworks.

Policy Discussion

The title of this report, "Labor Supply Pressures and the 'Brain Drain,'" is premised on the idea that workers of different ages make decisions about where they wish to work, and whether they wish to remain in the labor force. As the top tier of American workers has become more affluent, they have become more sensitive to quality-of-life considerations; as economic life becomes more "footloose" they have a greater ability to express these preferences through their own location decisions. Those decisions can impact metropolitan economies adversely, but they are amenable to policy intervention. Therefore, the more one knows about labor supply pressures in a metropolitan area, the better prepared one is to take steps to preserve workforce quantity. Preserving workforce quantity can keep wages competitive, prevent the loss of strategic skills, and keep local businesses happy and labor demand healthy.

In addition, policy makers in the booming economy of the 1990s recognized that problems of poverty and underutilized labor resources in urban areas were often related to skill mismatches—not to shortfalls in overall labor demand. New nonprofit organizations arose at the regional level to work on this fundamental problem of labor *supply*.[38] At the same time, business leaders (and economists) recognized that human capital—not land, buildings, or machinery—is the economy's most important asset.[39] The prospect of helping the poor, while at the same time reducing spot skill shortages faced by local employers, united liberals and conservatives around a labor supply policy agenda in many U.S. metropolitan areas.

Labor supply versus labor demand interventions

How can economic development professionals approach issues of both labor supply and demand to create economic growth or stem decline? In general:

- ***Labor supply*** policies target individuals. Such policies might include scholarships to promising college graduates that turn into repayable loans if the student takes a job out-of-state (a classic brain drain policy). A chamber of commerce might create a program at a local community college that turns retired manufacturing workers into teachers, mentors, and enthusiastic recruiters of young apprentices to carry on their trade. Both policies have the potential to increase the supply of certain types of labor.

- ***Labor demand*** policies target firms. Such policies might include tax breaks to businesses, reduced utility rates, research tax credits, or programs that try to move local university research into new startup companies. Because these programs have the potential to increase firms' sales or profits, they can eventually increase the demand for local labor.

In some sense, it is irrelevant whether out-migration is caused by declining labor supply or declining labor demand, because the effect on "critical mass" is the same in either case. Likewise, whether one selects a supply- or demand-side solution to a problem of declining employment is also irrelevant. A supply-side problem can be corrected with a demand-side solution, and vice-versa. Basic economics indicates that either type of policy could potentially increase employment, which is the goal of many economic development officials.

That said, metropolitan areas can expect a quicker and ultimately more successful solution if they fix an evident problem rather than try to improve an unrelated factor.

Imagine a metropolitan area where everybody agrees that the local indus-

try cluster is competitive internationally, but that companies are about to lose a body of strategic skills due to retirements. This is clearly a labor supply problem. Economic development officials could offer tax breaks to firms (probably a short-term solution), or work with the companies to develop a new product line that does not require the skills about to be lost to retirement (longer-term, but speculative). Both of these demand-side policies might be expected to increase employment—or at least, prevent its decline—compared to a policy of "do nothing."[40] On the other hand, a policy that offered incentives to retirees to stay on the job until replacements can be trained at a local community college could leverage the local industry's current strengths, while at the same time giving it the breathing room to explore new markets.

In the end, whether an individual metropolitan area's economic problems are caused by declining labor supply or declining labor demand depends on specific local information, which local businesses can help provide. But policy makers should also seek independent confirmation of the nature of the problem.[41] This report provides one indicator of labor supply problems in metropolitan areas: the size and characteristics of the cohort aged 55-to-64 in 2000. Many of these workers will soon choose to retire—a true supply-side effect. In contrast, another indicator explored here—the migration patterns of young and old workers—is clearly the result of supply and demand factors working together.

From supply and demand to a new human capital paradigm

Several academic studies have probed which factor ultimately generates economic growth in U.S. regions: shifts in labor supply or labor demand. Unfortunately, this literature is inconclusive for a number of reasons. The answer is probably not the same for all industries and all types of workers, and it is difficult to disentangle cause and effect in something as complex as a metropolitan economy. How, then, can local officials choose between supply and demand interventions to secure economic growth?

One way out of this morass is to move away from the standard labor supply and demand model of economics, with its emphasis on increased employment *quantity*, and embrace improved worker *quality* as the ultimate goal for local human resources policy. *Human capital* may be defined as years of formal education or a large amount of industry- or technology-specific knowledge. A metropolitan area can increase its "stock" of human capital by educating incumbent residents or by capturing the right kind of in-migration. Vijay Mathur of Cleveland State University has outlined the implications of this new way of viewing the role of labor in regional economic development.[43] The following insights flow from this human capital framework:

- ***Human capital programs "split the difference" between the supply side and the demand side.*** Human capital programs might educate existing workers, encourage the in-migration of particularly skilled workers, or discourage the out-migration or retirement of such workers. Thus they are labor supply policies on their face. Because these programs contribute to firm innovation, improved production processes, and the creation of new products, however, they are demand-side policies as well. In this way, the human capital approach recognizes that both supply and demand factors contribute to regional economic growth.

- ***The goal of human capital programs is not necessarily to increase the number of educated bodies, but instead to increase the stock of knowledge.*** The two are related, of course, but are not the same. If you had to choose between a brain drain program aimed at all college graduates, and one aimed at a smaller group of high achievers, you might consider choosing the latter. This report contains data on the migration and concentration of all young workers, as well as young workers with college degrees. Because studies have shown that the net flow of people and human capital can run in opposite directions, it is crucial to distinguish between the two.[44]

- ***Workers learn from each other.*** This is one reason why it is good to have a high proportion of workers with large individual stocks of human capital. The higher this proportion, the higher the probability that each worker will interact with skilled colleagues. Left to their own devices, workers will often accumulate too little human capital from society's point of view, because they do not consider the positive impact their human capital has on others, versus their own earnings. For instance, the benefits of keeping a group of older skilled craftsmen on the shop floor a few years longer relates not only to their own contribution to production, but also to their ability to train and motivate other workers. Therefore, even with a mobile workforce, public intervention in the accumulation of human capital is generally warranted.

- ***Entrepreneurship and human capital are a particularly powerful combination.*** Human capital may be defined as years of formal education or specialized vocational skills. But neither of those things will generate regional economic growth unless somebody is able to turn the knowledge held by individuals into new products or new companies.

- ***No "brain drain" policy yet devised by state governments or regional nonprofits has ever been able to***

identify future entrepreneurs. Perhaps members of the now-ubiquitous entrepreneurs' clubs in MBA programs should be targeted for recruitment—not just scientists, engineers, or all college graduates. In addition, demand-side economic development programs should make sure that entrepreneurs are rewarded for their efforts.[45] If the word got out that a region and its core institutions were particularly entrepreneur-friendly, this might actually attract the right kind of young worker.

- ***Human capital-based economic development programs are long run.*** The mechanism by which large stocks of human capital create economic growth in a region is technological innovation and the incorporation of technology into new physical capital. This is a long-run phenomenon. Young workers make decisions about the amount of education they would like to acquire, and where they would like to live, based on estimates of the economic return they are likely to earn over the long term. If a metropolitan area is attractive on these grounds (or can be expected to become so), then it will attract knowledge workers who take this "investment" view of their own lives.

- ***The key here is to avoid the quick fix.*** A demonstrated, long-term commitment to amenities and technology can be helpful. Institution-building, particularly in the area of higher education, helps to explain the present-day success stories of Austin and Raleigh-Durham, both of which were over 30 years in the making. Politicians are not always interested in programs with such long time horizons, but they are theoretically sound and have the best track record.

- ***Amenities are not everything, but they matter.*** The evidence reviewed here on young, educated worker location and migration patterns is strongly consistent with this group's perceived preference for high-amenity places. Because people with large stocks of human capital tend to be both more mobile and more likely to shop for place-specific goods than

Labor Supply Policy Resources

Some of the most popular brain drain programs aimed at college students include (1) internships designed to familiarize promising students with local companies or fields; (2) loans that are forgiven if a student settles in the home state; and (3) scholarship or tuition policies that attract local high school students to local universities, following the empirical observation that those who go to college in-state are more likely to take their first job there. Although based on some very strong statistical results, this last policy is likely to be less effective than its champions believe.[47]

A comprehensive overview of student retention policies may be found in a report by the Indiana Fiscal Policy Institute entitled *Survey of Current Practices in Postsecondary Graduate Retention* (Indianapolis, January 2000). A discussion of state-level policy making in this area can be found in Peter Schmidt, "More States Try to Stanch 'Brain Drains,' but Some Experts Question the Strategy," *The Chronicle of Higher Education* 44 (24) (1998): A36-A37. The most widely-read reports on student brain drain appearing prior to the release of Census 2000 are those by the Southern Technology Council, a division of the Southern Growth Policies Board (*Where Have All the Students Gone?* (1998); and *Who Will Stay and Who Will Leave?* (2001)). Yolanda Kodrzycki of the Federal Reserve Bank of Boston has conducted similar studies (*New England Economic Review* (July/August 1999 and January/February 2001)).

Problems posed by impending retirements have been discussed in: *Driving Michigan's Renassiance: Human Resource Issues in Michigan's Automotive Industry* (University of Michigan Transportation Research Institute, 1995); *Legal and Institutional Impediments to Partial Retirement and Part-Time Work by Older Workers* (Washington: Urban Institute, 2002); and *Challenges of an Aging Workforce: An Overview of the Issue* (Human Resources Development Canada, 2002). The first of these reports takes the micro/industry perspective, while the last two focus on national challenges.

One obvious solution to the retirement problem is to try to attract younger workers into whatever field is regarded as strategic for your metropolitan area. Programs might include job training, financial incentives, apprenticeships, mentoring, and marketing/recruitment. At the national level, however, there may simply not be enough young workers to go around, no matter how rich the incentives for a particular occupation. National proposals therefore center on increasing the flexibility of hours and working conditions so that older workers are happy to keep working. The concern is that current legal requirements and institutional practices give older workers an all-or-nothing choice about retirement, rather than a range of options that would suit their preferences about the mix of work and leisure.

others, an amenity strategy can successfully complement human capital strategies to promote economic growth.[46] In an evolving view, amenities are "necessary but not sufficient" for rapid tech-based development in any region. By the same token, a strong technology base and programs that encourage entrepreneurship are also necessary, but not sufficient.

Policies aimed directly at youth migration and at postponing the retirement of strategic workers may have a role to play in economic development, provided policy makers keep their eyes on the ultimate prize of human capital and the long-run development of technology. One thing seems clear: The broad demographic change the nation is now undergoing (aging of the baby boomers), combined with the human capital model of economic growth, ensure that labor supply policies will be on local and national radar screens for many years to come.

* * *

Technical Appendix

This note describes the methodology for the "decomposition analysis" figures presented in Table 2 and Appendix Table A.

1. Proportion attributable to cohort size—For each metropolitan area, calculate a proportion of college-educated 25-to-34-year-olds using: (a) the metro area's actual proportion of 25-to-34 year-olds; and (b) the average educational attainment for this age group across all 100 metro areas. Subtract from this figure the 100-metro average proportion of all workers who were young and educated (8 percent). The result is the metro area's deviation attributable to the size of its young cohort.

2. Proportion attributable to education— For each metropolitan area, calculate a proportion of college-educated 25-to-34-year-olds using: (a) the average proportion of the population aged 25-to-34 across all 100 metro areas; and (b) the metro area's actual rate of college degree attainment among 25-to-34-year-olds. Subtract from this figure the 100-metro average proportion of all workers who were young and educated (8 percent). The result is the metro area's deviation attributable to the educational attainment of its young cohort.

3. If the figures calculated in steps 1 and 2 have the same sign, add the two deviations together. The proportion of the overall deviation attributable to each factor is that factor's deviation divided by this sum. (Note: This is an approximation, since the sum of the two deviations does not equal the total deviation; i.e., each metro area's proportion of young and educated minus 8 percent.)

4. If the figures calculated in steps 1 and 2 have opposite signs, one factor must account for all (100 percent) of the deviation and the other none (0 percent).

Appendix A. "Young and Educated" Residents as a Proportion of Working-Age Residents, 100 Largest Metro Areas, 2000

Rank	Metropolitan area	Census region	Residents aged 25–64	Residents aged 25–34	As proportion of residents aged 25–64	Residents aged 25–34 with a B.A.	As proportion of residents aged 25–34	As proportion of residents aged 25–64	Deviation from 100-metro average	Portion attributable to education	Portion attributable to cohort size
55	Akron, OH PMSA	MW	363,268	91,835	25.3%	27,145	29.6%	**7.5%**	-0.5%	0.0%	100.0%
39	Albany-Schenectady-Troy, NY MSA	NE	459,745	113,845	24.8%	38,058	33.4%	**8.3%**	0.3%	100.0%	0.0%
72	Albuquerque, NM MSA	W	375,889	98,369	26.2%	24,993	25.4%	**6.6%**	-1.3%	80.2%	19.8%
81	Allentown-Bethlehem-Easton, PA MSA	NE	332,250	79,170	23.8%	20,812	26.3%	**6.3%**	-1.7%	42.0%	58.0%
6	Ann Arbor, MI PMSA	MW	311,679	86,193	27.7%	39,292	45.6%	**12.6%**	4.7%	98.4%	1.6%
12	Atlanta, GA MSA	S	2,318,884	722,617	31.2%	257,837	35.7%	**11.1%**	3.1%	61.4%	38.6%
4	Austin-San Marcos, TX MSA	S	678,157	227,910	33.6%	88,732	38.9%	**13.1%**	5.1%	59.0%	41.0%
100	Bakersfield, CA MSA	W	321,492	92,114	28.7%	9,562	10.4%	**3.0%**	-5.0%	100.0%	0.0%
28	Baltimore, MD PMSA	S	1,384,397	352,427	25.5%	121,493	34.5%	**8.8%**	0.8%	100.0%	0.0%
44	Baton Rouge, LA MSA	S	304,647	84,647	27.8%	24,383	28.8%	**8.0%**	0.0%	0.0%	100.0%
20	Bergen-Passaic, NJ PMSA	NE	746,299	189,932	25.4%	71,638	37.7%	**9.6%**	1.6%	100.0%	0.0%
36	Birmingham, AL MSA	S	488,359	131,484	26.9%	41,402	31.5%	**8.5%**	0.5%	100.0%	0.0%
9	Boston MA-NH NECMA	NE	3,300,880	903,454	27.4%	383,349	42.4%	**11.6%**	3.6%	98.8%	1.2%
83	Bridgeport, CT NECMA	NE	911,894	228,603	25.1%	55,506	24.3%	**6.1%**	-1.9%	44.9%	55.1%
57	Buffalo-Niagara Falls, NY MSA	NE	599,129	144,272	24.1%	44,119	30.6%	**7.4%**	-0.6%	0.0%	100.0%
40	Charleston-North Charleston, SC MSA	S	289,972	79,543	27.4%	23,832	30.0%	**8.2%**	0.2%	63.5%	36.5%
19	Charlotte-Gastonia-Rock Hill, NC-SC MSA	S	831,378	249,160	30.0%	80,435	32.3%	**9.7%**	1.7%	53.0%	47.0%
16	Chicago, IL PMSA	MW	4,382,966	1,280,225	29.2%	463,320	36.2%	**10.6%**	2.6%	76.3%	23.7%
38	Cincinnati, OH-KY-IN PMSA	MW	864,770	232,131	26.8%	72,492	31.2%	**8.4%**	0.4%	100.0%	0.0%
56	Cleveland-Lorain-Elyria, OH PMSA	MW	1,177,244	295,069	25.1%	87,715	29.7%	**7.5%**	-0.5%	0.0%	100.0%
41	Colorado Springs, CO MSA	W	275,842	77,421	28.1%	22,627	29.2%	**8.2%**	0.2%	20.2%	79.8%
23	Columbia, SC MSA	S	287,691	80,203	27.9%	26,857	33.5%	**9.3%**	1.3%	82.5%	17.5%
15	Columbus, OH MSA	MW	829,479	246,599	29.7%	87,858	35.6%	**10.6%**	2.6%	72.3%	27.7%
18	Dallas, TX PMSA	S	1,914,824	608,621	31.8%	187,116	30.7%	**9.8%**	1.8%	25.3%	74.7%
84	Dayton-Springfield, OH MSA	MW	492,022	122,714	24.9%	29,865	24.3%	**6.1%**	-1.9%	65.3%	34.7%
14	Denver, CO PMSA	W	1,187,469	351,096	29.6%	128,193	36.5%	**10.8%**	2.8%	75.4%	24.6%
54	Detroit, MI PMSA	MW	2,370,456	644,314	27.2%	177,032	27.5%	**7.5%**	-0.5%	96.1%	3.9%
92	El Paso, TX MSA	S	325,232	97,644	30.0%	15,308	15.7%	**4.7%**	-3.3%	100.0%	0.0%
58	Fort Lauderdale, FL PMSA	S	866,093	230,024	26.6%	63,326	27.5%	**7.3%**	-0.7%	70.0%	30.0%
62	Fort Worth-Arlington, TX PMSA	S	914,858	266,675	29.1%	65,321	24.5%	**7.1%**	-0.8%	100.0%	0.0%
97	Fresno, CA MSA	W	438,161	126,396	28.8%	18,569	14.7%	**4.2%**	-3.7%	100.0%	0.0%
91	Gary, IN PMSA	MW	325,615	78,299	24.0%	16,466	21.0%	**5.1%**	-2.9%	72.6%	27.4%
53	Grand Rapids-Muskegon-Holland, MI MSA	MW	551,910	152,442	27.6%	41,446	27.2%	**7.5%**	-0.5%	100.0%	0.0%
63	Greensboro-Winston-Salem-High Point, NC MSA	S	676,698	186,130	27.5%	47,911	25.7%	**7.1%**	-0.9%	100.0%	0.0%
82	Greenville-Spartanburg-Anderson, SC MSA	S	511,937	138,022	27.0%	31,663	22.9%	**6.2%**	-1.8%	93.3%	6.7%
73	Harrisburg-Lebanon-Carlisle, PA MSA	NE	334,631	81,676	24.4%	22,207	27.2%	**6.6%**	-1.4%	37.5%	62.5%

Rank	Metropolitan area	Census region	Residents aged 25–64	Residents aged 25–34	As proportion of residents aged 25–64	Residents aged 25–34 with a B.A.	As proportion of residents aged 25–34	As proportion of residents aged 25–64	Deviation from 100-metro average	Portion attributable to education	Portion attributable to cohort size
34	Hartford, CT NECMA	NE	615,023	149,824	24.4%	52,514	35.1%	**8.5%**	0.6%	100.0%	0.0%
43	Honolulu, HI MSA	W	461,659	128,709	27.9%	37,318	29.0%	**8.1%**	0.1%	0.0%	100.0%
51	Houston, TX PMSA	S	2,236,132	668,640	29.9%	170,408	25.5%	**7.6%**	-0.4%	100.0%	0.0%
29	Indianapolis, IN MSA	MW	864,154	244,831	28.3%	75,827	31.0%	**8.8%**	0.8%	64.4%	35.6%
86	Jacksonville, FL MSA	S	593,334	157,812	26.6%	35,435	22.5%	**6.0%**	-2.0%	92.2%	7.8%
5	Jersey City, NJ PMSA	NE	338,828	117,232	34.6%	43,963	37.5%	**13.0%**	5.0%	50.7%	49.3%
24	Kansas City, MO-KS MSA	MW	951,872	258,497	27.2%	88,060	34.1%	**9.3%**	1.3%	100.0%	0.0%
67	Knoxville, TN MSA	S	371,096	94,792	25.5%	25,191	26.6%	**6.8%**	-1.2%	56.6%	43.4%
93	Las Vegas, NV-AZ MSA	W	848,844	242,131	28.5%	39,557	16.3%	**4.7%**	-3.3%	100.0%	0.0%
48	Little Rock-North Little Rock, AR MSA	S	310,463	85,622	27.6%	24,023	28.1%	**7.7%**	-0.3%	100.0%	0.0%
50	Los Angeles-Long Beach, CA PMSA	W	4,955,978	1,562,471	31.5%	379,120	24.3%	**7.6%**	-0.3%	100.0%	0.0%
66	Louisville, KY-IN MSA	S	553,597	143,248	25.9%	38,557	26.9%	**7.0%**	-1.0%	59.0%	41.0%
95	McAllen-Edinburg-Mission, TX MSA	S	248,857	83,667	33.6%	10,678	12.8%	**4.3%**	-3.7%	100.0%	0.0%
60	Memphis, TN-AR-MS MSA	S	594,620	167,251	28.1%	42,976	25.7%	**7.2%**	-0.8%	100.0%	0.0%
68	Miami, FL PMSA	S	1,191,472	333,423	28.0%	80,451	24.1%	**6.8%**	-1.2%	100.0%	0.0%
8	Middlesex-Somerset-Hunterdon, NJ PMSA	NE	651,459	170,840	26.2%	78,628	46.0%	**12.1%**	4.1%	100.0%	0.0%
32	Milwaukee-Waukesha, WI PMSA	MW	779,927	205,841	26.4%	68,056	33.1%	**8.7%**	0.7%	100.0%	0.0%
11	Minneapolis-St. Paul, MN-WI MSA	MW	1,619,165	456,170	28.2%	182,178	39.9%	**11.3%**	3.3%	92.2%	7.8%
89	Mobile, AL MSA	S	276,405	69,646	25.2%	15,347	22.0%	**5.6%**	-2.4%	77.3%	22.7%
59	Monmouth-Ocean, NJ PMSA	NE	580,923	130,704	22.5%	42,098	32.2%	**7.2%**	-0.7%	0.0%	100.0%
21	Nashville, TN MSA	S	676,835	193,581	28.6%	63,672	32.9%	**9.4%**	1.4%	72.6%	27.4%
37	Nassau-Suffolk, NY PMSA	NE	1,483,362	350,480	23.6%	124,263	35.5%	**8.4%**	0.4%	100.0%	0.0%
71	New Orleans, LA MSA	S	698,413	182,196	26.1%	46,595	25.6%	**6.7%**	-1.3%	78.3%	21.7%
13	New York, NY PMSA	NE	5,043,119	1,517,786	30.1%	554,418	36.5%	**11.0%**	3.0%	68.9%	31.1%
31	Newark, NJ PMSA	NE	1,106,281	285,820	25.8%	96,690	33.8%	**8.7%**	0.8%	100.0%	0.0%
74	Norfolk-Virginia Beach-Newport News, VA-NC MSA	S	819,959	228,059	27.8%	54,184	23.8%	**6.6%**	-1.4%	100.0%	0.0%
17	Oakland, CA PMSA	W	1,324,790	363,064	27.4%	132,266	36.4%	**10.0%**	2.0%	94.2%	5.8%
65	Oklahoma City, OK MSA	S	560,897	152,816	27.2%	39,120	25.6%	**7.0%**	-1.0%	100.0%	0.0%
22	Omaha, NE-IA MSA	MW	375,407	105,560	28.1%	35,243	33.4%	**9.4%**	1.4%	82.2%	17.8%
35	Orange County, CA PMSA	W	1,534,651	462,244	30.1%	130,272	28.2%	**8.5%**	0.5%	0.0%	100.0%
49	Orlando, FL MSA	S	879,940	246,306	28.0%	67,465	27.4%	**7.7%**	-0.3%	100.0%	0.0%
27	Philadelphia, PA-NJ PMSA	NE	2,667,691	686,005	25.7%	236,233	34.4%	**8.9%**	0.9%	100.0%	0.0%
52	Phoenix-Mesa, AZ MSA	W	1,665,984	511,318	30.7%	125,882	24.6%	**7.6%**	-0.4%	100.0%	0.0%
45	Pittsburgh, PA MSA	NE	1,225,305	284,780	23.2%	97,238	34.1%	**7.9%**	-0.1%	0.0%	100.0%
30	Portland-Vancouver, OR-WA PMSA	W	1,054,955	298,577	28.3%	92,434	31.0%	**8.8%**	0.8%	66.3%	33.7%
61	Providence-Warwick-Pawtucket, RI NECMA	NE	495,066	128,375	25.9%	35,825	27.9%	**7.2%**	-0.8%	46.2%	53.8%
2	Raleigh-Durham-Chapel Hill, NC MSA	S	660,972	207,708	31.4%	93,791	45.2%	**14.2%**	6.2%	78.3%	21.7%
25	Richmond-Petersburg, VA MSA	S	544,604	142,419	26.2%	48,929	34.4%	**9.0%**	1.0%	100.0%	0.0%

Rank	Metropolitan area	Census region	Residents aged 25–64	Residents aged 25–34	As proportion of residents aged 25–64	Residents aged 25–34 with a B.A.	As proportion of residents aged 25–34	As proportion of residents aged 25–64	Deviation from 100-metro average	Portion attributable to education	Portion attributable to cohort size
98	Riverside-San Bernardino, CA PMSA	W	1,579,017	439,230	27.8%	58,770	13.4%	**3.7%**	-4.3%	100.0%	0.0%
47	Rochester, NY MSA	NE	573,722	141,089	24.6%	45,054	31.9%	**7.9%**	-0.1%	0.0%	100.0%
75	Sacramento, CA PMSA	W	855,828	222,892	26.0%	56,229	25.2%	**6.6%**	-1.4%	77.4%	22.6%
42	Salt Lake City-Ogden, UT MSA	W	635,662	204,538	32.2%	51,834	25.3%	**8.2%**	0.2%	0.0%	100.0%
80	San Antonio, TX MSA	S	808,415	230,780	28.5%	51,291	22.2%	**6.3%**	-1.6%	100.0%	0.0%
33	San Diego, CA MSA	W	1,459,625	436,610	29.9%	125,189	28.7%	**8.6%**	0.6%	0.0%	100.0%
1	San Francisco, CA PMSA	W	1,041,129	323,798	31.1%	172,814	53.4%	**16.6%**	8.6%	85.6%	14.4%
3	San Jose, CA PMSA	W	953,795	298,237	31.3%	133,224	44.7%	**14.0%**	6.0%	78.3%	21.7%
94	Sarasota-Bradenton, FL MSA	S	281,352	57,915	20.6%	12,326	21.3%	**4.4%**	-3.6%	52.4%	47.6%
88	Scranton-Wilkes-Barre-Hazleton, PA MSA	NE	316,705	74,572	23.5%	17,637	23.7%	**5.6%**	-2.4%	57.7%	42.3%
10	Seattle-Bellevue-Everett, WA PMSA	W	1,377,503	391,843	28.4%	155,613	39.7%	**11.3%**	3.3%	89.8%	10.2%
77	Springfield, MA NECMA	NE	304,724	75,191	24.7%	19,681	26.2%	**6.5%**	-1.5%	52.1%	47.9%
46	St. Louis, MO-IL MSA	MW	1,357,585	345,294	25.4%	107,256	31.1%	**7.9%**	-0.1%	0.0%	100.0%
99	Stockton-Lodi, CA MSA	W	274,090	74,656	27.2%	9,103	12.2%	**3.3%**	-4.7%	100.0%	0.0%
69	Syracuse, NY MSA	NE	373,694	91,830	24.6%	25,196	27.4%	**6.7%**	-1.3%	35.6%	64.4%
90	Tacoma, WA PMSA	W	371,279	100,543	27.1%	18,815	18.7%	**5.1%**	-2.9%	99.2%	0.8%
85	Tampa-St. Petersburg-Clearwater, FL MSA	S	1,233,931	303,451	24.6%	74,341	24.5%	**6.0%**	-2.0%	62.8%	37.2%
70	Toledo, OH MSA	MW	311,198	81,746	26.3%	20,856	25.5%	**6.7%**	-1.3%	80.3%	19.7%
78	Tucson, AZ MSA	W	426,533	113,359	26.6%	27,172	24.0%	**6.4%**	-1.6%	89.0%	11.0%
76	Tulsa, OK MSA	S	419,660	110,190	26.3%	27,276	24.8%	**6.5%**	-1.5%	82.1%	17.9%
87	Ventura, CA PMSA	W	396,174	102,853	26.0%	22,583	22.0%	**5.7%**	-2.3%	86.8%	13.2%
7	Washington, DC-MD-VA-WV PMSA	S	2,811,931	786,527	28.0%	349,002	44.4%	**12.4%**	4.5%	94.7%	5.3%
79	West Palm Beach-Boca Raton, FL MSA	S	555,425	131,476	23.7%	35,300	26.8%	**6.4%**	-1.6%	37.9%	62.1%
64	Wichita, KS MSA	MW	276,908	74,518	26.9%	19,380	26.0%	**7.0%**	-1.0%	91.8%	8.2%
26	Wilmington-Newark, DE-MD PMSA	NE	313,690	85,349	27.2%	28,070	32.9%	**8.9%**	1.0%	99.2%	0.8%
96	Youngstown-Warren, OH MSA	MW	306,004	70,618	23.1%	13,081	18.5%	**4.3%**	-3.7%	70.7%	29.3%
	Average for 100 largest metro are.as (unweighted)	**27.3%**	**29.2%**	**8.0%**	**71.9%**	**28.1%**					

Source: Census 2000

APPENDIX B. Net Migration Index, and Near-Retirement Worker Proportion, 100 Largest Metro Areas, 2000

Metropolitan area	Census region	Net migration index, cohort aged 25–34, 2000	Rank	Net migration index, cohort aged 35–64, 2000	Rank	Index difference	Rank	Proportion of labor force aged 55–64, 2000	Rank
Akron, OH PMSA	MW	-11.4%	92	-1.2%	52	-10.2%	93	10.2%	38
Albany-Schenectady-Troy, NY MSA	NE	-16.5%	96	-4.7%	74	-11.8%	96	10.3%	36
Albuquerque, NM MSA	W	18.9%	32	4.5%	25	14.4%	36	9.4%	65
Allentown-Bethlehem-Easton, PA MSA	NE	-2.6%	78	1.8%	35	-4.4%	86	10.9%	14
Ann Arbor, MI PMSA	MW	-9.8%	90	2.2%	32	-12.0%	97	9.1%	77
Atlanta, GA MSA	S	47.6%	3	10.9%	12	36.7%	7	8.3%	96
Austin-San Marcos, TX MSA	S	36.8%	12	14.2%	8	22.6%	24	7.1%	100
Bakersfield, CA MSA	W	17.7%	34	0.6%	41	17.1%	32	8.7%	90
Baltimore, MD PMSA	S	6.6%	61	-4.8%	76	11.4%	45	10.6%	22
Baton Rouge, LA MSA	S	-6.4%	83	-2.4%	63	-4.0%	80	8.7%	92
Bergen-Passaic, NJ PMSA	NE	11.3%	47	-1.2%	53	12.4%	44	12.3%	2
Birmingham, AL MSA	S	11.1%	49	-0.6%	48	11.7%	46	9.9%	48
Boston, MA-NH NECMA	NE	4.8%	66	-5.7%	81	10.5%	48	10.4%	28
Bridgeport, CT NECMA	NE	3.0%	71	-5.6%	80	8.6%	55	11.7%	5
Buffalo-Niagara Falls, NY MSA	NE	-15.4%	95	-6.7%	87	-8.6%	91	10.3%	33
Charleston-North Charleston, SC MSA	S	-6.4%	82	-6.3%	85	0.0%	72	9.3%	71
Charlotte-Gastonia-Rock Hill, NC-SC MSA	S	34.7%	14	10.7%	13	24.0%	21	9.4%	63
Chicago, IL PMSA	MW	17.3%	36	-5.5%	79	22.8%	17	9.9%	49
Cincinnati, OH-KY-IN PMSA	MW	7.4%	59	-2.3%	61	9.7%	52	9.4%	67
Cleveland-Lorain-Elyria, OH PMSA	MW	0.5%	75	-4.7%	75	5.2%	69	10.8%	17
Colorado Springs, CO MSA	W	18.3%	33	9.7%	14	8.6%	63	8.3%	95
Columbia, SC MSA	S	2.4%	73	0.7%	39	1.7%	71	9.2%	74
Columbus, OH MSA	MW	11.2%	48	-3.0%	66	14.2%	34	9.0%	83
Dallas, TX PMSA	S	41.7%	7	2.8%	31	38.9%	5	8.7%	91
Dayton-Springfield, OH MSA	MW	-13.8%	94	-8.9%	95	-4.9%	77	10.3%	35
Denver, CO PMSA	W	50.9%	2	6.5%	20	44.4%	3	9.0%	84
Detroit, MI PMSA	MW	5.8%	64	-7.0%	88	12.8%	35	9.4%	64
El Paso, TX MSA	S	-7.7%	84	-3.5%	69	-4.2%	79	8.4%	94
Fort Lauderdale, FL PMSA	S	47.6%	4	18.3%	6	29.3%	15	10.4%	26
Fort Worth-Arlington, TX PMSA	S	28.4%	17	2.8%	30	25.6%	16	9.2%	76
Fresno, CA MSA	W	9.4%	52	2.1%	33	7.4%	62	9.3%	73
Gary, IN PMSA	MW	-9.3%	88	-2.2%	60	-7.1%	90	10.5%	23
Grand Rapids-Muskegon-Holland, MI MSA	MW	10.4%	51	0.7%	40	9.7%	54	8.8%	88
Greensboro-Winston-Salem-High Point, NC MSA	S	15.1%	40	5.7%	21	9.4%	57	10.5%	24
Greenville-Spartanburg-Anderson, SC MSA	S	4.1%	68	5.5%	24	-1.5%	75	10.8%	18
Harrisburg-Lebanon-Carlisle, PA MSA	NE	-3.0%	80	0.5%	42	-3.5%	81	10.8%	16

Metropolitan area	Census region	Net migration index, cohort aged 25–34, 2000	Rank	Net migration index, cohort aged 35–64, 2000	Rank	Index difference	Rank	Proportion of labor force aged 55–64, 2000	Rank
Hartford, CT NECMA	NE	-8.5%	86	-7.1%	90	-1.4%	74	11.3%	10
Honolulu, HI MSA	W	0.2%	76	-11.1%	98	11.2%	40	10.3%	34
Houston, TX PMSA	S	29.9%	16	0.4%	44	29.5%	10	8.8%	86
Indianapolis, IN MSA	MW	22.7%	25	1.4%	37	21.3%	23	9.4%	68
Jacksonville, FL MSA	S	17.2%	37	7.8%	18	9.4%	59	9.7%	54
Jersey City, NJ PMSA	NE	37.0%	11	-12.3%	99	49.3%	2	9.1%	78
Kansas City, MO-KS MSA	MW	21.2%	30	-1.8%	56	23.0%	18	9.9%	50
Knoxville, TN MSA	S	6.5%	63	8.6%	17	-2.1%	78	10.6%	21
Las Vegas, NV-AZ MSA	W	72.3%	1	45.2%	1	27.1%	25	11.0%	12
Little Rock-North Little Rock, AR MSA	S	11.6%	46	0.2%	45	11.3%	49	9.9%	47
Los Angeles-Long Beach, CA PMSA	W	9.0%	55	-15.8%	100	24.8%	12	9.1%	81
Louisville, KY-IN MSA	S	9.1%	53	-0.8%	49	9.8%	53	9.5%	58
McAllen-Edinburg-Mission, TX MSA	S	19.1%	31	19.9%	4	-0.8%	83	7.2%	99
Memphis, TN-AR-MS MSA	S	8.2%	56	-2.0%	58	10.2%	50	9.5%	62
Miami, FL PMSA	S	22.1%	27	3.5%	29	18.6%	30	11.5%	8
Middlesex-Somerset-Hunterdon, NJ PMSA	NE	16.9%	38	0.0%	46	17.0%	31	10.8%	15
Milwaukee-Waukesha, WI PMSA	MW	2.7%	72	-6.4%	86	9.1%	51	10.0%	44
Minneapolis-St. Paul, MN-WI MSA	MW	25.3%	20	-1.7%	55	27.0%	13	9.1%	79
Mobile, AL MSA	S	0.5%	74	5.7%	22	-5.1%	89	10.3%	32
Monmouth-Ocean, NJ PMSA	NE	8.1%	57	9.2%	15	-1.1%	76	11.8%	3
Nashville, TN MSA	S	28.0%	19	7.5%	19	20.5%	26	9.4%	66
Nassau-Suffolk, NY PMSA	NE	-5.9%	81	-1.3%	54	-4.6%	85	11.8%	4
New Orleans, LA MSA	S	-2.9%	79	-6.3%	84	3.4%	70	9.7%	56
New York, NY PMSA	NE	23.7%	22	-8.5%	93	32.2%	8	10.3%	30
Newark, NJ PMSA	NE	7.5%	58	-4.6%	73	12.1%	41	11.4%	9
Norfolk-Virginia Beach-Newport News, VA-NC MSA	S	-8.3%	85	-7.0%	89	-1.3%	73	8.7%	89
Oakland, CA PMSA	W	23.5%	24	-2.8%	64	26.2%	14	10.0%	41
Oklahoma City, OK MSA	S	5.1%	65	-1.9%	57	7.1%	61	10.0%	43
Omaha, NE-IA MSA	MW	14.7%	41	-3.2%	68	17.9%	28	9.6%	57
Orange County, CA PMSA	W	16.8%	39	-5.1%	77	21.9%	20	10.0%	42
Orlando, FL MSA	S	31.5%	15	16.1%	7	15.4%	43	9.5%	60
Philadelphia, PA-NJ PMSA	NE	-0.8%	77	-5.9%	83	5.1%	68	10.7%	19
Phoenix-Mesa, AZ MSA	W	44.6%	6	18.4%	5	26.2%	19	9.2%	75
Pittsburgh, PA MSA	NE	-8.6%	87	-4.0%	72	-4.5%	82	11.0%	13
Portland-Vancouver, OR-WA PMSA	W	40.2%	8	8.9%	16	31.3%	9	9.3%	69
Providence-Warwick-Pawtucket, RI NECMA	NE	-9.6%	89	-3.7%	70	-5.9%	87	10.2%	37
Raleigh-Durham-Chapel Hill, NC MSA	S	34.9%	13	11.7%	11	23.2%	22	8.2%	97
Richmond-Petersburg, VA MSA	S	14.5%	42	1.5%	36	13.0%	42	9.7%	53

Metropolitan area	Census region	Net migration index, cohort aged 25–34, 2000	Rank	Net migration index, cohort aged 35–64, 2000	Rank	Index difference	Rank	Proportion of labor force aged 55–64, 2000	Rank
Riverside-San Bernardino, CA PMSA	W	17.6%	35	3.7%	27	13.9%	39	8.8%	87
Rochester, NY MSA	NE	-11.1%	91	-5.9%	82	-5.2%	84	10.1%	40
Sacramento, CA PMSA	W	22.6%	26	3.7%	26	18.8%	29	9.5%	61
Salt Lake City-Ogden, UT MSA	W	21.5%	29	2.0%	34	19.5%	27	8.2%	98
San Antonio, TX MSA	S	10.4%	50	3.7%	28	6.7%	67	9.0%	82
San Diego, CA MSA	W	4.2%	67	-8.0%	91	12.3%	37	8.5%	93
San Francisco, CA PMSA	W	46.5%	5	-10.2%	96	56.7%	1	10.3%	31
San Jose, CA PMSA	W	28.0%	18	-10.8%	97	38.8%	4	9.7%	55
Sarasota-Bradenton, FL MSA	S	23.6%	23	29.0%	2	-5.4%	94	14.1%	1
Scranton-Wilkes-Barre-Hazleton, PA MSA	NE	-19.4%	97	-0.9%	50	-18.5%	99	11.5%	7
Seattle-Bellevue-Everett, WA PMSA	W	37.5%	10	0.5%	43	37.0%	6	9.1%	80
Springfield, MA NECMA	NE	-31.6%	100	-3.2%	67	-28.4%	100	10.5%	25
St. Louis, MO-IL MSA	MW	3.1%	70	-5.2%	78	8.2%	56	10.0%	45
Stockton-Lodi, CA MSA	W	6.5%	62	-1.0%	51	7.6%	60	9.3%	72
Syracuse, NY MSA	NE	-26.5%	99	-8.4%	92	-18.1%	98	10.0%	46
Tacoma, WA PMSA	W	13.1%	45	5.6%	23	7.4%	66	8.9%	85
Tampa-St. Petersburg-Clearwater, FL MSA	S	21.9%	28	12.8%	9	9.1%	64	11.0%	11
Toledo, OH MSA	MW	-20.9%	98	-8.8%	94	-12.1%	95	9.3%	70
Tucson, AZ MSA	W	9.0%	54	12.4%	10	-3.4%	88	9.8%	52
Tulsa, OK MSA	S	13.2%	44	-0.1%	47	13.3%	38	10.4%	27
Ventura, CA PMSA	W	3.9%	69	-3.9%	71	7.7%	58	10.4%	29
Washington, DC-MD-VA-WV PMSA	S	24.1%	21	-3.0%	65	27.0%	11	10.2%	39
West Palm Beach-Boca Raton, FL MSA	S	38.4%	9	23.0%	3	15.4%	47	11.6%	6
Wichita, KS MSA	MW	13.5%	43	-2.2%	59	15.6%	33	9.5%	59
Wilmington-Newark, DE-MD PMSA	NE	7.3%	60	0.7%	38	6.6%	65	9.8%	51
Youngstown-Warren, OH MSA	MW	-11.7%	93	-2.3%	62	-9.3%	92	10.7%	20

Source: 1990 and 2000 decennial censuses

Endnotes

1. Paul D. Gottlieb is associate professor of agricultural, food, and resource economics, and extension specialist, at Cook College, Rutgers University.
2. See, e.g., Sandra Livingston, "Big City Bright Lights Draw Graduates Away," *The Plain Dealer,* January 14, 2001, p. 14A; Robert Smith, Susan Jaffe, and Alan Achkar, "Brain Drain a Threat to Area's Economy," *The Plain Dealer,* May 17, 2001, p. 1A; A. McLaughlin, "Midwest Vies to Keep its Eggheads Home," *Christian Science Monitor,* December 21, 1999, p. A1; "Midwest Cities, States Worry about Losing their Well-Educated, " *Associated Press,* February 27, 2000.
3. Interviews with Daniel Berry, director of the Jobs and Workforce Initiative, Greater Cleveland Growth Association.
4. In *The Rise of the Creative Class,* Florida highlights the importance of human creativity—in all its many forms—to regional economic growth. He associates economically valuable creativity with a critical mass of educated young people, a tolerance of diversity, and a set of "Bohemian" arts and amenities that can attract members of the creative class even in the absence of strong job demand. Richard Florida, The Rise of the Creative Class (New York: Basic Books, 2002); Richard Florida, "The Economic Geography of Talent," *Annals of the Association of American Geographers* 92 (4) (2002): 743-755.
5. For a review, see Paul D. Gottlieb and Michael Fogarty, "Educational Attainment and Metropolitan Growth," *Economic Development Quarterly*17 (4) (2003): 325-336.
6. Edwin Mills, "Sectoral Clustering and Economic Development," in E. Mills and J. McDonald, Eds., *Sources of Metropolitan Growth* (New Brunswick, NJ: Center for Urban Policy Research, 1992); Michael Porter, *The Competitive Advantage of Nations* (New York: Free Press, 1998).
7. M. Fogarty and A. Sinha. "Why Older Regions Can't Generalize From Route 128 and Silicon Valley." In L. Branscomb, F. Kodama, and R. Florida (eds.), *Industrializing Knowledge: University-Industry Linkages in Japan and the United States* (Cambridge, MA: MIT Press, 2000).
8. In June 2003, OMB introduced a new classification system for the nation's metropolitan areas, and announced revisions to many existing metro areas. Because a different system was in effect for Census 2000, researchers are not yet using these new definitions widely.
9. Some studies have found that bachelors' degree attainment better predicts regional economic performance than alternative measures of educational attainment, including associates' and high school degrees. See Gottlieb and Fogarty, *op. cit.*; Curtis Simon, "Human capital and metropolitan employment growth," *Journal of Urban Economics* 43 (1998): 223-243.
10. Assuming for discussion purposes a simple "Economics 101" model of upward-sloping labor supply curve and downward-sloping labor demand curve in each metro area. The actual shape of the curves is the subject of considerable debate; see, e.g., Vijay Mathur and Frank Song, "A Labor Market Based Theory of Regional Economic Development," *Annals of Regional Science* 34 (2000): 131-145.
11. The Midwest's second-place finish owes in part to the college towns present in some of its large metro areas, notably Columbus (Ohio State) and Ann Arbor (University of Michigan). The entire Midwest census region (urban and rural territory together) ranks slightly behind the West on its proportion of workers who are young and educated, suggesting that its large metropolitan areas perform better than average.
12. That is, if 9.4 percent of 25-to-64 year olds in the metropolitan West were college-educated 25-to-34 year olds, as in the Northeast, the region would have an additional 175,000 young, educated workers.
13. At the same time, the West holds up somewhat better on alternative definitions of young knowledge workers. It ranks second among the regions in the share of 25 to 34 year-olds with graduate degrees, and first in the proportion of workers of all ages in science and engineering occupations (these include computer and mathematical, architecture and engineering, and life, physical, and social science).
14. This hypothesis on the role played by resource-based industries in the South and the West was confirmed two ways. First, it was verified that the Southern and Western census regions have a larger proportion of their total employment in agricultural services and mining than the other two census regions. Next, the proportion of young and educated in a subsample of the 100 metropolitan areas was correlated with the proportion of employment in agricultural services and mining (a subsample was necessary because industry data was suppressed for some smaller metros). This exercise revealed a negative correlation of -0.44.
15. Brookings urban center analysis of decennial census data.
16. Sixty-six percent of foreign-born individuals who arrived in the U.S. during the 1990s had completed high school, compared to 85 percent of U.S.-born individuals. Philip Martin and Elizabeth Midgley, "Immigration: Shaping and Reshaping America" (Washington: Population Reference Bureau, 2003).
17. Because some might argue that having a "critical mass" of young and educated workers shapes metropolitan economies, Table 2 also presents the absolute size of this cohort in each metropolitan area. A more conventional view argues that young, educated workers drive economic culture only to the extent they are disproportionately represented in the labor force.
18. Rob Atkinson and Paul Gottlieb, *The Metropolitan New Economy Index* (Progressive Policy Institute and Center for Regional Economic Issues, 2001).
19. Jersey City ranks high on the list largely because it has become a bedroom suburb attractive to young, educated workers who cannot afford Manhattan rents.
20. An alternative explanation, of course, is that universities are co-located with industries, like technology, that are relatively large employers of workers in the 25-to-34 year-old educated cohort.
21. For metropolitan rankings of educational attainment and New Economy potential, see Gottlieb and Fogarty, "Educational Attainment and Metropolitan Growth;" Atkinson and Gottlieb, *The Metropolitan New Economy Index.*
22. In 2000, the proportion of adults age 25 and over with bachelor's degrees within the 100 largest metro areas ranged from 43.6 percent in San Francisco, CA, to 14.5 percent in Stockton-Lodi, CA.
23. The definition of high technology used here is based on a list of 4-digit SICs in information technology and biotechnology (see Paul Gottlieb, *Older Central Counties in the New Economy,* U.S. Economic Development Administration, 2001). This definition seems particularly well-suited for examining the hypothesis that young people are disproportionately drawn to "flashy" tech sectors that helped drive the stock market boom of the late 1990s. While a large number of scientists and engineers are employed in the defense industry and other traditional sectors that use technology, those sectors are distributed widely around the country and may be less likely to rely on younger, educated workers.
24. The author confirmed this using scatter plots of high technology jobs against educated workers of all ages and against young workers of all education levels; and by regressing the high technology measure on these two measures. Other variables were not included in this analysis.
25. Net migration is a dynamic phenomenon occurring throughout the decade, so we standardize the data on an estimate of population at the decade's midpoint. That estimate is a simple average of cohort population in the two census years.
26. Brookings urban center analysis of decennial census data.
27. For analysis of migration patterns of a related subgroup, unmarried 25-to-39 year-olds with college degrees, over the last half of the decade, see Rachel S. Franklin, "Migration of the Young, Single, and College Educated: 1995 to 2000." Census 2000 Special Reports CENSR-12 (U.S. Census Bureau, 2003).
28. W.A.V. Clark, *Human Migration* (Beverly Hills: Sage Publications, 1986); Borjas, G., Bronars, S. Trejo, S., "Self-selection and Internal Migration in the United States," *Journal of Urban Economics* 32 (2) (1992): 159-185; Paul Gabriel and Susanne Schmitz, "Favorable Self-Selection and the Internal Migration of Young White Males

in the United States," *Journal of Human Resources* 30 (3) (1995): 460-71.

29. Paul D. Gottlieb, "Economy Versus Lifestyle in the Inter-metropolitan Migration of the Young: A Preliminary Look at the 2000 Census," *International Journal of Economic Development* 4 (1) (2003) (online at **www.spaef.com/IJED_PUB**). Another obvious candidate for migration driver is climate. Yet neither climate nor a measure of recreational/outdoor amenities (both adapted from the Places Rated Almanac) relate significantly to in-migration of the youth cohort.
30. Cushing's study focused on "Generation X," which he defined as those aged 20 to 34 in 2000. The study is a good source of information on the migration patterns of young people of different races. See Bill Bishop and Mark Lisheron, "Gen X finds its natural habitat: Tech cities," *Austin American-Statesman,* December 7, 2002, posted at **www.statesman.com**.
31. See Janet Pack, *Growth and Convergence in Metropolitan America* (Washington: Brookings Institution, 2002).
32. Cross-tabulations of educational attainment by age are not readily available in the 1990 census. A quick look at college degree attainment for all adults in 1990 and 2000 did not show a narrowing of the spread in this statistic across the four census regions (including territory outside the 100 largest metro areas). Interestingly, older cohorts had higher attainment than younger cohorts in the West in 2000, perhaps reflecting aging engineers and managers in the region's declining defense industry, as well as new Latin American immigration to the region's urban centers.
33. The table ranks the 100 largest metro areas on the degree to which the net migration index for 25-to-34 year-olds is greater or less than expected, given the net migration index for 35-to-64 year-olds. The "expected" value is determined by the regression of the youth migration index on the older migration index. The metro areas in Table 5 are ranked by the residual of that regression, the degree to which the expected value differs from the actual value.
34. This was verified using correlations between the variables shown in Table 3 and the residual in the linear regression of young migration rate on old migration rate (see note 33).
35. Because we are not adding educational attainment as an additional population characteristic, it is not necessary to use people aged 25-to-64 to proxy the labor force. Age by labor force status is available directly in the 2000 Census as table PCT35. Labor force status is calculated for all residents aged 16 or over.
36. William H. Frey and Alan Berube, "City Families and Suburban Singles: An Emerging Household Story from Census 2000" (Washington: Brookings Institution, 2002).
37. This possibility stands in direct opposition to the idea, expressed above, that a local economy could collapse if it falls below a critical mass of industry-specific skills. This more optimistic idea of equilibration has a long tradition in economic thinking, and it might hold for particular types of workers or industries (e.g., blue-collar retirees) and not others (e.g., young "knowledge" workers).
38. One such organization—the Jobs and Workforce Initiative of the Greater Cleveland Growth Association—helped fund this research.
39. See Vijay Mathur, "Human Capital-Based Strategy for Regional Economic Development," *Economic Development Quarterly* 13 (3) (1999): 203-216.
40. Of course, it is also possible that the benefits of the policy in jobs saved, taxes, or other measures of local welfare, would not exceed its costs. For purposes of the current discussion, assume that these policies pass some basic cost/benefit threshold at the local level.
41. One way to do this is to measure whether local wages are rising or falling; determining real wage trends at the local level, however, is a complicated empirical task. One problem with relying on data self-reported by local businesses is that they may be reluctant to admit shortcomings in their own marketing and R&D operations.
42. G. Borts. and J. Stein, Economic Growth in a Free Market (Columbia University Press, 1964); R. Muth, "Migration: Chicken or Egg?" *Southern Economic Journal* 37 (3) (1971): 295-306; Mathur and Song, op. cit.
43. Mathur, op cit. Mathur's works on the more traditional labor supply and demand model for metropolitan growth include Mathur and Song, op. cit.; V. Mathur and S. Stein, "A Dynamic Interregional Theory of Migration and Population Growth," *Land Economics* 67 (3) (1991): 292-98; V. Mathur and S. Stein, "The Role of Amenities in a General Equilibrium Model of Regional Migration and Growth," *Southern Economic Journal* 59 (3) (1993): 394-409.
44. Randall Krieg, "Human Capital Selectivity in Interstate Migration," Growth and Change 22 (1) (1991): 68-76.
45. Mathur, *op. cit.*
46. Paul D. Gottlieb, "Amenities as an Economic Development Tool: Is there Enough Evidence?" *Economic Development Quarterly* 8 (3) (1994): 270-285; Florida, *The Rise of the Creative Class.*
47. This policy is based at least partly on fallacious reasoning. If there is no government intervention, and you observe that people who go to high school and college in the same state are also likely to settle in that state, you have observed a fundamental attachment to home. If you provide incentives so that some proportion of high school graduates who would otherwise have gone to college out of state now go to the local state university, you may well achieve that effect, but you have not necessarily transformed them into the first type of person. Advocates of these kinds of programs have interpreted the statistical evidence on people who stay home for college and subsequent careers as causal, instead of simply a "selection effect."

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