C. Occupational Structure and Urban Growth

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Urban areas have exhibited widely divergent growth in recent years. Between 1990 and 2003, the estimated U.S. population growth rate was 16.9 percent.[1] Over the same period, Las Vegas, Nevada, the most rapidly growing Metropolitan Area (MA), grew by 109.1 percent, while the most rapidly declining area, the Steubenville–Weirton, OH–WV MA, shrank by nearly 10 percent. Previous literature has identified a number of factors correlated with population growth at the city and MA level. While some of these, such as climate, have no obvious implications for occupational structure, others, such as a negative correlation between growth and employment in manufacturing, suggest ways in which occupational structure may differ between fast- and slow-growing urban areas. This article uses Occupational Employment Statistics (OES) data to look for relationships between occupational composition and MA population growth rates. Following a brief literature review, the article outlines some predictions for specific occupational groups and then describes the methodology used to compare occupational structure across groups of fast-, slow- and moderately growing MAs. After summarizing the results for selected occupational groups and comparing them with the earlier predictions, the article concludes with some general remarks and issues lending themselves to future research.

Some facts about recent urban growth

This section summarizes findings from previous literature on urban growth between the 1990 and 2000 censuses. Although much of the discussion focuses on cities rather than MAs, differences between growth relationships at the city and MA levels are mentioned where relevant. Except as noted, the primary sources are Edward Glaeser and Jesse Shapiro, "Is There a New Urbanism? The Growth of U.S. Cities in the 1990s," NBER Working Paper 8357, 2001; and, by the same authors, "City Growth and the 2000 Census: Which Places Grew, and Why?" Brookings Institution, May 2001. Among the interesting findings to come out of these sources are the following:

- Growth rates of cities showed a high degree of persistence: the correlation between growth rates in the 1990s and the 1980s was greater than 75 percent. Thus, one of the primary predictors of an area's growth between 1990 and 2000 was its growth in the recent past.

- Western and Southern cities grew the most rapidly, with average growth rates of 19.5 percent and 12 percent, respectively. Cities in the Midwest grew by an average of 3.4 percent, an improvement over their negative growth rate in the 1980s. Cities in the Northeast shrank by an average of 1 percent.

- Hot, dry cities gained population at the expense of cool, wet cities. With regions controlled for, higher temperatures and lower rainfall were significant predictors of city growth.

- There was no significant correlation between initial population and later growth. However, the average growth rate of large cities (those with more than 1 million inhabitants) relative to that of smaller cities did appear to increase somewhat in the 1990s.

- Cities with younger residents and higher per capita incomes grew more rapidly. However, these relationships do not always remain statistically significant after controlling for other variables; for example, age becomes insignificant at both the city and MA level after college education is taken into account, presumably because college education is more prevalent among younger people.

[1] Population growth rates are calculated from the U. S. Census Bureau's 1990 Census population data and 2003 population estimates, the latest data available for all components of OES metropolitan areas.

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- High-density cities built around public transportation and pedestrians declined in population, while low-density cities in which driving represents the primary mode of transportation grew. This correlation is interpreted, not as a causal effect of public transportation, but as evidence of a movement away from older cities built around earlier forms of transportation. Although the relationship between the percentage driving to work and population growth is not significant at the MA level, where driving is more universal than at the city level, other variables representing MA age and density are still significant predictors of population growth.

- Cities with larger immigrant populations grew more rapidly in general, but only up to a certain level: cities with the highest concentrations of immigrants (more than 15 percent foreign born) grew less rapidly than those with immigrant populations of 8 percent to 15 percent.

- Cities with high human capital grew more rapidly. The percentage of the population 25 years and older with a college degree or higher is a significant predictor of growth at both the city and MA level. The percentage of the population 25 years and older with a high school degree or higher is positively correlated with growth at the city level, but not at the MA level. Other research shows that areas with high numbers of colleges per capita before World War II tended to have both high levels of college-educated residents several decades later and higher population growth rates over the 1970–2000 period (Glaeser and Saiz, 2003).[2] However, this research also suggests that the human capital and skill effects matter more in "potentially declining cities," but are less important in warm cities with large immigrant communities, two factors that tend to be highly correlated with rapid growth.

- Cities with high levels of poverty and unemployment grew less rapidly. The civilian unemployment rate is a significant negative predictor of growth at both the city and MA level. The percentage of the population living below the poverty level is a significant negative predictor of growth at the city level, but insignificant at the MA level, where average per capita income appears to be more important. The percentage of the population that is black is significantly negatively correlated with growth at both the city and MA level, even after controlling for average income and percentage living below the poverty level.

- Manufacturing cities had low population growth rates. The percentage of civilian employment in manufacturing is significantly negatively correlated with both city and MA growth. Employment in public administration and employment in health services also are negatively correlated with growth. According to the authors, the latter does not reflect differences between the demographic structures of growing and declining cities: although older populations are positively correlated with employment in healthcare, the correlation between age and growth of the population is relatively weak. The authors speculate that this phenomenon may occur instead because healthcare and public administration are among the last industries to leave a declining area.

- Cities with larger governments grow more slowly. Per capita city government expenditures are a significant negative factor in growth. Controlling for the overall size of the government budget, expenditures on education, and expenditures on police are significantly negatively correlated with growth. This relationship was tested only at the city level, because cities, not MAs, represent a more natural political unit.

- Other than the strong negative impact of crime, variables representing lifestyle amenities, such as eating and drinking establishments and museums, are generally not strong predictors of growth rates (Glaeser and Saiz, 2003).[3]

Possible implications for occupational structure

The preceding literature summary suggests a number of ways in which occupational structures might differ between fast- and slow-growing urban areas:

- The negative correlation between growth and manufacturing employment suggests that the employment share in production occupations should be higher in slow-growing areas. This group of occupations contains many that typically are associated with manufacturing activities, such as welders, cutters, solderers, and brazers; sewing machine operators; and engine and other machine assemblers.

- Because employment in the healthcare industry was higher in slow-growing areas, population growth should be negatively correlated with occupations concentrated in this industry.

- The lack of evidence that lifestyle amenities such as restaurants, movie theaters, and museums are associated with urban growth suggests that there should be no clear correlation between MA growth and employment in occupations associated with providing various consumption amenities. Occupations that might

[2] Glaeser, Edward L., and Saiz, Albert, *The Rise of the Skilled City*, NBER Working Paper (Cambridge, MA, National Bureau of Economic Research, 2003).

[3] Glaeser and Saiz, *The Rise of the Skilled City*.

be associated with lifestyle amenities include food preparation and serving related occupations; arts, design, entertainment, sports, and media occupations, such as actors, athletes and sports competitors, musicians and singers, and fine artists; personal care and service occupations, such as barbers, fitness trainers and aerobics instructors, and manicurists; and sales-related occupations that might indicate a consumption amenity in the form of a vibrant retail sector.

- High levels of crime are associated with slower population growth. To the extent that high-crime areas combat this problem by employing more law enforcement personnel, we might expect to see higher concentrations of protective service workers in slow-growing areas. In addition, because law enforcement workers are public employees, the negative correlation between growth and share of employment in public administration tends to reinforce this prediction.

- If poverty and large local government employment are correlated with higher levels of social services, we might expect to see higher concentrations of community and social services occupations, such as social workers and counselors, in slow-growing areas.

- Because previous literature has found a positive correlation between population growth and educational attainment, slow-growing areas, particularly in the Northeast and Midwest, might be expected to have smaller concentrations of occupations requiring higher levels of education or skill. Occupations that may be associated with higher educational attainment include management occupations; business and financial operations occupations, such as management analysts and accountants and auditors; computer and mathematical science occupations; architecture and engineering occupations; life, physical, and social science occupations; legal occupations; and education, training, and library occupations. Because the number of colleges was found to be associated with higher population growth, one might in particular expect high concentrations of postsecondary teachers in fast-growing areas.

- In addition to these predictions based on the literature, because rapid population growth is likely to spur demand for new housing, fast-growing areas might also be expected to have higher employment shares in construction and extraction occupations.

Data and methodology

In order to test the preceding implications, MAs were first assigned to growth classes on the basis of their population growth rates. For each growth class, employment data from the May 2004 OES survey were used to calculate the percentage of total employment in each major occupational group, as defined by the 2000 Standard Occupational Classification system (SOC).[4] These employment shares were then compared across MA growth classes. To better isolate effects of geography or the size of the area, metropolitan areas were further subdivided by initial population size and by region.

On the basis of their 1990 to 2003 population growth rates, the 331 MAs were divided into three growth classes: 72 fast-growing MAs, with 1990–2003 growth rates greater than 25 percent; 145 moderately growing MAs, with growth rates of 10 percent to 25 percent; and 114 slow-growing MAs, with growth rates less than 10 percent. These intervals were chosen to be of similar orders of magnitude in terms of number of MAs, to offer intuitive endpoints, and to include the 1990–2003 U.S. population growth rate (16.9 percent) and median MA growth rate (15.5 percent, Lawrence, MA–NH MA) within the center interval.

The MAs also were grouped by region—Northeast, Midwest, South, or West—and into one of three possible size classes, based on their initial (1990) population. "Small" MAs had an initial population of less than 250,000; "medium-sized" MAs had an initial population of 250,000 to 1 million; and "large" MAs had an initial population of more than 1 million.

For each set of MAs, May 2004 OES employment figures were used to calculate the percentage of total employment in each SOC major group. Three sets of comparisons were then performed, checking for significant differences in employment shares for each occupational group across MA growth classes. In all comparisons, fast- or slow-growing MAs were compared with their moderately growing counterparts, rather than directly with one another. Because not all subgroups contained MAs in each growth class, making all comparisons relative to moderately growing MAs allowed the analysis to be performed consistently across all three sets of comparisons.

The initial inquiry involved comparing employment distributions across growth classes for the full data set. Because geographical area is one of the major determinants of urban growth, and these strong regional effects may obscure the effects of other growth factors on occupational structure, the second stage of the inquiry involved comparing MAs within the same region across growth classes wherever possible. Because the fast-growing MA group contained only two Midwestern MAs and no Northeastern ones, comparisons for those regions were possible only between slow- and moderately growing MAs. Similarly, only five MAs in the West met the definition of "slow growing." Comparisons were performed between these MAs and moderately growing Western MAs, but the results should be interpreted with caution, given the small size of the slow-growing group. Finally, although previous literature found no signifi-

[4] For more information on the 2000 Standard Occupational Classification, see Appendix A at the end of this publication.

cant correlation between initial size and subsequent growth, it is possible that correlations between growth rate and occupational structure differ by size of MA. Therefore, the third stage of the inquiry involved comparing MAs of similar size across growth classes. Findings for selected occupational groups are presented in the next section.

Summary of results

The data appear to support the prediction of a negative correlation between growth and the share of employment in production occupations. This relationship generally holds across regions and size groups. In the full data set, the employment share in the production occupational group was 1.16 percentage points lower in fast-growing MAs than in moderately growing ones, while the employment share in slow-growing MAs was 0.62 percentage point above that in moderately growing ones. (See table C1.) When the data are broken down by region, fast-growing MAs in the South and the West have significantly lower shares in production occupations than do moderately growing MAs in the same regions. In 3 out of the 4 regions, slow-growing MAs have significantly higher shares of production occupations than do moderately growing MAs. The exception is the West, for which slow-growing MAs contain a significantly *lower* share of production employment; however, this result may reflect the small number of slow-growing MAs in the West and the unusually low percentage of production workers in that region (3.84 percent, compared with an average of 7.2 percent across all MAs).

The size-class data show lower shares of production occupations in fast-growing small and medium-sized MAs, relative to moderately growing MAs in the same size class, while the share difference was not significant for fast-growing large MAs. In 2 out of 3 size classes, slow-growing MAs had higher shares of production occupations than did their moderately growing counterparts. Although this result did not hold for slow-growing medium MAs, the difference in share was relatively small in absolute value.

Table C1. **Production occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	6.12	7.29	7.90	[1]–1.16	[1] 0.62
By region:					
Midwest	—	8.90	10.14	—	[1]1.24
Northeast	—	5.33	6.78	—	[1]1.45
South	6.24	7.02	7.72	[1]–.78	[1].70
West	5.91	7.18	3.84	[1]–1.27	[1]–3.34
By size class:					
Small	6.48	8.64	9.90	[1]–2.16	[1]1.26
Medium	5.55	8.85	8.57	[1]–3.30	[1]–.28
Large	6.37	6.33	7.20	.04	[1].87

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C2. **Healthcare practitioner and technical occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	4.50	4.97	5.54	[1]–0.47	[1]0.57
By region:					
Midwest	—	5.11	5.52	—	[1].41
Northeast	—	5.23	5.62	—	[1].39
South	4.60	5.31	6.10	[1]–.70	[1].80
West	4.29	4.14	4.00	.15	–.14
By size class:					
Small	4.86	5.61	5.97	[1]–.75	[1].36
Medium	4.85	5.40	5.57	[1]–.54	[1].17
Large	4.26	4.66	5.44	[1]–.41	[1].78

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

In a number of these comparisons, the differences in share between growth classes are relatively large in magnitude, frequently exceeding 1 percentage point in absolute value. For example, in small and medium-sized MAs, the shares of production occupations in fast-growing MAs are respectively 2.16 percentage points and 3.30 percentage points below those in moderately growing MAs. Similarly, slow-growing MAs in the Northeast have a 1.45-percentage-point higher share in production occupations than do moderately growing MAs in the same region, while the corresponding difference in share for the Midwest is 1.24 percentage points. Both the direction and magnitude of the share differentials support the finding that manufacturing, and hence employment in production occupations, is negatively correlated with urban growth.

The occupational data also are largely consistent with previous findings of a negative correlation between growth and employment in the healthcare industry. Relative to moderately growing MAs, both healthcare practitioner and technical occupations and healthcare support occupations have lower employment shares in fast-growing MAs, and higher shares in slow-growing MAs, in the full data set. (See tables C2 and C3.) In the regional data, all statistically significant differences in share have the anticipated sign. Fast-growing Southern MAs have lower shares of both healthcare groups than do moderately growing Southern MAs. Slow-growing MAs have higher shares of both healthcare groups in the South and Midwest and of the first group—healthcare practitioner and technical occupations—in the Northeast. Share differences are not statistically significant for both groups in the West and for healthcare support in slow-growing Northeast MAs. Similarly, the size-class comparisons all show the expected sign when the differences are statistically significant. Fast-growing MAs in all three size classes have lower shares of both healthcare groups, with the exception of healthcare support in medium-sized areas, for which the difference has the anticipated sign, but is not statistically sig-

Table C3. **Healthcare support occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	2.19	2.39	2.89	[1]–0.20	[1]0.49
By region:					
Midwest	—	2.28	2.82	—	[1].54
Northeast	—	3.04	2.99	—	–.05
South	2.19	2.34	3.06	[1]–.15	[1].72
West	2.18	2.18	2.09	.00	–.09
By size class:					
Small	2.41	2.77	3.17	[1]–.36	[1].40
Medium	2.50	2.57	2.93	–.07	[1].36
Large	2.00	2.24	2.81	[1]–.25	[1].56

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

nificant. Slow-growing areas have higher shares of both healthcare groups across all size classes.

The data also appear to support the prediction of a positive correlation between growth and employment in construction and extraction occupations, at least for fast-growing MAs. In the full data set, both comparisons have the expected sign and are statistically significant: the share of employment in construction and extraction occupations is 1.20 percentage points higher in fast-growing MAs than in moderately growing MAs, while the difference in share between slow- and moderately growing MAs is –0.32 percentage point. (See table C4.) Fast-growing MAs in both the South and the West have higher shares of construction and extraction occupations than do moderately growing MAs; in addition, the share differential in the West is quite large in absolute value: nearly two percentage points. However, the regional data for slow-growing MAs show a more mixed pattern. While the share differentials have the expected sign for both the Midwest and the West, the latter difference is not statistically significant. Furthermore, in both the South and the Northeast, slow-growing MAs have a significantly higher share of construction and extraction occupations in comparison to moderately growing MAs.

Table C4. **Construction and extraction occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	5.69	4.49	4.17	[1]1.20	[1]–0.32
By region:					
Midwest	—	4.40	4.25	—	[1]–.15
Northeast	—	3.64	3.83	—	[1].19
South	5.12	4.89	5.46	[1].23	[1].57
West	6.52	4.55	4.43	[1]1.97	–.12
By size class:					
Small	5.85	4.75	4.80	[1]1.10	.05
Medium	5.92	4.83	4.31	[1]1.09	[1]–.52
Large	5.54	4.29	3.99	[1]1.25	[1]–.31

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

The size-class comparisons exhibit a pattern similar to that found in the regional data. Relative to moderately growing MAs, fast-growing MAs in all three size classes have significantly higher shares of construction and extraction occupations; in addition, the share differentials all exceed 1 percentage point in absolute value. However, the pattern is less pronounced in the comparisons between slow- and moderately growing MAs. In 2 out of 3 size classes, the differences in share have the expected sign, but are relatively small in absolute value, while the difference is not statistically significant for small MAs.

Across the board, the data exhibit a pattern of higher shares in construction and extraction occupations in fast-growing MAs, consistent with the presence of booming construction markets in those areas. However, this pattern appears to hold mainly in comparisons between fast- and moderately growing MAs; in slow-growing areas, the relationship between these occupations and growth is less pronounced.

Previous research has found no evidence of a correlation between growth and various measures of consumption amenities, such as number of eating and drinking establishments or motion picture establishments per capita. This finding suggests that no relationship should exist between growth and employment shares in occupational groups associated with consumption amenities, such as food service, personal care, and arts and entertainment. However, that prediction is not fully supported by the data. Instead, employment in food preparation and serving related occupations appears to follow a bimodal peak, with the share of this occupational group higher in both fast-growing areas and slow-growing areas relative to moderately growing ones. In the full data set, the employment share of these occupations is 0.8 percentage point higher in fast-growing MAs than in moderately growing MAs, while the employment share in slow-growing MAs is 0.31 percentage point higher than in moderately growing MAs. (See table C5.) The same pattern can be observed in the regional data: both fast-growing and slow-growing MAs have higher shares of this occupational group than do moderately growing MAs, with all differences statistically significant. The size-class data also show evidence of the same bimodal peak, with the exception of small fast-growing MAs, for which the difference in share is positive, but not statistically significant.

One possible explanation for this result is that different factors are at work in fast- and slow-growing MAs with respect to this occupational group. Restaurants and other eating and drinking places produce a service that is not easily traded across geographical areas and thus must locate near their potential customers. Therefore, in slow-growing cities, these occupations may represent a "residual" source

Table C5. **Food preparation and serving related occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	8.59	7.78	8.09	[1]0.80	[1]0.31
By region:					
Midwest	—	7.78	8.53	—	[1].75
Northeast	—	6.89	7.36	—	[1].47
South	8.46	8.17	9.24	[1].29	[1]1.07
West	8.74	7.80	9.67	[1].94	[1]1.87
By size class:					
Small	9.77	8.89	9.01	[1].88	.12
Medium	9.00	8.35	8.48	[1].65	[1].13
Large	8.20	7.33	7.74	[1].87	[1].41

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

of employment when the production of more highly tradable goods and services has relocated elsewhere. In fast-growing MAs, however, a relatively high share of employment in this occupational group may reflect a thriving food service industry that represents a lifestyle amenity to the area's growing population. To the extent that the latter explanation is correct, these data fail to support earlier findings that consumption amenities, such as eating and drinking establishments, are not strongly correlated with growth.

Personal care and service occupations represent another occupational group that may be associated with consumption amenities. Like food preparation and serving related occupations, personal care and service occupations show evidence of a bimodal distribution, although the pattern is less pronounced. Both slow- and fast-growing MAs in the full data set have higher shares of this group than do moderately growing MAs; the differences in share, though slight, are statistically significant. (See table C6.) In the regional data, both fast- and slow-growing MAs have higher shares of this occupational group in all comparisons except for slow-growing Northeastern MAs, for which the share of personal care and service occupations is 0.88 percentage point lower than in moderately growing Northeastern MAs. The size-class data show higher shares for both fast- and slow-growing MAs in all comparisons where the differences are statistically significant, although the differences are not statistically different from zero for fast-growing large MAs and slow-growing small ones. Like food service employees, personal care and service workers generally must locate near their customers. Thus, the explanation offered for the bimodal peak in food preparation and serving occupations may be advanced for this group as well.

Table C6. **Personal care and service occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	2.56	2.37	2.51	[1]0.19	[1]0.14
By region:					
Midwest	—	2.26	2.46	—	[1].20
Northeast	—	3.40	2.52	—	[1]–.88
South	2.54	2.10	2.64	[1].44	[1].53
West	2.59	2.22	2.59	[1].37	[1].36
By size class:					
Small	2.53	2.34	2.37	[1].19	.03
Medium	2.83	2.21	2.49	[1].62	[1].28
Large	2.42	2.45	2.55	–.03	[1].11

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Employment in arts, design, entertainment, sports, and media occupations appears to display the opposite pattern, with shares of this group generally higher in moderately growing MAs than in either slow- or fast-growing ones. In the full data set, the employment share is 0.44 percentage point lower in fast-growing MAs, and 0.36 percentage point lower in slow-growing MAs, relatively to moderately growing ones. (See table C7.) The regional data show a similar pattern, with moderately growing MAs exhibiting higher employment shares in this group than either fast- or slow-growing MAs, with the exception of the small group of slow-growing Western MAs, for which the difference in share is negative, but not significant. The size-class data exhibit this pattern less strongly, however. Although moderately growing MAs have higher shares of arts, design, entertainment, sports, and media workers in 3 out of 6 comparisons, the difference in share between moderate and fast-growing small MAs is not statistically significant. Furthermore, medium-sized MAs deviate from the pattern, with the share of these occupations significantly higher in both slow- and fast-growing medium-sized MAs compared with moderately growing ones. Overall, the data for this group provide some evidence that slow-growing MAs may have particularly low shares of employment in arts, design, entertainment, sports, and media occupations, but little evidence that the presence of these workers constitutes a consumption amenity in fast-growing areas.

The data suggest some evidence of a positive correlation between growth and employment in sales and related occupations. Shares of this group in the full data set are 0.59 percentage point higher in fast-growing MAs, and 0.10 percentage point lower in slow-growing MAs relative to moderately growing ones. (See table C8.) In both regions for which the comparison is possible, fast-growing MAs have a higher share of sales and related occupations than moderately growing MAs have. However, the regional comparisons between slow- and moderately growing MAs are generally not statistically significant; only the Northeast shows a significantly lower share of this group in slow-growing MAs. Fast-growing MAs have a higher share of sales and related workers in 2 out of 3 size classes, but no significant

Table C7. **Arts, design, entertainment, sports, and media occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	1.10	1.54	1.19	[1]–0.44	[1]–0.36
By region:					
Midwest	—	1.26	1.17	—	[1]–.08
Northeast	—	2.03	1.17	—	[1]–.85
South	1.09	1.15	.86	[1]–.06	[1]–.29
West	1.11	2.11	1.94	[1]–.99	–.17
By size class:					
Small	1.08	1.09	.92	–.01	[1]–.17
Medium	1.14	1.03	1.12	[1].11	[1].09
Large	1.09	1.85	1.27	[1]–.77	[1]–.58

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C8. **Sales and related occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	11.18	10.59	10.49	[1]0.59	[1]–0.10
By region:					
Midwest	—	10.55	10.38	—	–.17
Northeast	—	10.74	10.52	—	[1]–.22
South	11.44	10.59	10.63	[1].85	.04
West	10.77	10.54	10.71	[1].23	.17
By size class:					
Small	10.73	10.73	10.55	.00	[1]–.18
Medium	10.78	10.61	10.32	[1].17	[1]–.29
Large	11.45	10.56	10.55	[1].89	–.01

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

difference for small MAs. Similarly, 2 out of 3 size classes show a lower share of sales and related workers in slow-growing MAs, with the difference in share insignificant for large MAs. In general, where the difference is significant, the data support a positive correlation between employment shares of sales and related workers and MA growth. However, several of the comparisons are not statistically different from zero, and overall the evidence of a positive correlation is not strong. In addition, while at least two-thirds of the employment in this group is retail sales related, it also contains nonretail salesworkers such as telemarketers, real estate sales agents and brokers, and wholesale and manufacturing sales representatives.

Although previous research has failed to find a correlation between growth and consumption amenities such as eating and drinking establishments, high levels of crime, as proxied by the murder rate, appear to be "a very salient disamenity" from the point of view of population growth (Glaeser and Saiz, 2003).[5] Assuming that high-crime areas respond to their situation by devoting a larger share of local resources to law enforcement, we might expect to see a higher employment share for protective service occupations in slow-growing areas. In addition, because law enforcement personnel are public employees, the correlation between large government and slow growth provides a further reason to expect a negative correlation between the share of these workers and population growth. However, the data do not appear to support this prediction. In the full data set, both fast- and slow-growing MAs employ a smaller proportion of protective service workers than do moderately growing MAs. (See table C9.) Fast-growing MAs in the South employ a lower share of protective service workers than do their moderately growing counterparts, but for fast-growing areas in the West, the reverse is true. Relative to moderately growing MAs in the same region, slow-growing Western MAs employ a higher share of protective service workers, slow-growing Northeastern MAs employ a lower share, and the differences in share for the other two regions are not statistically significant. The size-class comparisons show a similarly mixed pattern. These data suggest that, although high crime may be correlated with low population growth, it is not necessarily correct to assume that high-crime areas respond by devoting a higher share of resources to the employment of police and other protective service workers.

Table C9. **Protective service occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	2.32	2.38	2.27	[1]–0.06	[1]–0.10
By region:					
Midwest	—	2.02	2.02	—	.00
Northeast	—	2.99	2.37	—	[1]–.62
South	2.31	2.48	2.47	[1]–.17	–.01
West	2.34	2.22	2.70	[1].12	[1].48
By size class:					
Small	2.13	1.96	2.22	[1].16	[1].26
Medium	2.41	2.15	2.25	[1].26	[1].11
Large	2.29	2.56	2.29	[1]–.27	[1]–.27

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Similarly, previous findings have indicated negative correlations between poverty and growth, as well as between the size of local government and growth. These findings suggest that slow-growing areas might have relatively higher concentrations of community and social service occupations, both because government tends to be a large employer in

[5] Glaeser and Saiz, *The Rise of the Skilled City.*

Table C10. **Community and social services occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	1.08	1.29	1.45	[1]–0.21	[1]0.16
By region:					
Midwest	—	1.15	1.13	—	–.02
Northeast	—	1.71	1.70	—	–.01
South	.90	1.26	1.31	[1]–.36	.05
West	1.33	1.21	1.46	[1].12	[1].25
By size class:					
Small	1.19	1.38	1.60	[1]–.19	[1].22
Medium	1.25	1.24	1.47	.01	[1].23
Large	.97	1.29	1.41	[1]–.32	[1].11

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

this occupational group and because high levels of poverty might be reflected in high levels of some social services. Where differences are statistically significant, this predicted pattern appears to hold. For example, in the full data set, the employment share for the community and social services occupational group is 0.21 percentage point lower in fast-growing MAs than in moderately growing ones, while the share in slow-growing MAs is 0.16 percentage point higher than in moderately growing areas. (See table C10.) Three out of 6 regional comparisons are statistically insignificant; of the remainder, only 2 have the expected sign, with fast-growing MAs in the West having a higher, rather than lower, share of these occupations. As regards the size-class data, for all three size classes, slow-growing MAs had a higher share of community and social service occupations than did moderately growing MAs, while fast-growing MAs had a lower share of these occupations in two size classes, with the difference in share for medium-sized MAs not statistically significant.

The statistical insignificance of several comparisons, as well as the generally small magnitude of the share differences in the remaining comparisons, suggests that employment in community and social service occupations is only weakly correlated with slow growth. Previous research had found a negative correlation between poverty and growth at the city level only, while the correlation was not significant at the MA level. In addition, only city-level data were examined for correlations between size of government and growth, because the city, and not the MA, was perceived as the basic political unit. Thus, the use of MA rather than city data in this article may weaken any potential connections among slow growth, poverty, and large government. In addition, to the extent that slow growth is associated with poverty even at the MA level, it is not necessarily the case that poorer areas devote more resources to the provision of social services.

Finally, previous research found that local skill levels, as measured by educational attainment, were a strong predictor of population growth rates. This observation suggests that faster growing areas should have heavier concentrations of employment in occupational groups characterized by higher levels of skill, such as management occupations; business and financial operations occupations; computer and mathematical science occupations; architecture and engineering occupations; life, physical, and social science occupations; legal occupations; and education, training, and library occupations. Interestingly, the data largely fail to bear out this prediction, with many comparisons showing a lower concentration of these "high-skill" occupations in fast-growing areas.

In the full data set, fast-growing MAs have lower employment shares than moderately growing MAs in all of the foregoing groups except architecture and engineering occupations. (See tables C11–C17.) The comparisons between slow- and moderately growing MAs are more consistent with the predicted pattern. Of the aforementioned seven occupational groups, only one—education, training, and library occupations—has a higher share in slow-growing areas, although the difference in share for architecture and engineering occupations is statistically insignificant.

The regional data reveal that the West appears to be characterized by a negative correlation between growth and employment shares in skilled occupations. Relative to moderately growing Western MAs, fast-growing Western MAs exhibit lower concentrations of all of the "high-skill" groups, with the exception of education, training, and library occupations, for which the difference is statistically insignificant. Similarly, the small group of slow-growing Western MAs has a higher share of all of these groups except architecture and engineering occupations and education, training, and library occupations, with the latter share differential again statistically insignificant. In the South, only architecture and engineering occupations have a higher share in fast-growing areas than in moderately growing ones; of the remaining six groups, four have lower shares in fast-growing areas and two show no significant difference in shares. Slow-

Table C11. **Management occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	4.84	5.13	4.84	[1]–0.29	[1]–0.29
By region:					
Midwest	—	5.01	4.28	—	[1]–.74
Northeast	—	5.14	5.16	—	.02
South	5.06	5.14	4.51	[1]–.08	[1]–.63
West	4.57	5.23	6.20	[1]–.66	[1].97
By size class:					
Small	4.22	4.43	4.23	[1]–.20	[1]–.20
Medium	4.40	4.79	4.49	[1]–.40	[1]–.30
Large	5.16	5.41	5.11	[1]–.25	[1]–.30

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C12. **Business and financial operations occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	4.13	4.52	4.19	[1]–0.39	[1]–0.33
By region:					
Midwest	—	4.85	4.28	—	[1]–.57
Northeast	—	4.57	4.30	—	[1]–.26
South	4.17	4.26	2.80	[1]–.10	[1]–1.47
West	4.09	4.51	5.11	[1]–.42	[1].60
By size class:					
Small	3.35	3.59	2.83	[1]–.24	[1]–.76
Medium	3.72	3.78	3.81	–.06	.03
Large	4.46	5.03	4.64	[1]–.57	[1]–.39

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

growing areas in the South, however, largely display the expected pattern. Shares of all the "high-skill" occupational groups, with the exception of education, training, and library occupations, are lower in slow-growing Southern MAs relative to moderately growing MAs. In some cases, the share differentials also are quite substantial. For example, the share of computer and mathematical occupations is 1.69 percentage points lower in slow-growing Southern MAs, while the share of business and financial occupations is 1.47 percentage points lower. Slow-growing Midwestern MAs exhibit shares that also are largely consistent with the predicted pattern: all of the groups except architecture and engineering occupations have lower shares in slow-growing areas, although the difference in share for education, training, and library occupations is not significant. Finally, the results for slow-growing MAs in the Northeast are somewhat mixed, with business and financial operations occupations; legal occupations; and education, training, and library occupations having lower shares in slow-growing areas, architecture and engineering occupations having a higher share, and the remaining three groups showing no significant differences.

In the size-class data for fast-growing MAs, only life, physical, and social science occupations had a higher share in small MAs, with the remaining groups not following the predicted pattern. In medium-sized MAs, 3 out of the 7 occupational groups had higher shares in fast-growing areas, 1 group had a lower share, and the remaining differences were statistically insignificant. Fast-growing large MAs deviated strongly from the predicted pattern, with lower shares of all the "high-skill" occupational groups except architecture and engineering occupations. The size-class comparisons between slow- and moderately growing MAs, however, appear to be more consistent with the predicted pattern. Slow-growing small MAs have lower shares of all seven groups except education, training, and library occupations, for which the difference in share has the expected sign, but is not statistically significant. Medium-sized slow-growing MAs have lower shares for 4 of the 7 groups, with education, training, and library occupations showing a higher share and the remaining two differences insignificant. Finally, slow-growing large MAs have lower shares of five of the seven groups, with architecture and engineering and education, training, and library occupations the exceptions.

Overall, the data fail to show a positive correlation between growth and employment concentrations in "high-skill" occupational groups. This negative result is particularly noticeable in the comparisons between fast- and moderately growing MAs, in which the correlation between skill and growth frequently appears to run the other way. Note that earlier research found the correlation between skill and growth to be important only for areas that might otherwise tend to be declining—that is, cities that are not located in warm, dry areas with significant immigrant communities. Thus, we would expect positive correlations between skill and growth to be less likely in the West and South and more likely in the Midwest and Northeast. Data for the West bear out this assumption; in fact, the region shows clear evidence of a negative correlation between growth and employment in skilled occupations. Thus, the importance of the West among the fast-growing cities, and the lack of Northeastern and Midwestern cities in this category, may help explain some of the unusual results. The South, however, displays a more complex pattern, with fast-growing Southern MAs appearing similar to fast-growing Western ones, while slow-growing Southern MAs display a positive correlation between skilled occupations and growth. One possible explanation is that, in the South, different growth factors may be relevant to slow- and fast-growing MAs. Specifically, fast-growing Southern MAs may have higher rates of immigration, thus falling into the category of MAs for which skill is not strongly

Table C13. **Computer and mathematical occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	2.51	2.74	2.28	[1]–0.23	[1]–0.46
By region:					
Midwest	—	2.60	2.02	—	[1]–.58
Northeast	—	2.51	2.57	—	.07
South	2.76	2.72	1.03	.04	[1]–1.69
West	2.18	3.07	3.55	[1]–.90	[1].48
By size class:					
Small	1.59	1.87	1.12	[1]–.28	[1]–.75
Medium	2.29	1.95	1.86	[1].35	[1]–.08
Large	2.75	3.26	2.70	[1]–.51	[1]–.56

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C14. **Architecture and engineering occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	2.06	1.95	1.94	[1]0.10	–0.02
By region:					
Midwest	—	1.88	2.30	—	[1].42
Northeast	—	1.40	1.80	—	[1].41
South	2.02	1.85	1.35	[1].17	[1]–.50
West	2.13	2.56	1.86	[1]–.43	[1]–.70
By size class:					
Small	1.80	1.75	1.39	.05	[1]–.37
Medium	1.90	1.93	1.74	–.03	[1]–.19
Large	2.18	2.00	2.14	[1].17	[1].13

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C15. **Life, physical, and social science occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	0.86	0.97	0.87	[1]–0.12	[1]–0.11
By region:					
Midwest	—	.91	.68	—	[1]–.23
Northeast	—	.95	1.00	—	.04
South	.83	.92	.60	[1]–.09	[1]–.32
West	.90	1.13	1.34	[1]–.23	[1].21
By size class:					
Small	1.44	.94	.61	[1].50	[1]–.33
Medium	.89	.84	.76	[1].05	[1]–.07
Large	.76	1.04	.96	[1]–.28	[1]–.08

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

Table C16. **Legal occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	0.75	0.89	0.78	[1]–0.14	[1]–0.11
By region:					
Midwest	—	.72	.64	—	[1]–.08
Northeast	—	1.11	.86	—	[1]–.25
South	.81	.99	.66	[1]–.18	[1]–.33
West	.67	.77	1.17	[1]–.10	[1].40
By size class:					
Small	.56	.55	.46	.01	[1]–.09
Medium	.74	.66	.65	[1].08	–.01
Large	.77	1.05	.90	[1]–.27	[1]–.15

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

predictive of growth. Slower growing Southern MAs, by contrast, may be less likely to contain significant immigrant communities and may therefore rely more on skill to generate growth. Indeed, a check of the data reveals that most of the fast-growing Southern MAs (24 out of 35) are in Florida or Texas; the corresponding figures for moderately and slow-growing Southern MAs are 15 out of 60 and 7 out of 33, respectively. Census data show that these two states have higher estimated annual rates of net international migration than the United States as a whole and than most of the other Southern states, the majority of which are below the national average in this regard.[6] In sum, it is possible that the general population shift to warm, dry areas and the importance of immigration as a source of population growth dominate among fast-growing MAs, leading to negative correlations or none at all between skill and population growth in these areas. In the comparisons between slow and moderately growing MAs, where these two factors are less important, share differentials for high-skill occupational groups follow the predicted pattern more closely.

On a note of caution, although all of these groups contain occupations generally associated with higher levels of education and skill, there is some variance in the skill levels associated with specific occupations in each group, as well as in the skill levels of individual practitioners of these occupations. Thus, compared with measuring the population's educational attainment, employment in these groups represents a less direct measure of local skill levels. In addition, although education, training, and library occupations are associated with high levels of skill, the demand for primary and secondary school teachers, a major component of this group, is also likely to be highly dependent on a community's demographics, a feature that may tend to weaken the results for this occupational group as a whole.

Conclusion

Occupational Employment Statistics data reveal a number of ways in which occupational structures at the metropolitan-area level appear to vary with population growth rates. These comparisons are not intended to imply any causal relationship between occupational structure and growth. In particular, because May 2004 OES data are used in conjunction with population growth rates for 1990–2003, it cannot be concluded that differences in occupational structure contributed to subsequent differences in population growth rates. Rather, the comparisons presented here suggest ways in which MAs with a recent history of rapid population growth may differ in terms of their current occupational structures from those with a less remarkable growth history.

Some of the observed differences appear to be consistent with predictions based on earlier findings. For example, em-

[6] Table 6: Estimates of Average Annual Rates of the Components of Population Change for the United States and States: April 1, 2000 to July 1, 2004 (NST-EST2004-06), Population Division, U.S. Census Bureau, January 28, 2004.

Table C17. **Education, training, and library occupations**

Region and size class	Employment share (percent)			Share differential (percentage point)	
	Fast growing	Moderately growing	Slow growing	Between fast and moderate	Between slow and moderate
Full data set	5.80	5.95	6.21	[1]–0.15	[1]0.26
By region:					
Midwest	—	5.72	5.53	—	–.19
Northeast	—	6.99	6.82	—	[1]–.17
South	5.79	5.65	5.89	.14	[1].24
West	5.85	5.96	5.75	–.11	–.21
By size class:					
Small	6.83	6.61	6.50	.21	–.11
Medium	5.83	5.80	6.38	.03	[1].59
Large	5.63	5.89	6.08	[1]–.26	[1].18

[1] Share differential is statistically significant.
NOTE: Dash indicates data not available.

ployment in production occupations appears to be negatively associated with growth; for this occupational group, differences in share frequently exceeded 1 percentage point in absolute value, suggesting that these differences were both statistically and economically significant. As predicted, employment in both healthcare occupational groups also appeared to be higher in slow-growing areas. In other cases, relationships between occupational distributions and growth appeared to diverge from those predicted. For instance, rather than finding no relationship between growth and occupational groups that might be associated with lifestyle amenities, the data suggest that food preparation and serving occupations and, to a lesser extent, personal care and service occupations may have a bimodal peak, displaying higher concentrations in both fast- and slow-growing MAs relative to moderately growing ones. One possible explanation of this observation is that fast-growing areas may indeed provide higher levels of amenities to their residents, while in slow-growing areas higher concentrations of employment in these occupations may merely reflect the lack of employment opportunity in other occupational groups. Finally, in comparisons between fast- and moderately growing MAs, the data showed no evidence of correlation between growth and employment in more highly skilled educational groups; in fact, fast-growing areas frequently appeared to have lower concentrations of highly skilled occupations. However, comparisons between slow- and moderately growing MAs conform more closely to the predicted pattern, displaying at least some evidence of a positive correlation between skill and growth. Because the fast-growing group was composed almost entirely of MAs in the South and West, this finding was not inconsistent with previous evidence that skill was not a significant growth factor in warm, dry areas with large immigrant communities, but mattered more elsewhere. Examining in more detail the relationships among immigration, population growth, skill, and occupational composition remains a subject for future research. ■