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Geographic Skills Mismatch, Job Search, and Race

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Abstract

This paper examines whether a geographic skills mismatch exists between the location of less-educated minorities, in particular African Americans, and high-skill job concentrations, and if so, whether it contributes to the relatively poor employment outcomes of this group. It explores these questions by examining data on the recent geographic search patterns of less-educated workers in Los Angeles and Atlanta from the Multi-City Study of Urban Inequality. These data are combined with employer data from the concurrent Multi-City Employer Survey to characterize the geographic areas searched by respondents with respect to high-skill job requirements. The results indicate that in relation to less-educated whites, comparable blacks and Latinos search in areas with higher levels of job skill requirements. Moreover, racial residential segregation as well as blacks' lower car-access rates accounts for most of blacks' (but not Latinos') relatively greater mismatch. Evidence is also found that such a geographic skills mismatch is negatively related to employment and accounts for a significant share of the racial differences in employment.

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INTRODUCTION

Over the past two decades, considerable attention has been paid to the labor market difficulties of the less-educated, particularly of those who are African American.[1] Over this period, many have observed declines in the real wages and employment of the less-educated and persistent black-white differences in these outcomes (Holzer and Offner, 2003; Bound and Freeman, 1992; Jaynes and Williams, 1989). In recent research, much attention has been focused on rising skill requirements of jobs as a prime factor in contributing to these outcomes, among many other factors (Holzer, 1998; Autor, Katz, and Krueger, 1998; Murphy and Welch, 1993; Levy and Murnane, 1992). Though there is some debate about whether and to what extent the skill requirements of jobs are rising faster than the skill acquisition of workers and the attendant negative labor market consequences of these, less attention has been placed on the geographical dimensions of this potential skills mismatch.

Some have documented that in metropolitan areas, jobs with higher skill requirements tend to be concentrated in central cities for a variety of reasons, including that idea-intensive industries benefit from the positive externalities of knowledge transfers in dense urban areas (Glaeser and Kahn, 2001). These empirical observations, combined with persistent racial residential segregation in which less-educated African Americans remain more concentrated in central cities than less-educated whites, have led others to hypothesize about a potential geographic skills mismatch between less-educated minority workers and high-skill jobs in the central cities (Kasarda, 1985). Indeed, some have shown that such a geographic skills mismatch is partly responsible for the inferior labor market outcomes of blacks and other minorities by measuring geographic variation in skill requirements of

[1]By less-educated, we mean those with a high school degree or less.

jobs and correlating these measures with intraregional and interracial differences in employment outcomes (Pastor and Marcelli, 2000; Kasarda, 1995).

This paper extends the discussion of skills mismatch by exploring its geographical dimensions. It presents an alternative test of the geographic skills mismatch by analyzing the geographic search patterns of less-educated white, black, and Latino workers.[2] In this analysis, the geography of an individual's search effort is characterized according to the percentage of jobs that require a college degree (i.e., high-skill jobs) in areas searched. To the extent that high-skill job requirements are greater in central cities than in suburbs and that blacks', and perhaps Latinos', geographic search is limited to central city job centers, perhaps because of their greater search costs stemming from racial residential segregation or their inferior access to private modes of travel, the job skill requirements faced by black (Latino) searchers will be higher than those of whites. Moreover, to the extent that less-educated workers' search in areas with relatively high skill requirements is negatively correlated with employment, then some of the observed racial differences in employment is likely attributable to the relatively greater geographic skills mismatch of minorities.

Thus, the central questions that this study addresses is whether blacks, and perhaps Latinos, face a geographic skills mismatch, whether private search behavior by these groups can undo such mismatch, and, if not, whether greater search costs prevent them from expanding their search into areas with more skill-appropriate opportunities. In particular, we want to understand whether racial residential segregation and minorities' inferior access to cars are factors that limit the geographic extent of their search into these

[2]The analysis will focus on blacks and whites because the Atlanta sample only surveyed these groups. However, Latinos are included in the analysis because they represent a large share of the Los Angeles population. The Asian American subsample in Los Angeles is not included because they are considerably less segregated than blacks and Latinos, have fairly high employment rates relative to whites, and because the lion's share of work in this area focuses on blacks and to a lesser extent on Latinos. Moreover, the addition of Asian Americans in the analysis did not alter the main findings shown here, and many of the results for this group were not significant.

areas. Finally, as a corollary, we are also interested in addressing whether geographic skills mismatch can account for part of the observed racial differences in employment.

To address these questions, we use combined individual and employer data from the 1994 Multi-City Study of Urban Inequality and Multi-City Employer Surveys for Los Angeles and Atlanta, respectively.[3] The individual data focus on a subset of recent, less-educated job searchers to address these questions. The advantage of using a data set of recent job searchers is that we capture in the analysis those actively searching for work and thus can more accurately measure the geographic location of an individual's search efforts. The data used in this study of two metropolitan areas are unique because they are the only data sets to our knowledge that have extensive questions on job search and its geographical dimensions, residential location, modes of transportation used, and other relevant variables for such an analysis.

In the remainder of the paper, I discuss the relevant literature highlighting the discussion on job search, race and geography, and then describe the data and methods used in the analysis. Finally, I describe the major findings of the analysis and then present the conclusions.

JOB SEARCH AND THE GEOGRAPHY OF RACE AND JOB SKILL REQUIREMENTS

In standard search theory, individuals choose reservation wages and search intensity by comparing the marginal benefits and costs of search and equating them at the margin (Lippman and McCall, 1976). In this model, search costs include forgone earnings, time, and other resources devoted to looking for a job, while the benefits from search include increases to the employment probability and future stream of earnings. Including geography into the search model adds a new decision margin to the analysis. This includes modeling the decision of how large an area to search (the extensive margin) and, holding the area constant, how thoroughly to search (the intensive margin) since travel imposes costs, in

[3]The other two metropolitan areas in MCSUI (Boston and Detroit) are not included in this study because the questions on search in these surveys are not comparable with those in Atlanta and Los Angeles.

time and money, during search (Stoll, 1999). Hence, incorporating geography into the analysis allows a role for transportation mode in determining the length of unemployment spells and expected wages since differences in travel mode are associated with differential costs.

Geographic isolation from areas with skill-appropriate jobs can increase search costs in several ways. First, search costs, such as the additional time and out-of-pocket costs of an extra mile of travel during search, vary with travel. For example, each additional mile of private auto travel during search requires more out-of-pocket costs for such items as gas, while traffic congestion and use of public modes of transportation increase the time costs of travel during search.[4] Hence, workers residing far from areas with skill-appropriate jobs must travel farther, and thus must incur more costs, to access such jobs than those residing closer. Second, workers residing far from areas with skill-appropriate jobs must exert greater efforts in acquiring information about such opportunities. Hence, to the extent that these geographic costs of job search are significant, the geographic areas searched by two otherwise equal individuals residing in different regions of the same metropolitan area are likely to differ.

These theoretical arguments suggest some predictions concerning which areas are searched by less-educated minority and white workers and the relative skill appropriateness of jobs in these search areas. This is especially relevant given the racially segregated residential patterns observed in most U.S. metropolitan areas coupled with the central-city bias in the spatial concentration of high-skill jobs. Assume that residential segregation concentrates blacks in central-city areas with higher concentrations of high-skill jobs, while whites are concentrated in suburban neighborhoods with lower concentrations of these jobs. Furthermore, assume that geographic search costs are substantial enough to prevent casting geographic search nets over the entire metropolitan area. Under such conditions and all else equal, less-

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[4]The basis of this discussion is developed in Stoll (1999). Stoll shows that average distance from search areas as well as not having access to cars is negatively related to the number of areas searched and to the distance searched by workers. Thus, distance from search areas and lack of access to cars impose high search costs (in both time and money) on workers and limit the extent of geographic job search.

educated blacks will search areas centered predominantly in and around the central city while less-educated whites will search in areas centered around suburban job centers. Given the relative concentration of high-skill jobs in the central city, black workers are likely to lower their reservation wages below those of their suburban white counterparts and attempt to offset the skill inappropriateness of the areas searched by expanding the geographic radius of their search. Nevertheless, nontrivial geographic search costs should result in qualitative differences in the areas searched by less-educated black and white workers.[5]

Recent empirical research suggests urban economic geography corresponding to the segregated patterns assumed above. Residential segregation remains quite high in the United States, especially in large metropolitan areas, although it has declined somewhat over the most recent decades (i.e., 1980 to 2000) (Massey and Denton, 1993). For example, in 2000, 61 percent of African Americans lived in central cities, while the comparable figure for whites was 27 percent (Frey, 2001). For African Americans, this percentage is down from 73 percent in 1980 and 70 percent in 1990, suggesting that black suburbanization increased from 1980 to 2000 (US Census, 1993). However, research suggests that this black suburbanization is occurring largely in inner-ring suburban areas that differ only mildly in characteristics from central cities (Schneider and Phelan, 1993; Kain, 1985).

At the same time, there is evidence that jobs and industries requiring more skill are more centralized than less skill-intensive industries. Since the postwar period, metropolitan areas have been characterized by decentralization in part as a result of the reduced costs of transportation and lower land prices in the suburban periphery (Glaeser and Kahn, 2001; Mills, 2000). Indeed, this continued decentralization of jobs has led to fewer employment opportunities for the less-educated in central cities and hence the importance of spatial mismatch (Stoll and Raphael, 2000). However, this pattern of

[5]These predictions are also consistent with empirical results in Stoll (1999). Stoll shows that while search costs limit the geographic distance black and white workers are willing to, and do, travel during search, blacks search in more areas than whites, which is a behavioral response consistent with living in low job opportunity areas.

decentralization is less true of industries and jobs that are more skill-intensive as measured by either the average education level of workers or the extent of computer use across industries (Glaeser and Kahn, 2001). Some argue that this pattern is explained by the information externalities of proximity, as dense urban areas facilitate the speed and flow of ideas. If this is the case, then idea-intensive industries such as commercial banking would be much more likely than others such as manufacturing to centralize, which is supported by the empirical research (Glaeser and Kahn, 2001; Glaeser, 2000).

To the extent that this is true, jobs in central cities are likely to have higher skill requirements than those in the suburbs, though central cities may account for a smaller fraction of the metropolitan areas jobs as a result of decentralization.[6] Figure 1 provides evidence on this question for Atlanta and Los Angeles using data from the 1992–94 Multi-City Employer Survey (MCES).[7] It shows that in both metropolitan areas, the percentage of last-filled jobs in firms that require a college degree was higher in the central city than in suburbs.[8] The lower percentage of high-skill jobs in Los Angeles in either the

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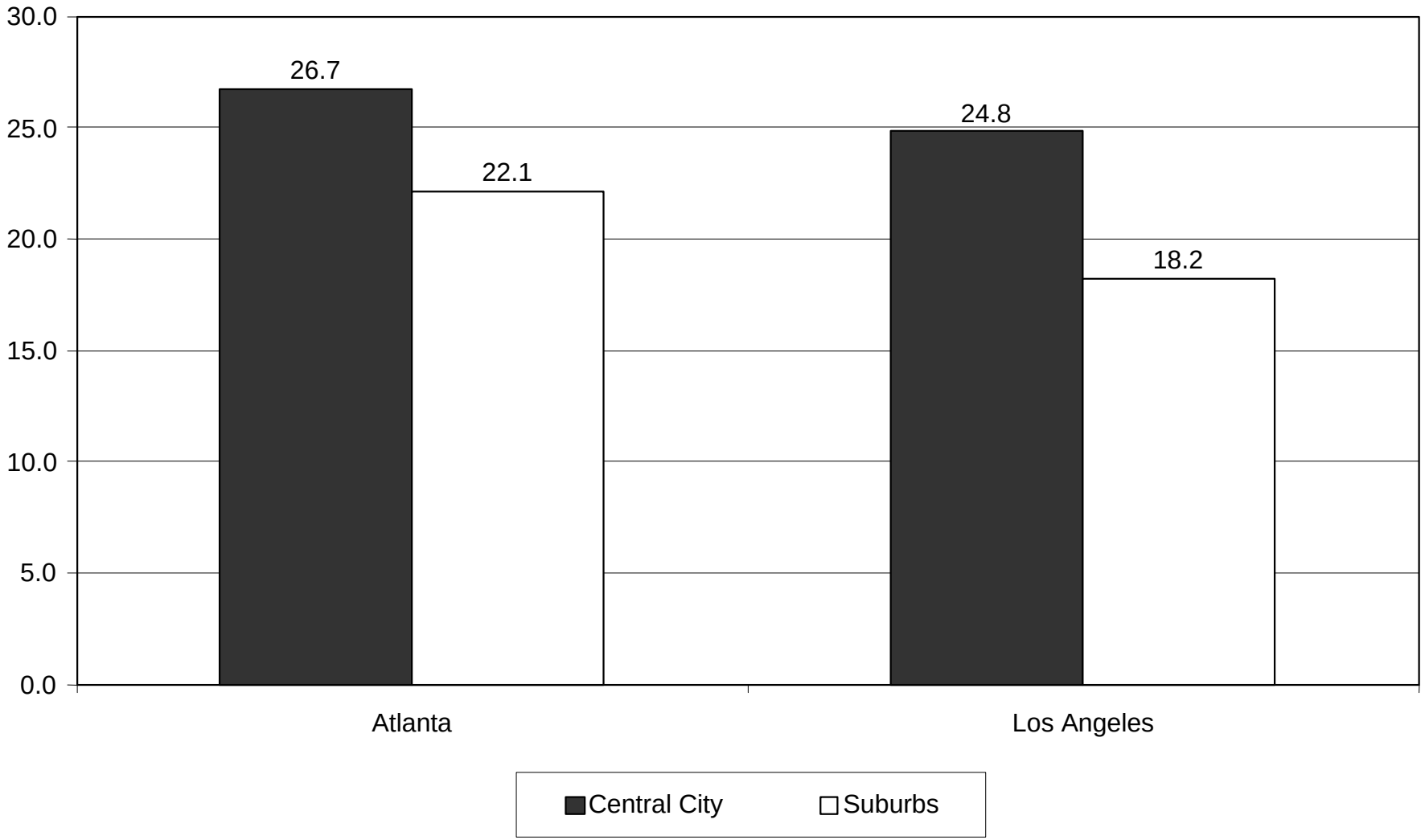
[6]An alternative story is that the skill requirements of jobs in the central city are increasing over time and beyond the skill acquisition of residents there. Some evidence on this question is provided in Kasarda (1995), who shows that from 1970 to 1990 in most large metropolitan areas, the percentage of jobs in the central city that require a college degree is much higher than the share of residents with a college degree. Moreover, he documents that the percentage of jobs in the central city that require a college degree rose dramatically from 1970 to 1990, and rose much faster than central city residents' attainment of college degrees over this period.

[7]The Multi-City Employer Survey was developed by Harry J. Holzer. The MCES produced telephone interviews with 3,220 employers between 1992 and 1994 in four cities (approximately 800 per city): Atlanta, Boston, Detroit, and Los Angeles. Questions focused on overall employer and employee characteristics, e.g., establishment size, recent hiring behavior, composition of current employees by race/gender, the numbers and characteristics of all currently vacant jobs and recently filled jobs, and of the last worker hired into that job. The sample of firms was drawn from two sources: a random sample of firms and their phone numbers stratified by establishment size; and the employers of respondents in the MCSUI household survey. The random samples were drawn across establishment size categories to reproduce the distribution of employment across these categories in the work force; the household-generated sample implicitly weights firms in the same way. The sample of recently filled jobs at these firms reasonably represents the universe of new jobs that are currently available to job seekers. There were few differences in response rates across observable categories (e.g., establishment size, industry, location), suggesting little if any sample selection bias. In addition, comparison of industries and size of firm with the *County Business Patterns* and with U.S. Census data on occupations verified the representativeness of the sample.

[8]MCES also contains this information for Boston and Detroit and finds that for the last-filled jobs, the percentage of jobs that require a college degree is higher in the central city than in suburbs in Detroit and about identical in Boston.

Figure 1
Percentage of Last-Filled Jobs that Require a College Degree, 1992–94



central city or suburbs could in part be related to the greater presence of less-educated immigrants there than in Atlanta.

Finally, recent research on racial differences in car access suggests that mode of transit, in addition to location, is a major factor influencing geographic job search and hence blacks' ability to undo the potential geographic skills mismatch. Blacks, and to a lesser extent Latinos, are significantly less likely than whites to have access to cars, and these differences are greater for the less-educated (Raphael and Stoll, 2001; Holzer, et. al., 1994). Hence, blacks and Latinos are much more likely to travel by public transportation, thereby increasing their search costs in a number of ways. Commuting times by public modes of transit are considerably longer than private modes of travel. Moreover, reverse commutes are difficult because of transit service unavailability and sparse location of routes, particularly for rail (Wachs and Taylor, 1998). Finally, suburban firms are more distant from public transit stops than are central city firms, making many suburban employment opportunities inaccessible (Holzer and Ihlanfeldt, 1996).[9] Thus, the relative lack of access to cars is likely to aggravate blacks' ability to undo the potential geographic skills mismatch. Alternatively, access to cars should allow blacks and Latinos to extend their geographic job search to include more areas with skill-appropriate job opportunities.

DATA, DEFINITION OF MAIN VARIABLES, AND EMPIRICAL STRATEGY

The primary individual-level data sets used in this analysis are the Los Angeles and Atlanta portions of MCSUI collected between 1992 and 1994. The surveys are a sample of single housing units with approximately equal proportions of two (whites and blacks) and four (whites, blacks, Latinos, and Asians) major racial/ethnic groups residing in the Atlanta and Los Angeles metropolitan areas,

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[9]To be sure, other factors impact search quality yet have little to do with geographic mismatch. These include search intensity and effectiveness (Holzer, 1987), search methods including social networks (Kasinitz and Rosenberg, 1996; Neckerman and Kirschenman, 1991; Granovetter, 1974), and other factors such as perceived hostility by blacks of suburbs (Sjoquist, 1997), and gender differences in geographic search (England, 1995; Hanson and Pratt, 1991). These, however, are beyond the scope of this analysis.

respectively. The sample includes individuals 21 years of age and older. The surveys used a random stratified sample where households in the areas were stratified by income/poverty level and the racial/ethnic composition of census tracts in 1990. Concentrated poverty areas were oversampled. The data sets contain weights that adjust for both the oversampling and differential probabilities of selection due to household size. These weights are used when descriptive statistics are shown but not used during the regression analysis. The sample data closely parallel 1990 U.S. Census distributions for age, sex, nativity, education, and occupation within each racial/ethnic category for each metropolitan area. In all, there are 1,528 completed interviews in Atlanta and 4,025 in Los Angeles. Finally, the surveys contain a battery of exact core questions so that meaningfully comparisons between metropolitan areas can be conducted.

To conduct the analysis, the data are restricted to those white and black (and Latinos in Los Angeles) respondents aged 21 to 65 and without a college degree who indicated that they had searched for work within the year prior to the survey (N=237 and 590 for Atlanta and Los Angeles, respectively).[10] The use of recent job searchers has several advantages.[11] Given that employment status is current (i.e., at the time of the survey), use of recent job searchers should yield a stronger correspondence between observed employment outcomes and observed search behavior. Second, the surveys include questions for recent job searchers concerning whether each respondent had searched in a number of areas within Atlanta or Los Angeles to which data can be attached to characterize these areas with respect to high-skill job requirements. Thus, the sample is further restricted to those who searched in at least one of the predesignated search areas. This restriction eliminates about 9 and 10 percent of cases in Atlanta and Los

[10]Hence, less-educated is defined in this analysis as those without a college degree. This definition is motivated in part by practical reasons since the sample of white recent job searchers is limited and thus any reduction to include only those with a high school degree or less would leave a trivial number of whites in either Atlanta or Los Angeles. However, estimates of the percentage of jobs requiring a college degree in areas searched for blacks and Latinos using a definition of less-educated as having a high school degree or less produced estimates statistically indistinguishable from those shown here.

[11]The surveys also ask respondents about their search behavior within the last 5 years prior to the survey.

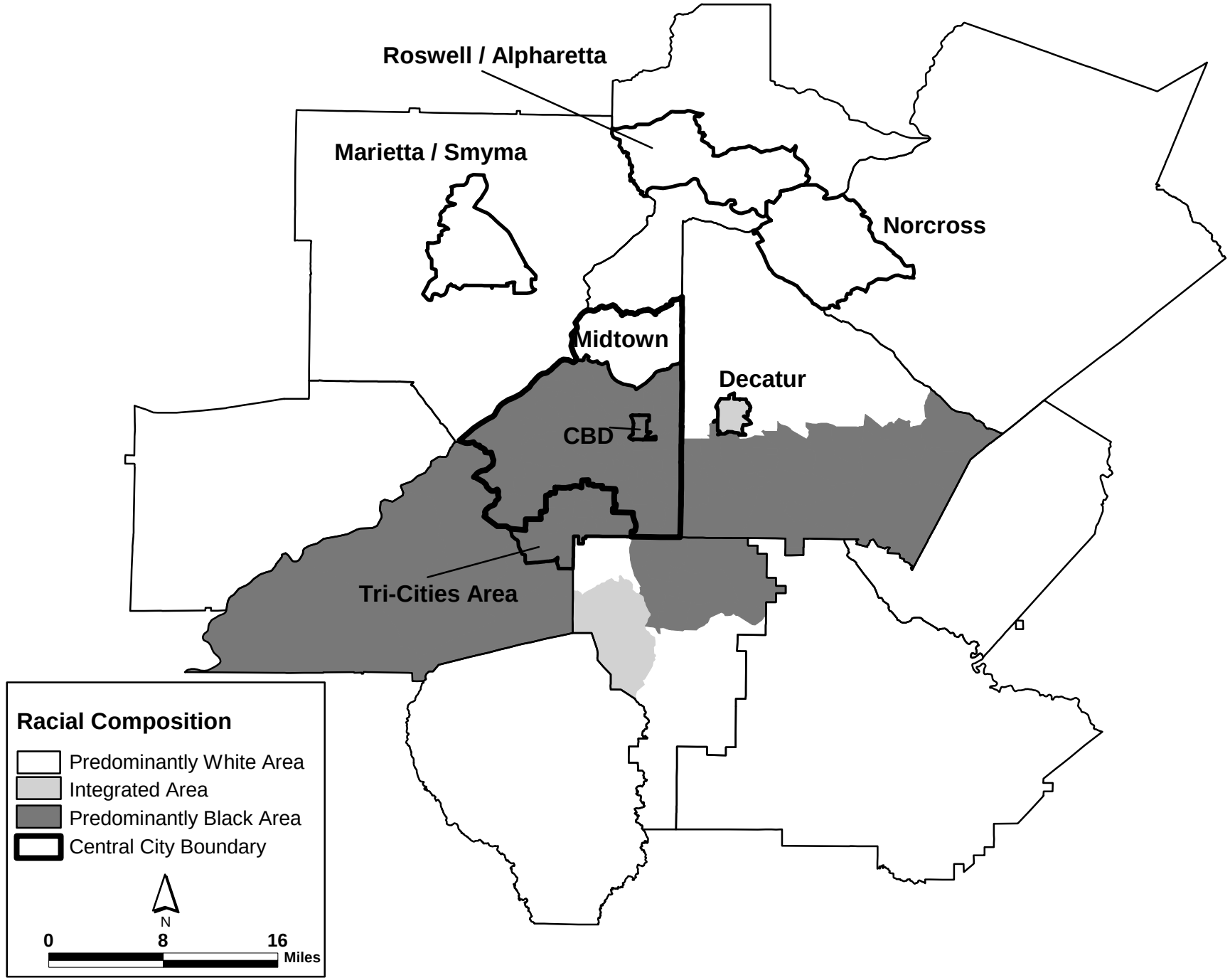
Angeles, respectively. The sample is also restricted to those without a work-preventing disability (about 2 percent of cases eliminated in both metropolitan areas). The final sample has N=212 and N=522 for Atlanta and Los Angeles, respectively.[12]

The empirical strategy is as follows. A measure of the percentage of jobs with high skill requirements in areas searched by respondents is constructed and then the factors determining such search, such as residential location and mode of transportation, are analyzed. Specifically, the high-skill jobs measure is constructed by averaging the percentage of jobs that require a college degree in those areas searched by the respondent—e.g., for a worker searching in areas 1, 2 and 3, high-skill job concentration is the average of the values of the percentage of jobs that require a college degree in these three areas. This measure is constructed using the seven search areas for which the surveys in each metropolitan area gathered information. Though not exhaustive, the areas covered are fairly representative of the central city and suburbs in each metropolitan area, though this is more true in Atlanta than in Los Angeles (See Figure 2 and 3 for the geographic location and boundaries of these search areas in Atlanta

[12]A concern in using recent job searchers is that these subsamples maybe systematically different from the overall samples along some measured or unmeasured (such as motivation) characteristics, and thus could lead to bias in model estimates. While it is difficult to examine this potential bias for unmeasured characteristics for obvious reasons, it is not for the measured ones. One potential source of bias is that there may be systematic differences in the extent to which racial groups search for work, especially given the employment difficulties of blacks. To examine this, pooled regressions across racial groups in each metropolitan were estimated using a dummy variable indicating whether the respondent recently searched (within year prior to survey) as the dependent variable. Independent variables in the models include personal, residential location, and mode of transit variables listed here. Coefficient estimates for whether the respondent was black (or Latino in Los Angeles) were never significant in these models in either metropolitan area, indicating no differential selection across racial groups. However, the models indicated that recent job searchers are much more likely to be single, young, without children, and not employed, as would be expected. Racially specific estimates of these models for each metropolitan area indicate that this bias is true for each racial group. Since the analysis focuses on comparisons across racial groups, the selectivity of job searchers across these dimensions is unlikely to be a serious issue in this analysis because it moves in the same direction and is equal in magnitude across racial groups.

Atlanta Search Areas

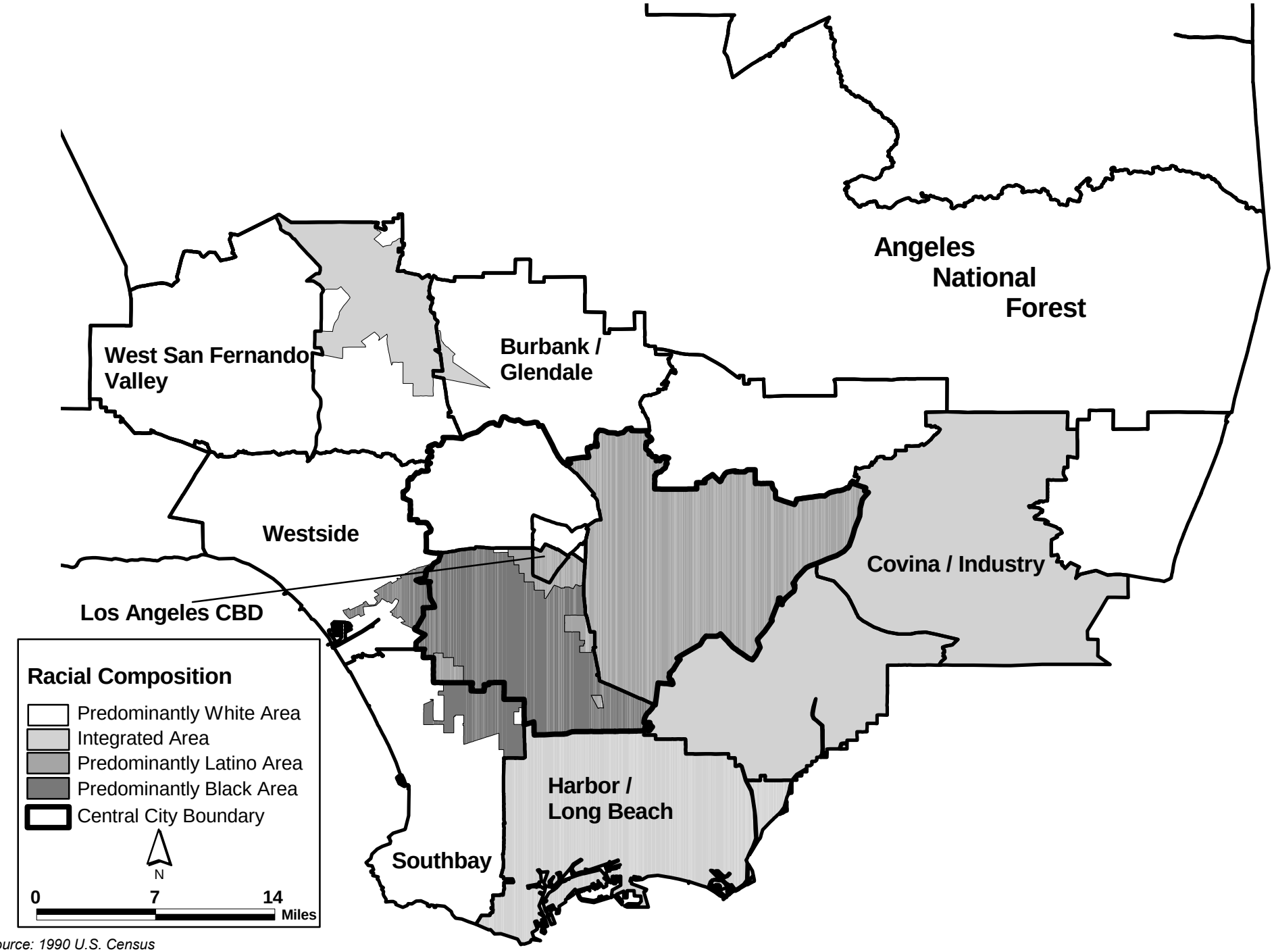
Figure 2



Source: 1990 U.S. Census

Los Angeles Search Areas

Figure 3



Source: 1990 U.S. Census

and Los Angeles). We experimented with a number of other measures of geographic skills mismatch but found results qualitatively similar to those shown here.[13]

The Atlanta and Los Angeles portions of the MCES are used to measure the percentage of jobs in the search areas that require a college degree. These data are based on questions about the last-hired worker/last filled job in the firm.[14] MCES are an employee-weighted representative sample of firms in each metropolitan area interviewed in 1993/94. The MCES also contains geographic identifiers at the census tract level so that the geographic boundaries of the search areas identified in the household survey can be superimposed on the employer data. Geographic Information Systems (GIS) techniques are used to geocode firms in the MCES employer data to the seven geographic search areas in Atlanta and Los Angeles, and the percentage of jobs that require a college degree in these areas is calculated.

The use of the MCES has a number of other advantages. The MCES ran concurrently with the MCSUI household survey so that the concentration of jobs requiring college degrees faced by the respondent during search in the geographic areas in question is likely accurately measured. Finally,

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[13]Since these search areas differ by geographic size (in both Los Angeles and Atlanta), and therefore by the magnitude of the employment opportunities they offer, we experimented with alternative estimates of the geographic skills mismatch variables in areas searched that included weights for the number of employment opportunities (i.e., number of recent hires in search area). We also experimented with the ratio of low-skilled workers being hired to low-skilled searchers in each search area as an alternative measure of geographic skills mismatch. This measure would account for the fact that while average skill requirements are higher in the central cities, there may be many jobs for low-skilled workers in central cities and that low-skilled workers searching for jobs there should be applying for jobs with low skill requirements. Results of these alternative estimates were qualitatively similar to those shown here,

[14]Focusing on the last-hired worker in each establishment might cause an oversample of high-turnover or low-wage/low-skill employees *within* (as opposed to across) establishments. This bias could therefore lead to underestimates of the true percentage of jobs that require a college degree. However, Holzer (1996) shows that the distribution of workers across 1-digit occupations in these establishments corresponds fairly closely to the same estimated distributions in the 1990 census for these four metropolitan areas, which implies that any such bias in the nature of the sample is not severe. Because of the sampling design, the sample might still overstate the presence of high-turnover jobs within the lower educational or occupational categories. But the relatively high frequency of reading/writing, arithmetic, and computer tasks required on these jobs (Holzer, 1998) also suggests that any such bias should not be not terribly large. It is not clear whether this potential bias is greater in the suburbs than in the central city, though the disproportionate share of low-skill jobs in the suburbs suggests that this may be the case.

MCES contains a rich set questions concerning the job skill requirements (education, experience, and training) of and tasks involved in the last-filled job in the firm.

Concerns about the empirical strategy and the definition of high skill used in this analysis must be addressed. Surely, the proposed measure of high-skill job concentration is imperfect. The MCES survey only gathered information on seven possible search areas in each metropolitan area. Hence, if a person searches anywhere within the search area in question, high-skill job concentration for the entire area is averaged into the measure. Unfortunately, more spatially disaggregated measures of search behavior are not available. Nevertheless, to the extent that the skill variable is plagued by measurement error, estimates of the effect of high-skill job concentration on the probability of having a job will likely be biased downward. This bias should be kept in mind when interpreting the results presented below.

Second, the measure of job-skill requirements using education as a proxy for skill may be limited. There is some debate about what constitutes skill. In addition to education, others have stressed the importance of cognitive and social/interactive skills as relevant in assessing job requirements (Autor, Levy, and Murnane, 2002; Cappelli, 1996; Holzer, 1996). To address these concerns, alternative definitions of high-skill jobs that include measures of cognitive and social tasks and other job experience requirements are constructed and compared. These alternative measures of high-skill jobs are shown below and are strongly correlated to that used in this study; when used in regressions, they produce qualitative results similar to those presented here.

In addition to the measure of high-skill job concentration, the primary explanatory variables used in the models include measures of residential location, mode of transportation, job search, employment status, and the standard vector of observed demographic and human capital variables (race, age, sex, marital status, children younger than 18 at home, education, enrolled in school, and ever had job training). For residential location, GIS and 1990 U.S. Census data are used at the census tract level to examine the racial/ethnic residential composition of census tracts in Atlanta and Los Angeles and seven types of submetropolitan areas are defined following Stoll, et al. (2000): central business district (CBD), black

central city, Latino central city, white central city, black suburbs, integrated suburbs, and white suburbs.[15] Respondents in Atlanta and Los Angeles are then assigned to these areas based on their census tract location. In Atlanta, there are no respondents in the CBD (the ASUI did not sample people there), nor is a Latino central city present.

Mode of transportation measures include dummy variables for how respondents *regularly* travel to work on their last or current job: car, public transportation, or other means. There are a couple of concerns in this definition of mode of travel. First, mode of travel is not asked for those who searched while not employed; thus, for this group it must be assumed that mode of travel during search is the same as that for their last job. A potential problem here is that car access could explain employment, but this assumption works in the other direction of this potential bias. Second, car access is defined as whether the respondent regularly traveled to work by car. This definition, however, should pose little problem since it is a broader definition of car access than in other surveys, which ask only whether the respondent owns a car; in the latter case car access could include use of another household member's car but would not be measured as such. A larger problem is that the public mode of transportation option response does not differentiate between rail and bus.

Finally, several controls are included for job search during the most recent search. Several researchers have shown that job search methods are important determinants of employment outcomes (Holzer, 1988; Melendez and Falcon, 1997). Moreover, differences in search methods used may be important determinants of search in areas with high-skill job requirements. For those who searched for employment in the last year prior to the survey, the surveys ask whether respondents used up to eleven job search methods. From these questions, four more general job search method dummy variables are

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[15]See Stoll et al. (2000) for a fuller justification and richer discussion of these definitions. A number of different definitions and measures of these submetropolitan areas were defined and compared. For example, white suburbs were alternatively defined as those contiguous areas with whites representing 70 or 90 percent of the population. However, none of these alternative definitions of submetropolitan areas changed the basic qualitative story that emerges here, although the magnitudes of the estimates changed slightly.

developed using factor analysis. The eleven search methods load into the following categories: open (help wanted signs and walk-ins), social (use of friend and relatives), credential (sending resumes and using newspapers), and intermediary methods (school job placement offices, use of state, temporary, and/or private employment agencies and unions). In addition to these, a search intensity variable is included, which counts the number of areas searched (i.e., 1 through 7) during search.

DESCRIPTIVE STATISTICS

The geographic locations of the search areas in Atlanta and Los Angeles are shown in Figures 2 and 3, respectively. The search areas queried in ASUI and LASUI are located in either predominantly white, integrated, or black suburban areas (in Atlanta) and not in black (or Latino in Los Angeles) central city areas. The incomplete coverage of search areas is likely to bias our estimates of the percentage of high-skill jobs in areas searched and the number of areas searched. Below, the direction of these biases is discussed in more detail.

Table 1 provides measures of high-skill job concentrations for the search and nonsearch areas of Atlanta and Los Angeles.[16] Column 1 presents the percentage of jobs that require a college degree in these areas. Alternative measures of high-skill jobs are also provided to verify their distribution. Column 2 presents a broader definition of high-skill jobs that includes the tasks performed and the experience, training, and educational levels required by employers. This measure includes jobs that require a college degree, plus those recently filled jobs that require recent work experience, and specific work experience or training, plus those that require reading, writing, and math tasks. Finally, in column 3, high-skill jobs are defined even more broadly as jobs that require a college degree plus those recently filled jobs that

[16]Using MCES, the minimum number of firms in the search areas identified in the Atlanta and Los Angeles MCSUI was 15, but the vast majority had over 30 firms. For those areas with 15 to 30 firms, we re-estimated the high-skill concentration measure using a geographic boundary that extended 3 miles around the periphery of the area in question so as to capture more firms in the area. In the vast majority of cases, this new estimate did not differ statistically from those shown here.

TABLE 1
Percent of Jobs with High-Skill Requirements in Submetropolitan Areas of Atlanta and Los Angeles

	Job Skill Requirements (JSR) Measures[a]				Job Skill Requirements (JSR) Measures[a]		
Atlanta	1	2	3	**Los Angeles**	1	2	3
Search Areas				**Search Areas**			
Marietta/Smyrna	.188	.362	.533	West San Fernando Valley	.188	.335	.443
Roswell/Alpharetta	.245	.454	.541	Burbank/Glendale	.110	.312	.431
Norcross	.278	.413	.496	South Bay	.220	.443	.516
Decatur	.373	.564	.628	Westside	.159	.357	.515
Tri-City	.283	.317	.393	Harbor/Long Beach	.258	.325	.427
Mid-Town	.290	.488	.564	Covina/Industry	.094	.227	.334
Central Business District	.356	.565	.640	Central Business District	.379	.420	.551
Other Areas				**Other Areas**			
South Atlanta	.155	.348	.381	South Central	.098	.262	.279
South Dekalb	.294	.397	.427	East Los Angeles	.400	.480	.487
North Dekalb	.291	.498	.602	Southeast	.445	.535	.545
South Cobb	.171	.187	.327	Pomona	.164	.316	.349
North Cobb	.169	.192	.227	Pasadena	.151	.309	.331
Gwinnett	.104	.314	.370	Agoura Hills/Malibu	—	—	—
Douglas	.220	.375	.471	East San Fernando Valley	.147	.230	.333
Clayton/Riverdale	.119	.192	.254				
Fayette	.207	.471	.577				
Henry	.282	.408	.521				
Rockdale	.197	.403	.486				
Correlations				Correlations			
JSR 1	1.00	.825	.723	JSR 1	1.00	.881	.758
JSR 2	.825	1.00	.949	JSR 2	.881	1.00	.847
JSR 3	.723	.949	1.00	JSR 3	.758	.847	1.00

Source: 1992–94 MCSUI Employer Survey

[a]Job skill requirements are defined in the following ways: (1) percentage of all recently filled jobs that require a college degree; (2) those jobs in (1) plus those recently filled jobs that require recent work experience, and specific work experience or training, and that require reading, writing, and math tasks; and (3) those jobs in (1) plus those recently filled jobs that require recent work experience, and specific work experience or training, and that require more than three tasks, and that require a high school diploma.

require recent work experience, and specific work experience or training, and that require more than three tasks, and that require a high school diploma.[17] These definitions could be described as judgment decisions and therefore somewhat arbitrary, but we have greater confidence in them since similar ones have been used elsewhere (Stoll et al., 2000; Holzer, 1996).[18]

Two strong patterns emerge from Table 1. First, the three measures of high-skill jobs indicate similar spatial distributions of high-skill job concentrations across submetropolitan areas of Atlanta and Los Angeles, though they differ in levels, as should be expected. As can be seen in the lower panel, all three measures of high-skill jobs are strongly correlated. Hence, though much less broad in definition than the alternative measures, jobs that require a college degree is a reasonable measure of high-skill jobs. Second, there is considerable variation in the percentage of high-skill jobs across the search areas and across all submetropolitan areas of Atlanta and Los Angeles. In the search areas, high-skill job concentration is relatively higher in or near the central business district and in areas nearer to black (and to a lesser extent Latinos in Los Angeles) populations. In nonsearch areas, high-skill job concentration is relatively lower in black residential areas (such as in South Atlanta in Atlanta and South Central in Los Angles) and in suburban areas that are predominantly white (such as Gwinett and Clayton/Riverdale in Atlanta and Pasadena in Los Angeles, though the locations of these areas are not identified in the maps).

Table 2 addresses the question of whether less-educated blacks and Latinos, relative to comparable whites, face a geographic skills mismatch.[19] The results for both the combined MSAs (panel A) and by each metropolitan area (panel B) show statistically significant racial differences in high-skill

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[17]Possible tasks on the job include reading, writing, math, computer, customer-oriented, or phone tasks.

[18]More alternative definitions of high-skill jobs were also explored. For example, jobs that require a college degree were excluded from the high-skill job definitions in column 2 and 3 in Table 1. These alternative measures can be considered high-skill jobs (based on measures of education, experience, and tasks requirements) that do not require a college degree. These measures were also strongly correlated with those shown in Table 1 and when used in models shown below produced similar estimates to those shown here.

[19]Of course, when the college educated are included in the sample, the estimates of the geographic skill mismatch of blacks (Latinos) relative to whites narrows, as expected, but the basic patterns shown here still hold.

TABLE 2
Means (standard deviations) of Main Variables by Race for Atlanta and Los Angeles

A. Combined MSAs	White	Black	Latino	All
Employed	.67	.45	.52	.52
High-skill job requirements				
Mean for area of residence	18.02	20.04*	17.06	21.48
	(6.58)	(7.47)	(11.55)	(9.84)
Mean for areas searched	20.18	24.11*	18.33	21.39
	(7.91)	(8.44)	(6.23)	(7.91)
By number of areas searched				
0–1 areas	17.82	25.80*	22.38*	22.78
2–3 areas	21.53	24.84*	17.40*	21.68
4–5 areas	22.07	23.77	17.45*	21.79
6–7 areas	24.98	22.49	17.54*	21.86
Number of areas searched				
Unadjusted	2.95	3.36	2.86	3.11
	(1.89)	(1.79)	(1.69)	(1.80)
Adjusted	.18	.27*	.23*	.24
	(1.95)	(1.80)	(1.69)	(1.79)
Residential location				
Black central city	.05	.61*	.13*	.33
Latino central city	.01	.01	.21*	.07
White central city	.07	.07	.10	.08
Central business district	.01	.01	.27*	.10
Black suburbs	.11	.16*	.01*	.10
Integrated suburbs	.09	.08	.13*	.10
White suburbs	.66	.05*	.14*	.22
Mode of transportation				
Car access	.84	.52*	.57*	.61
Public	.05	.34*	.27*	.25
Other	.11	.14*	.16*	.14
N	170	334	230	734

(table continues)

TABLE 2, continued

B. By MSA	Atlanta		Los Angeles		
	White	Black	White	Black	Latino
Employed	.73	.53*	.61	.40*	.52*
High-skill job requirements					
Mean for area of residence	22.11 (3.04)	25.86* (2.57)	14.12 (7.16)	16.97* (7.73)	17.06* (11.55)
Mean for areas searched	25.11 (6.94)	31.20* (5.76)	16.18 (6.77)	19.64* (5.17)	18.33* (6.23)
By number of areas searched					
0–1 areas	20.81	30.04*	13.89	20.11*	22.38*
2–3 areas	25.88	32.92*	18.05	19.92*	17.40
4–5 areas	28.46	31.37*	18.24	18.92	17.45
6–7 areas	28.61	28.52	18.63	18.56	17.54
Mean employment growth for areas searched	29,517.91 (8,278.40)	20,267.49* (7,049.18)	62,306.13 (24,146.48)	48,230.34* (16,057.00)	53,478.85* (25,380.63)
Number of areas searched					
Unadjusted	2.96 (2.04)	3.52* (1.90)	2.94 (1.74)	3.26 (1.72)	2.86 (1.69)
Adjusted	.17 (2.05)	.24* (1.89)	.19 (1.75)	.29* (1.72)	.23 (1.69)
Residential location					
Black central city	.03	.54*	.03	.66*	.13*
Latino central city	—	—	.02	.02	.22*
White central city	.06	.02	.11	.09	.10
Central business district	—	—	.02	.02	.27*
Black suburbs	.16	.36*	.04	.05	.01
Integrated suburbs	.00	.02	.19	.13*	.13*
White suburbs	.75	.06*	.59	.03*	.14*
Mode of transportation					
Car access	.93	.45*	.77	.59*	.61*
Public	.02	.44*	.08	.29*	.24*
Other	.05	.09*	.15	.12	.15
N	83	129	87	205	230

Source: ASUI (1994) and LASUI (1994).
*Statistically different from whites at the .05 level of significance within metropolitan areas.

job concentration for *area of residence*. This result is consistent with past studies and indicates a geographic skills mismatch for less-educated blacks (Pastor and Marcelli, 2000; Kasarda, 1995). Of course, this method of determining geographic skills mismatch for minorities does not imply that less-skilled whites are not mismatched. They could be, but this seems unlikely given the racial residential patterns and high-skill job concentrations observed here. Still, the purpose of using this approach is ultimately to assess how much of the racial difference in employment is accounted for by minorities' relatively greater geographic skills mismatch.

Do blacks undo the geographic skills mismatch through search behavior? The data show that this is apparently not the case as the racial differences in high-skill job concentration in *areas searched* in both metropolitan areas remain statistically significant.[20] That is, blacks tend to search in areas where the percentage of jobs that require a college degree is higher than those of whites.

A note on bias in these results should be pointed out, however. The incomplete coverage of search areas in Atlanta and Los Angeles generated by the survey design is likely to bias estimates of the racial and ethnic differences in the extent of high-skill job concentration in areas searched and in the number of areas searched. In Atlanta, survey respondents were not asked whether they searched for work in the predominantly black central city areas, while the same was true in Los Angeles for respondents in predominantly minority areas of South Central, East, and South East L.A. (see Figure 3). These areas show lower concentrations of high-skill jobs. At the same time, many predominantly white suburban areas that also show lower concentrations of high-skill jobs in these metropolitan areas were not included as search areas in the survey.

Thus, the direction of bias in the estimates of the racial and ethnic differences in the extent of high-skill job concentration in areas searched generated by the survey design is not clear. However, that

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[20]These same patterns are found when the alternative definitions of high-skill jobs are used as defined in Table 1. The means of these for each racial group are shown in Table A1 for each metropolitan areas.

the estimates of high-skill job concentration for area searched is systematically higher than that for area of residence suggests that the estimates of the former are upwardly biased for the sample. This may be even truer for blacks since the interracial estimates of these are greater for high-skill job concentration measures for areas searched than for area of residence. This could lead to an overestimate of the degree of geographic skills mismatch faced by blacks. On the other hand, there are also reasons to believe that these results are precise or may understate the racial differences in the percentage of jobs that require a college degree in areas searched. This would occur if blacks do not search first near their area of residence because of knowledge of the lack of job opportunities there (i.e., spatial mismatch).

Table 2 also shows a few other clear patterns. Note that the interracial differences in the skill-level job requirements variables for areas searched and area of residence are higher in Atlanta than in Los Angeles, perhaps because Atlanta is more centralized (at least at the time of the survey).[21] Second, the interracial differences in high-skill job concentration in areas searched narrows as respondents search more areas (as can be seen in the third through sixth rows of Table 2), implying that as whites extend their geographic search they are more likely to search in areas with higher percentages of high-skill jobs, with the opposite being true for blacks, and to a lesser extent Latinos.[22] The table also reveals that consistent with previous research, the employment rates for blacks and Latinos are significantly lower than those for whites.

The incomplete coverage of ASUI and in particular LASUI search areas is also likely to understate the number of areas searched by minority respondents relative to the number searched by

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[21]For example, using 1996 Department of Commerce data on employment and 1990 U.S. Census data on people, Glaeser and Kahn (2001) estimate that about 44 and 17 percent of Atlanta's employment and population, respectively, are located in the inner ring, while the comparable figures for Los Angeles are about 32 and 10 percent, respectively. The inner ring is defined as those areas that are less than the median distance to the central business district.

[22]The number of areas searched is a statistically significant predictor of the percentage of jobs that require a college degree in areas searched in racially specific regressions in both metropolitan areas. The coefficient signs of the number of areas searched for each racial group of this variable is consistent with those shown in Table 2.

whites in Atlanta and Los Angeles. Again, minority residential areas were not included as search areas in the survey, but relative to white areas that also were not included, this problem appears more acute in Los Angeles than Atlanta. Thus, to the extent that people are likely to search first in their areas of residence and in those areas bordering their residence, and to the extent that minorities are less likely than whites to live in one of the omitted search areas, the estimate of the number of areas searched by minority workers in this survey will be biased downward. Table 2 shows the unadjusted number of areas searched. In Atlanta, blacks searched in more areas than whites, and in Los Angeles there were no statistical differences in the number of areas searched across racial groups. However, once statistical adjustments are made to account for the survey design bias, blacks, but not Latinos, searched in more areas than whites in Los Angeles and blacks still searched in more areas than whites in Atlanta.[23] These results are consistent with those in Stoll (1999) and suggest a behavioral response by blacks in extensive geographic search that is consistent with living in low-opportunity areas.

Other notable differences in the means are presented in Table 2. Consistent with research on racial residential segregation (Massey and Denton, 1993), there are significant differences in residential location between blacks (Latinos) and whites. Moreover, consistent with recent research on racial differences in car access (Raphael and Stoll, 2001), blacks (Latinos) are much less likely to have access to cars than whites, though the differences between blacks and whites is much greater in Atlanta than in Los Angeles, perhaps because of the over-reliance of cars in Los Angeles and the relatively more developed rail system in Atlanta. Finally, areas searched by blacks relative to whites are characterized by low

[23]To account for the survey design bias, OLS regressions were estimated for each racial/ethnic group in each metropolitan area, with the number of areas searched as the dependent variable. The independent variables included dummy variables for whether the individual lived in a search area or not, and dummy variables for whether the individual resided in a search area that bordered none, one, three, or four search areas (bordered two search areas is the reference category). The means for these variables are shown in Table A1. The adjusted means for the number of areas searched shown in Table 2 are the means of the residuals from these regressions.

employment growth in both Atlanta and Los Angeles, and therefore low opportunity for employment, which is consistent with research on spatial mismatch (Stoll et al., 2000).

EMPIRICAL RESULTS

Explanations of Racial Differences in High-Skill Job Concentration in Areas Searched

In this section, OLS regressions are estimated to examine the factors that account for interracial differences in search in areas with high-skill job concentrations. The complete model specification is given by:

$$HSJC_i = \beta' \chi_i + RHSJC_i \gamma + \nu' R_i + \theta' M_i + \phi' JS_i + u_i \quad (1)$$

where *i* indexes individuals, $HSJC_i$ is a measure of high-skill job concentration for areas searched by *i*, χ_i represents a vector of personal characteristics, $RHSJC_i$ is a measure of high skill job concentration in area of residence, R_i is a vector of residential location dummy variables described above, M_i indicates a vector of mode of transportation variables, JS_i is a vector of search variables including search methods used by individual *i* during the most recent search and a variable measuring the number of areas searched, and u_i is the error term that is assumed to be normally distributed.[24] The personal characteristic variables include age (measured in years), dummy variables for educational attainment (high school dropout, high school graduate, and some college) with high school dropout as the reference category, and sex. Personal

[24]In this and other models in this paper, one must consider that due to the ASUI and LASUI survey design, the use of normal OLS and probit models likely introduces bias in estimating model coefficients and standard errors. ASUI and LASUI used a stratified sampling technique to ensure oversampling of the poor and to minimize the costs of data collection on specific racial/ethnic groups. ASUI and LASUI is a clustered sample on fractions of the total census tracts in Atlanta and Los Angeles. For example, in Los Angeles, LASUI sampled on only 98 of the 1,652 census tracts in Los Angeles County. Because of this sampling technique, key estimating assumptions, such as random individual effects and uncorrelated and independent error terms necessary for unbiased and efficient coefficient estimates, are violated. More importantly, the usual standard errors and test statistics for the slope coefficients may be seriously biased (Moulton, 1990). Thus, the potential nonindependence of observations *i* within neighborhood groups *j* were taken into account (i.e., census tracts) by adjusting the standard errors in these and other models using clustering techniques. The results of these were never significantly different than those shown here however.

characteristic variables also include a dummy variable for marriage, presence of own children, whether the individual ever received job training, or whether employed. Table A1 presents the means of the personal variables for the sample used in the analysis. Dummy variables for race are also included, with whites as the reference category.

We include the number of areas searched to control for geographic job search intensity. Given that the survey design is likely to cause a bias in estimates of the number of areas searched as discussed above, this variable is adjusted for the effects of residential location relative to the search areas as discussed in footnote 12. The adjusted number of areas searched variable is included in the model specification.

Table 3 presents the results for several OLS specifications of the high-skill job concentration variable for the pooled sample across metropolitan areas and racial groups. The small sample sizes for whites in both metropolitan areas makes pooling across racial groups necessary, and F-tests on the coefficients of the main variables of interest in metropolitan area-specific regressions indicate such pooling is justifiable. The first model in column 1 controls for race and ethnicity, and a host of personal characteristic and search variables listed in Tables 2 and A1, and a dummy variable for Atlanta.[25] Note that when compared to the mean racial differences in high-skill job concentration in areas searched presented in Table 2, adding the variables described above has little effect on estimates of black-white differences. Latino-white differences widened with their inclusion, in particular with the control for metropolitan area.[26]

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[25]The inclusion of residential location dummies indicating proximity to the search areas as controls for the survey design bias were never significant and never significantly affected estimates of the other coefficients in the model and thus are not included here.

[26]Surprisingly, few of the personal variables are significant in these models, in particular those for education. One expectation is that those with some college would tend to search in areas characterized by higher skills requirements than those who are have a high school degree or who are dropouts. However, when the college educated are included in the samples, we find a positive, significant relationship between these and search in areas with high job-skill requirements as expected, though the results are not shown here.

TABLE 3
Linear Regression Estimates of Search in Areas Characterized by High-Skill Job Requirements

	(1)	(2)	(3)	(4)	(5)
Black	3.334***	3.382***	-1.691	1.557**	1.049
	(0.622)	(0.652)	(1.852)	(0.765)	(0.762)
Latino	3.349***	2.903***	-0.816	2.616***	2.458***
	(0.763)	(0.886)	(1.991)	(0.840)	(0.830)
High-skill job requirements - Area of residence	—	0.016	-0.175**	—	—
		(0.030)	(0.082)		
High-skill job requirements - Area of residence x black	—	—	0.260***	—	—
			(0.089)		
High-skill job requirements - Area of residence x Latino	—	—	0.189***	—	—
			(0.090)		
Residential location					
Black central city	—	—	—	2.595***	2.227***
				(0.829)	(0.822)
White central city	—	—	—	2.836***	2.499***
				(1.006)	(0.995)
Latino central city	—	—	—	0.354	-0.231
				(1.107)	(1.099)
Central business district	—	—	—	2.087**	1.177
				(1.046)	(1.052)
Black suburbs	—	—	—	2.155**	2.171**
				(0.953)	(0.969)
Integrated suburbs	—	—	—	-1.565*	-1.571*
				(0.935)	(0.933)
Mode of transportation					
Car access	—	—	—	—	-2.485***
					(0.544)
Other transit	—	—	—	—	-0.611
					(0.847)
R^2	0.39	0.39	0.39	0.42	0.44
N	734	734	734	734	734

Notes: Standard errors are adjusted for clustering and are reported in parentheses. * p < .10; ** p < .05; *** p < .01.
All models include controls for metropolitan area (Atlanta dummy), personal characteristics including variables for age and dummy variables for sex, educational attainment, marriage, children, job training, and employment status, and search including variables for number of areas searched (adjusted) and dummy variables for search method variables listed in Table A1.

Model 2 adds the skill level of jobs in the area of residence variable to examine whether such a variable influences the skill level of jobs in areas searched, perhaps because of frictions that limit the spatial extent of search. The coefficient is not significant, suggesting that it does not for the sample as a whole. But if blacks' or Latinos' search is more limited than other groups, either because of racial segregation that limits their ability to relocate or because of lack of private transportation, then the skill level in the residential areas should be a more important determinant of the skill level of areas searched than for whites. This suggests that the residential-area skill level variable should be interacted with the racial dummies, with positive coefficients expected on these interactions. Model 3 includes these interactions and finds positive and significant results offering support for this hypothesis.

Models 4 and 5 analyze whether racial segregation and lack of private transportation are factors that limit the extent of blacks' and Latinos' geographic search by examining whether these factors account for racial differences in the skill level of jobs in areas searched. Model 4 adds dummies for residential location to the specification in column 2. The high-skill job requirement variable for area of residence is not included because of the high level of multicollinearity with the residential location dummies. The results show that relative to the white suburbs, residing in the central city (except the Latino central city), as well as in black suburbs, is associated with search in areas with higher levels of high-skill job concentration. Moreover, adding the residential dummies causes large declines relative to the results in column 3 in the estimated black-white differences in this search (54 percent) and smaller declines in Latino-white differences (10 percent), perhaps because Latinos are less segregated from whites than are blacks. Hence, racial residential segregation appears to be a principal determinant of black-white differences in search in areas with high-skill job concentrations.

Model 5 adds the mode of transportation dummies to the specification in column 4 to examine the extent to which lack of car access may be responsible for the relatively high levels of high-skill job concentration searched by blacks and Latinos. The results indicate that car access does matter for an individual's geographic search. Car access is associated with search in areas with lower levels of high-

skill job concentration.[27] Moreover, the addition of these transit dummies to the model specification reduces the estimate on the coefficient for blacks and Latinos by 32 and 6 percent, respectively.

Estimating the Relationship between Employment and Search in Areas Characterized by High Skill Job Concentration

In this section, I examine whether search in areas with high-skill job concentration is negatively correlated with employment in order to estimate whether and to what extent geographic skill mismatch can account for racial differences in employment. These questions are examined by estimating a series of probit employment models pooled across racial groups and metropolitan areas that include the measure of high-skill job concentration along with a host of covariates in the model specification. This analysis is captured by the following equation:

$$P_i(E) = \beta' \chi_i + \varphi HSJC_i + \theta' M_i + \phi' JS_i + \kappa' LD_i + u_2 \qquad (2)$$

where $P_i(E)$ is equal to the probability of employment for the i^{th} individual, *HSJC* is the high-skill job concentration measure of the areas searched by *i*, and *LD* is a control variable for labor demand that measures employment growth in areas searched by *i*, with the remaining terms previously identified.[28] Employment growth is measured as the change in total employment between 1980 and 1990 in each search area for each metropolitan area using data from the Atlanta Regional Commission (ARC) and the Southern California Association of Governments (SCAG) for Atlanta and Los Angeles, respectively.[29] These counts are then transformed into metropolitan area-specific trecile dummy variables and used in the regressions. Previous research has documented that employment growth is a good measure of

[27]Interactions between the race dummies and the mode of transit dummies indicate a positive coefficient for the black and car access interaction, suggesting that reduction of search costs through increased auto access significantly increases blacks' geographic search to include areas with more skill-appropriate jobs.

[28]Dummy variables for area of residence are not included in the models specified here since adding them eliminates all of the variation in the high-skill job concentration measure.

[29]The author thanks Keith R. Ihlanfeldt at Florida State University for providing these data for Atlanta, and David Sjoquist at Georgia State University for detailed geographical information about Atlanta's superdistricts.

employment opportunity, and is strongly correlated with a host of other measures of job opportunity such as vacancy rates, employment-to-people ratios, and employment-growth-to-population growth ratios (Stoll and Raphael, 2000).[30]

Using probit regressions where the dependent variable is a binary employment indicator, several models are specified. Model 1 in Table 4 includes in the employment probit control variables for personal and search characteristics and for metropolitan area and only shows coefficients for the racial dummy variables. The coefficients on these variables indicate that blacks are still significantly less likely to be employed relative to whites and Latinos even after such characteristics and factors are taken into account.

Column 2 adds the high-skill job requirement measure to the specification in column 1. It indicates that there is a significant, negative correlation between search in areas with high-skill job levels and employment, and that black-white differences in high-skill job concentration in areas searched accounts for a substantial fraction (36 percent) of the black-white difference in employment, as measured by the reduction in the coefficient on the black dummy. Moreover, the partial derivatives of the probit coefficients are estimated at the sample means to evaluate the magnitude of the effect of search in areas characterized by high-skill job requirements on employment. These estimates indicate that a 1 point increase in the percentage of jobs that require a college degree in areas searched by the noncollege-educated is associated with about a 1 percentage point reduction in employment (.009).

Column 3 adds controls for mode of transportation. Relative to the results in column 2, the coefficient for high-skill job requirements remains stable with these controls. The positive and significant coefficient on car access is consistent with previous studies, including those which use instruments for car

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[30]ARC and SCAG employment data are reported at the census tract level. To construct the employment growth measures in the analysis, these data were geocoded and aggregated within the seven search areas identified in ASUI and LASUI. Of course, a more precise measure of labor demand for noncollege educated could be constructed from low-skill employment counts or for those industries in which jobs were disproportionately low-skill like retail trade, but SCAG data records these employment counts by industry for 1990 only, and not by educational level.

TABLE 4
Probit Estimates of Employment Status

	(1)	(2)	(3)	(4)
High-skill job requirements for areas searched	—	-0.028**	-0.026*	-0.027*
		(0.012)	(0.013)	(0.014)
Black	-0.488***	-0.310	-0.216	-0.201
	(0.198)	(0.221)	(0.242)	(0.260)
Latino	-0.150	-0.133	-0.141	-0.130
	(0.184)	(0.185)	(0.185)	(0.186)
Mode of transportation				
Car access	—	—	0.412**	0.409**
			(0.209)	(0.210)
Other transit	—	—	0.234*	0.223*
			(0.137)	(0.137)
Employment growth for areas searched				
Second trecile	—	—	—	0.285**
				(0.141)
Third trecile	—	—	—	0.359**
				(0.152)
Log likelihood	-472.30	-472.15	-467.25	-456.24

Notes: Standard errors are adjusted for clustering and are reported in parentheses. * $p < .10$; ** $p < .05$; *** $p < .01$.
Control variables for personal and search characteristics (those described in Table 3, except dummy for employment status) and metropolitan area (Atlanta) are included in all specifications.

ownership (such as gas taxes and car insurance rates) to disentangle the endogenous relationship between car access and employment (Raphael and Rice, 2002; Ong, 2001). Column 4 adds a measure of employment growth in areas searched to the specification in column 3 to control for spatial variation in employment demand. The addition of this control does not appreciably change the basic results.

Using these results, we can estimate the contribution of the geographic skills mismatch to the racial differences in employment. Table 2 indicates a black-white and Latino-white employment rate difference of 22 and 15 percentage points, respectively. The employment probit indicates that a 1 percentage point increase in jobs that require a college degree in areas searched decreases employment by 1 percentage point. Multiplying this figure by the black-white mean differences in the skill-search variables (3.93 percentage points) indicates that lowering the percentage of jobs that require a college degree in areas searched by blacks to that of whites would increase the black employment rate by 3.93 percentage points to nearly 49 percent. This corresponds to an 18 percent reduction in the black-white employment rate differential. These estimates are somewhat lower than those received in Table 4, when the change in the magnitude of the coefficient on black is examined after the inclusion of the skill-search variable into the equation shown in columns 1 and 2.

The corresponding analysis for Latinos (using the Latino-white difference in the skill-search variable from Model 1 in Table 3 (or 3.35 where the metropolitan area control is taken into account) indicates that lowering the percentage of jobs that require a college degree in areas searched by Latinos to that of whites would increase the Latino employment rate by approximately 3.35 percentage points to nearly 55 percent. This corresponds to an approximately 20 percent reduction in the Latino-white employment rate differential.

CONCLUSION

Persistent racial differences in employment, especially among the less-educated, raise important questions about their causes. Among many factors examined, less attention has focused on the potential role of a geographic skill mismatch in contributing to these differences. Given the persistence of racial

residential segregation observed in U.S. metropolitan areas combined with nonrandom patterns in the location of high-skill jobs, blacks' residential concentration in central cities where high-skill jobs also tend to concentrate is likely to harm their employment opportunities. This is especially true if the costs of job search limit the geographic extent of search.

This paper has examined whether a geographic skills mismatch between the location of less-educated minorities, in particular African Americans, and high-skill jobs contributes to the lower employment rates of this group. It has done so by examining geographic search patterns of less-educated workers. The results from this study are several and generally confirm expectations. They indicate that in relation to less-educated whites, comparable blacks and Latinos suffer from a geographic skills mismatch. This mismatch is found to be slightly more pronounced in Atlanta than in Los Angeles, possibly because Atlanta is more centralized. Given racial housing segregation and the greater share of high-skill jobs near black and Latinos residences, less-educated blacks and Latinos tend to search in areas with higher concentrations of high-skill jobs, while comparable white workers tend to search in areas with lower levels of these concentrations. However, the analysis reveals further that this mismatch is not undone by private search behavior of less-educated blacks and Latinos. These findings confirm the notion that the geographic spatial search patterns of minority workers appear to be centered on respondents' residential locations in part because of the greater costs (in relation to whites) of extending their geographic search.

The results also reveal that much of the relatively greater geographic skills mismatch faced by blacks is accounted for by racial residential segregation and in racial differences in car access. Residents in central city areas, where most blacks are concentrated, search in areas with higher concentrations of high-skill jobs. These results are less true for Latinos, perhaps because they are less segregated from whites than are blacks. Interestingly, car access attenuates this relationship, especially for blacks. This suggests that less-educated blacks who have access to cars, perhaps especially those with residential locations in the central city, search in areas with lower concentrations of high-skill jobs. One interpretation of this is that car access lowers search costs by reducing travel time and improving

flexibility during search, thus allowing such searchers to extend their geographic job search possibly to suburban areas characterized by lower concentration of high-skill jobs. Thus, the additional search costs imposed on less-educated blacks and Latinos relative to whites include those from racial residential segregation and their inferior access to cars.

But the geographic skills mismatch would be of little concern if such conditions did not affect employment. This paper also examined whether geographic skills mismatch matters in employment and found a negative, significant relationship between search in areas with high-skill job requirements and employment, even after controlling for the variation in labor demand (i.e., spatial mismatch) and other significant factors such as search methods and human capital attributes. Indeed, the estimates from these models indicate that geographic skills mismatch accounts for about 18 to 36 percent of the black-white employment gap and about 18 percent of the Latino-white gap.

TABLE A1
Means (standard deviations) for Personal Characteristics, Alternative High-Skill Job Requirements for Areas Searched, Search and Residence Adjustment Variables

A. Combined MSAs	White	Black	Latino	All
Female	.53	.65*	.44*	.56
Age	36.3	33.1*	33.7*	34.0
	(11.1)	(9.0)	(10.4)	(10.1)
Married	.37	.18*	.35	.28
Children	.34	.48*	.56*	.47
Less than H.S. degree	.11	.15*	.61*	.28
H.S. degree	.62	.65	.31*	.54
Some college	.27	.20*	.08*	.18
Enrolled in school	.14	.12	.14	.13
Training	.45	.47	.19*	.38
High-skill job concentration 2				
Mean for areas searched	39.38	42.44*	35.26	39.48
	(7.75)	(7.72)	(5.45)	(7.65)
High-skill job concentration 3				
Mean for areas searched	48.25	50.79*	43.67*	47.97
	(8.59)	(8.69)	(5.46)	(8.57)
Search methods				
Open	.60	.77*	.79*	.74
Social	.75	.83*	.83*	.81
Credential	.83	.86	.77*	.83
Intermediaries	.39	.53*	.32*	.43
N	170	334	230	734

(table continues)

TABLE A1, continued

	Atlanta		Los Angeles		
B. By MSA	White	Black	White	Black	Latino
Female	.52	.61*	.51	.60*	.47
Age	35.6	32.4*	37.2	33.5*	33.7*
	(11.2)	(8.2)	(11.1)	(9.5)	(10.4)
Married	.37	.22*	.37	.16*	.35
Children	.33	.41*	.34	.53*	.56*
Less than H.S. degree	.16	.14	.07	.17*	.61*
H.S. degree	.58	.67*	.66	.62	.31*
Some college	.27	.19*	.28	.21*	.08*
Enrolled in school	.14	.08*	.13	.15	.14
Training	.48	.43	.41	.50*	.19*
High-skill job concentration 2					
Mean for areas searched	45.00	49.96*	34.01	37.71*	35.26
	(4.31)	(4.39)	(6.38)	(4.12)	(5.45)
High-skill job concentration 3					
Mean for areas searched	54.67	59.95*	42.12	45.03*	43.67*
	(4.73)	(4.55)	(6.78)	(4.77)	(5.46)
Search methods					
Open	.59	.79*	.61	.76*	.79*
Social	.69	.81*	.82	.84	.83
Credential	.78	.86	.87	.87	.77*
Intermediaries	.34	.53*	.44	.53*	.32*
Residence (adjustment)					
Reside in search area	.49	.25*	.49	.28*	.47
Border 0 search areas	.18	.03*	.03	.00	.00
Border 1 search area	.07	.25*	.01	.01	.02
Border 2 search areas	.17	.47*	.29	.01*	.07*
Border 3 search areas	.04	.00	.01	.02	.14*
Border 4 search areas	.05	.00	.16	.67*	.29*
N	83	129	87	205	230

Source: ASUI (1994) and LASUI (1994).
*Statistically different from whites at the .05 level of significance within metropolitan areas.

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