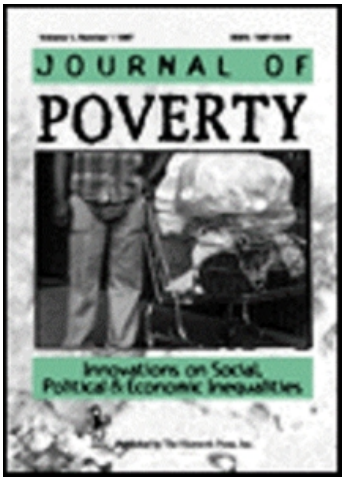


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# How Do Low-Skill Workers Fare in High Growth Areas? Job Accessibility in Phoenix, 1995-2000

Laura R. Peck [a]; John David Godchaux [b]
[a] School of Public Affairs, Arizona State University, Phoenix, Arizona, USA [b] NiJeL—Community Impact Through Mapping, Tempe, Arizona, USA

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# How Do Low-Skill Workers Fare in High Growth Areas? Job Accessibility in Phoenix, 1995–2000

LAURA R. PECK
*School of Public Affairs, Arizona State University, Phoenix, Arizona, USA*

JOHN DAVID GODCHAUX
*NiJeL—Community Impact Through Mapping, Tempe, Arizona, USA*



*Lack of jobs has been blamed as an important cause of poverty. Scarce research on the rapidly growing region of the southwestern United States compels this examination of a worker-work mismatch in the greater Phoenix metropolitan area. Analyzing a creative combination of data from the U.S. Census and local sources, the research finds little evidence that the spatial distribution of workers and work make entry-level jobs inaccessible to entry-level workers.*

*KEYWORDS employment, poverty, spatial mismatch, job accessibility*

Knowing what causes poverty is necessary to ameliorate it, and many theories exist. A considerable body of research argues that lack of jobs is a major cause of poverty. One explanation for the lack of jobs is a mismatch between workers and work, in terms of skills and in terms of space. Many empirical studies concentrated in the older cities of the Midwestern and northeastern United States have shown that for specific racial and ethnic groups, workers are spatially separated from employment opportunities, which may be the main cause of poverty locally. However, many of these studies empirically test a narrowly defined spatial mismatch, often between African American males and available jobs in a particular city or array of cities. But if the mismatch between workers and work is more broadly defined to include all races and ethnicities, and we include the younger cities of the

Address correspondence to Laura R. Peck, School of Public Affairs, Arizona State University, Phoenix, AZ 85004-0687, USA. E-mail: Laura.Peck@asu.edu

southwestern and western United States, do we still encounter low-skill workers that have poor access to jobs? After introducing the context in more detail, this article examines the extent to which entry-level jobs are accessible to low-skill workers in the greater Phoenix metropolitan area. In brief, we find no evidence that low-skill workers have poor access to entry-level jobs, an observation that allows us to rule out this important cause of poverty but that raises other questions, the implications of which we discuss in the conclusion.

## BACKGROUND

First advanced by Kain (1965, 1968, 1992), the spatial mismatch hypothesis asserts that access to employment among African Americans has been adversely affected by industrial shifts that moved employment opportunities to suburban areas, coupled with housing market discrimination, leaving disadvantaged residents in city centers without work or opportunities to move. Greater credence was given to this hypothesis in the important work of Wilson (1987), identifying both spatial and skills dimensions to the problem of mismatch between workers and jobs. These and the many other empirical studies that comprise the mismatch literature focus very heavily on African Americans, on men, and on youth, and they focus very heavily on the old industrial cities of the Midwest and Northeast (e.g., Chicago, Detroit, Pittsburgh, and Cleveland).[1] For example, at least eight papers reviewed the spatial mismatch hypothesis empirical literature during the 1990s, most of which found overall support for the hypothesis (Holzer, 1991; Ihlanfeldt, 1992; Ihlanfeldt & Sjoquist, 1998; Jencks & Mayer, 1990; Kain, 1992; Moss & Tilly, 1991; Preston & McLafferty, 1999; Wheeler, 1990). However, many of the studies reviewed concentrate exclusively on the spatial mismatch between African American workers (although not necessarily poor African Americans) and all employment opportunities, not necessarily employment opportunities relevant to a particular skill level. Many of these studies also focus on cities with long established urban forms where central cities with high concentrations of poverty give way to suburban, moderate-to-high income single-family homes.

Over time, the original notion of the spatial mismatch hypothesis has evolved to include different populations, such as women and those of Hispanic ethnicity, and not only African American males. Likewise, some scholars recognize that a broader conceptualization of spatial mismatch may be necessary (Preston & McLafferty, 1999), a conceptualization that accounts in a more holistic way for the varied populations, city types, and dimensions of disadvantage that exist in concert with possible spatial tensions. It is important to note that this more expansive formulation of the hypothesis deviates starkly from Kain's (1992) original notion of spatial mismatch, which was quite specifically aimed at African American males

facing housing discrimination. It follows that more recent studies with differing target populations and either different or no obvious housing constraints are not directly testing the narrowly defined Kainian spatial mismatch hypothesis, but are testing the spatial mismatch between a defined population and available jobs. This article considers job accessibility in broad context, considering low-skill workers and the jobs they might be suited to; we do not directly test Kain's formulation of the spatial mismatch hypothesis, though it generally motivates our work.

As we do, other studies motivated by the spatial mismatch hypothesis branch out in some ways. For example, one recent study examines a possible mismatch between welfare recipients (a unique population among mismatch studies) and low-skill job opportunities (Allard & Danziger, 2003). At the same time as being innovative in its choice of population, this work defends its choice of Detroit as sample city because it is "typical" by having "a high degree of residential segregation, a high central-city poverty rate, and a low suburban ring poverty rate . . ." (Allard & Danziger, 2003, p. 678). The industrial Rustbelt that Detroit is typical of is not typical of the urban areas of the U.S. southwest. There, cities have grown more than in any other region in the recent past and where cities have fundamentally different histories and lack the physical and residential structures of the older, northeastern-midwestern industrial areas.

Research on spatial and skills mismatches that exist in these "traditional" cities provides solid evidence that spatial problems disadvantage various populations in these cities; but we know very little about possible mismatches in the younger, rapidly growing cities of the U.S. southwest. Although some research includes southwestern cities—either as a single, focal city (Stoll, 1999) or as one or more of many cities studied (Cooke, 1996)—evidence is underwhelming that spatial mismatch operates there as elsewhere. For example, among the nine cities used in Cooke's (1996) analysis, only four show significant employment differences between central city and suburban residents. Stoll (1999) finds, in Los Angeles, that non-Whites generally engage in job search over greater geographic area, but the study ignores large job growth that occurred in some areas not studied. Other studies in western cities, such as Raphael's (1998a, 1998b) in Oakland, CA, and the Bay Area, show mixed evidence in terms of mismatch. Further, even Oakland's structure and history liken it more to traditional industrial cities than newer growing cities. While these are important contributions, the literature is not only thin with regard to cities of the U.S. southwest but also generally continues to ignore that cities are quite heterogeneous, and important unstudied dimensions of difference relate to age, structure, and growth. Some research on Phoenix (Gober & Burns, 1998, 2002) suggests that growth matters in understanding cities' spatial constraints. The common policy prescription that stems from observed mismatch—better resident-job linkages—does not fit in cities like Phoenix (Gober & Burns, 1998).

The 2000 Census data has identified the states of Arizona and Nevada as having experienced the most growth *by far* of any state between 1990 and 2000. While the U.S. population overall increased 13.2%, Nevada experienced a 66.3% population increase, and Arizona a 40.0% increase. Four of the next 10 ranked states in terms of percentage population growth are also southwestern: Colorado, Utah, Texas, and New Mexico each experienced between 20% and 30% population growth. Twenty-one of the top 50 ranked cities are located in these six states, with Las Vegas, NV, experiencing the most growth (88.3% between 1990 and 2000) and Phoenix-Mesa, AZ, ranking eighth among U.S. cities (with 45.3% growth).[2] Not only have these locations experienced large percentage growth, but they also have experienced large absolute growth according to U.S. Census data. With large population shifts in this direction, concerns about the quality of life—particularly for less advantaged populations—undoubtedly arise.

In addition to the rapid growth the southwest has experienced over the last 40 years, it is important to note that for cities like Phoenix, Tucson, Las Vegas, Salt Lake City, and Albuquerque, development occurred largely after 1970. Urban forms of these cities that "grew up" in the late-20th century are fundamentally different from cities that were large before the post-war era (Morrison Institute, 2000). These southwestern cities were small in the age before air conditioning and rapidly grew when automobiles were American's main mode of transportation. As a consequence, the downtown areas in these cities, while still hubs of commerce and employment, were never densely populated places. As growth in these cities increased, new populations moved into newly built developments all across the city, and employment growth occurred in many locales including the central cities (Morrison Institute, 2000). Moreover, entry-level jobs are on the rise in most places within the greater Phoenix metropolitan area including the downtown area as shown in Figure 1. This differs dramatically from cities with longer, more established urban cores. In those locations, growth in employment has stagnated or declined in central cities—especially in regard to entry-level employment—while it has grown in the suburbs and exurbs. These fundamental differences and other regional issues such as water availability, public land, and increasing urban density highlight the importance of understanding the extent of dislocations between workers and work in these locations. The greater Phoenix metropolitan area—the largest city that is a product of the above trends—is a logical place to begin. (Appendix Figure A1 shows a general layout of the region).

Population characteristics and experiences with growth and change are clearly different in the Southwest, but poverty persists there as elsewhere. Nationally, the poverty rate was 11.3% in 2000, and it was generally higher in the southwestern states (e.g., 13.5% in Arizona, 19.3% in New Mexico, and 14.9% in Texas).[3] Limited access to job opportunities can be a major cause of poverty, but little is known about how accessible jobs are to entry-level

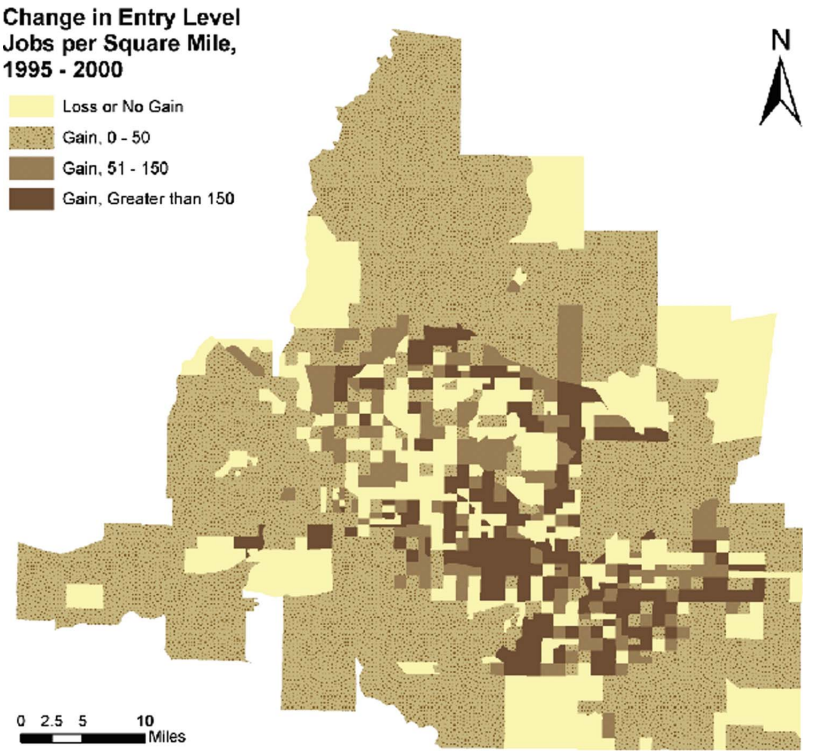


**FIGURE 1** Change in Number of Entry-Level Jobs, per Square Mile, in Greater Phoenix, 1995–2000.

Source: Authors' computation from the Maricopa Association of Governments' 1995, Employer Database, 1997 and the Maricopa Association of Governments' 2000, Employer Database, 2002.

workers in cities across the southwest. As such, we can not identify or rule it out as a cause of poverty, thereby limiting knowledge of how to address this important social problem. Given the rapid growth especially over the past quarter century, which is likely to continue into the future, it is important to begin to understand the implications of the changing distribution of income, poverty, and job opportunity in this region.

This study examines the relationships between potential workers and jobs in greater Phoenix between 1995 and 2000. The article proceeds as follows: we first pose research questions and discuss the data and methods used to answer those questions; we then present the analytic findings and address implications and next steps.

## RESEARCH QUESTIONS

In an attempt to assess how access to job opportunities contributes to poverty in growing cities of the U.S. southwest, this section poses a series of related

research questions. More specifically, we examine the spatial distribution of residents and jobs in the greater Phoenix metropolitan area between 1995 and 2000. Our overarching question is: to what extent are entry-level jobs accessible to low-skill workers in the greater Phoenix-Mesa, AZ, metropolitan statistical area (MSA)? In order to answer this primary research question, we will explore a series of related questions as follows:

- What is the geographic distribution of (1) the low-skill, working-aged population; and (2) entry-level employment opportunities?
- What is the geographic distribution of job *accessibility*? In other words, to what extent is the spatial distribution of low-skill, working-aged people associated with the spatial distribution of entry-level jobs?
- What other factors are associated with the geographic distribution of job accessibility? And to what extent does accessibility explain labor force-related outcomes?

The first of these three questions is simply descriptive of Phoenix's population and employment patterns. The second draws connections between the components of the first question, and the third examines further the relationships among potential workers and work, resulting in information necessary to determine the extent of contributions and implications of accessibility to the urban area's labor market conditions.

## DATA AND MEASUREMENT

After describing the data used for this project, this section describes the key measure of accessibility. Data needed to answer the proposed research questions fall into two main categories: aggregated data on individuals, families, or households, and data on employers.

For this project, we have defined the geographic area of interest as somewhat broader than the U.S. Census Bureau's definition of the Phoenix-Mesa, AZ, MSA. Within Maricopa County, our chosen boundaries include the reservation land that encompasses Fort McDowell, Salt River-Maricopa, and Gila River Indian communities. In addition, we have included rapidly growing areas north of the MSA that are home to residents who commute into the MSA for work. For longitudinal comparison purposes, the unit of analysis for this project is the census tract, and 656 of them lie within the defined area (Figure A1).

Aggregate individual/family/household data come from the 2000 U.S. Census Bureau Decennial Census, Standard Form 3 (SF 3, the "long form"), the 1995 Special Census of Maricopa County, and the GeoLytics Census CD Neighborhood Change Database (NCDB). All data for the year 2000 come directly from the 2000 Census. The 1995 data come from both a Special Census of Maricopa County residents and the NCDB. The Maricopa Association of

Governments (MAG) and the U.S. Census Bureau in 1995 partnered to conduct a special census only in Maricopa County, which contains most of metropolitan Phoenix. This special census asked 17 questions on population and housing utilizing the same set of census tracts that U.S. Census Bureau used in the 1990 Census. The NCDB (a joint project of GeoLytics Corp. and The Urban Institute) was created wholly from U.S. Census SF 3 data from the years 1970, 1980, 1990 and 2000. The important feature of the NCDB is that all data have been normalized to the 2000 census tract boundaries.[4] This allows for straightforward longitudinal comparisons at the census tract level. More detail on the computation of the 1995 variables used in the analyses appears in the analytic methods section.

For the employer-level data, we use data from the MAG Employer Database from both 1995 and 2000. These data originate as point data, and they have been aggregated to the census tract level to report the number of jobs overall and in selected main occupational categories—particularly those that contain entry-level jobs—in each census tract.

Although analyses include many variables, one created variable is of specific interest. Evidence both supporting and opposing the mismatch of workers and employment opportunities has largely hinged on the measurement of job accessibility (Raphael, 1998a; Rogers, 1997). Many studies of the spatial mismatch hypothesis use a measure of job accessibility to estimate a variety of modeled outcomes, such as employment, labor force participation, and wages. Scholars have devised many ways to measure job accessibility in creative ways, generally following one of three basic approaches: (1) computing mean commute times (Cooke, 1997; Cutler & Glaser, 1997; Holloway, 1996; Kasarda & Ting, 1996; Pastor & Adams, 1996; Thompson, 1997), (2) calculating percentages of employment either inside or outside of a defined "central city" area (Holzer, et al., 1994; Raphael, 1998a; Ross, 1998; Stoll, 2005; Wheeler, 1993), and (3) calculating employment-to-worker ratios with varying levels of sophistication (Blumberg & Ong, 1998; Cooke, 1993; Immergluck, 1998; O'Regan & Quigley, 1996; Raphael, 1998a; Shen, 1998; Wang & Minor, 2002). While each of these methods of measuring job accessibility has shortcomings, the gravity-based models put forward by O'Regan & Quigley (1996), Raphael (1998b), Shen (1998); Wang & Minor (2002) overcome many of the issues presented by other methods. The gravity-based method accounts for all jobs and all workers competing for those jobs in a region (the greater Phoenix metropolitan area in our case) taking into account labor market connectivity across arbitrary geographic boundaries (Raphael, 1998a; Shen, 1998) and recognizes that job accessibility and worker competition for jobs exponentially decline with increasing distance. In other words, distant jobs and competition are weighted less in these models since they have less impact on the labor market outcomes of workers (Raphael, 1998a; Wang & Minor, 2002).

We propose to use, most directly, the work of Wang and Minor (2002)—who examine the connections among employment, jobs access and

crime—as a model[5], though our accessibility measure is in line with all of those who use the approach (Raphael, 1998a; Shen 1998; Wang & Minor, 2002; and others). We modify their gravity-based job accessibility index to suit our data and analytic situation. We create two variants of an access measure that combine information on the number and location of jobs, the number and location of working-aged people (16–64 years), and the distance between these by geographic unit as follows:

$$A_i = \sum_{j=1}^{n} \frac{J_j d_{ij}^{-\beta}}{V_j},$$

where

$A_i$ is the job accessibility at location i;
$J_j$ is the number of jobs in location j;
$d_{ij}$ is the distance between the working-aged people in location i and jobs in location j;
$\beta$ is the distance friction (an empirically determined constant)[6]; and
$n$ is the total number of job locations;

and where

$$V_j = \sum_{k=1}^{m} W_k d_{kj}^{-\beta},$$

where

$V_j$ is the job competition intensity at location j;
$W_k$ is the number of workers in location k;
$d_{kj}$ is the distance between the working-aged people in location k and jobs in location j;
$\beta$ is the distance friction; and
$m$ is the total number of residential locations.

The above computation is for general job accessibility across the metropolitan area. Our second measure of job access uses the same computation but for a subset of jobs and for a subset of individuals, akin to Shen's (1998) approach. Specifically, we are interested in access to jobs among those with relatively lower levels of skills, which is this project's measure of population disadvantage (as opposed to other studies' use of race). To this end, we use the number of jobs that have low skill requirements and look at the number of individuals that have a high school degree, GED, or less education. This more nuanced measure captures access to appropriate jobs among those

with lower skills.[7,8] Though we have both measures available—accessibility overall and accessibility among entry-level jobs—we report here only on the latter, because it is the lower-skill workers that are the center of this research.

For our measure of accessibility, we measure distance not in transportation time but in "as the crow flies" distance, or simply a straight-line measured across space. Although this distance is adjusted by the distance friction constant to reflect distance decay properties, we do not estimate the amount of time required to travel across space, which may be a dimension added to future research using these measures.

One shortcoming of using census tracts as the unit of analysis, as others have noted, is the limited ability to tease out issues of residential choice endogenous to employment location. As Raphael, for example, notes, "to the extent that job growth (or job loss) is endogenously determined by the unobserved characteristics of an area's [residents] . . . the causal effect of spatial proximity inferred from the analysis of tract-level summary data will be overstated" (1998a, p. 507). We revisit this point in interpreting our results.

In sum, our data set is organized so that the unit of observation is the census tract (our sample size is 656 tracts), and we have data available on each unit's population and employment characteristics along with the distances between these and two summary measures of job accessibility for each.

## ANALYTIC METHODS

The analysis involves two main components: a Geographic Information Systems (GIS)-based analysis and a multiple regression analysis used to understand the factors influencing and influenced by job accessibility.

The first of these involves a GIS-based analysis of the raw data. We use ArcGIS software and the Census-produced cartographic boundary files to create a set of polygons containing all 656 census tracts within our defined geographic area. We then join the 2000 Census data to these polygons to create purely descriptive maps (like that of Figure 1). For the 1995 data, our method for extracting the raw data into usable variables is two fold. First, we create variables for race, ethnicity, work and poverty status, and housing characteristics by aggregating point data from the 1995 Special Census to the 2000 census tract boundaries. Second, we calculate mid-point values between the 1990 NCDB data and the 2000 Census data for our education level and travel mode to work variables. Our GIS analysis also includes aggregating the Maricopa Association of Governments' Employer Database point data to the census tract level, calculating ratios of entry-level jobs and low-skill workers, and displaying the spatial distribution of job accessibility.

The second set of analyses involves regression analyses of job accessibility across the geographic units in Phoenix. As others have done (see, for

example, Ellwood, 1986; Wang & Minor, 2002), in examining the determinants of accessibility, we conduct a straightforward Ordinary Least Squares (OLS) regression where census tract is the unit of analysis and in which job accessibility, defined above, is modeled as a function of census tract population characteristics (in percentage terms, race, ethnicity, education, poverty status, and work experiences). In addition to understanding the extent to which these characteristics determine the level of job accessibility, we also explore the extent to which job accessibility influences labor force participation and unemployment levels.[9] For these analyses, we use a logistic regression because of the limited dependent variables (both labor force participation and unemployment range only from zero to one). We include both level and change models, where the former are analyzed as limited dependent variables (logit) models and the latter are analyzed using OLS.

Whereas more narrowly defined Kainian spatial mismatch research involves a close examination of the role of race, we replace this part of the analysis with an examination of low-income populations more broadly. As does Shen (1998), for example, we explore the extent to which people with lower skills are constrained by the accessibility of entry-level jobs. Throughout our analyses, we report results for entry-level job accessibility and make comparisons to the overall accessibility analyses (not reported) only where relevant.



## RESEARCH FINDINGS

This section describes findings from our research. First we present a series of maps that describe the conditions across the greater Phoenix, AZ, metropolitan area. We then examine the mean values of varied household and individual characteristics across the census tracts. Finally, we present the results of a series of regressions, first where job accessibility is a variable used to explain labor force participation and unemployment in the census tract, and then where entry-level job accessibility is the dependent measure.

The figures that follow show that low-skill, working-aged adults are dispersed all across the greater metropolitan area (Figure 2), with relatively fewer per square mile on the far fringes of the area but no exclusive clustering near the downtown area. The entry-level jobs that these workers might seek are likewise dispersed across the metropolitan area (Figure 3), again with somewhat fewer per square mile on the fringes and greater density not just in the downtown Phoenix area but also in Scottsdale, Mesa and the near West Valley.

More importantly, Figure 4 shows the intersection of low-skill workers with entry-level jobs as a ratio, which makes clear that some clustering of workers-to-jobs exists in Phoenix. Many areas both in the center of and around the metropolitan area have less than one entry-level job per low-skill worker; and many fewer areas have a ratio of greater than one-to-one.[10]

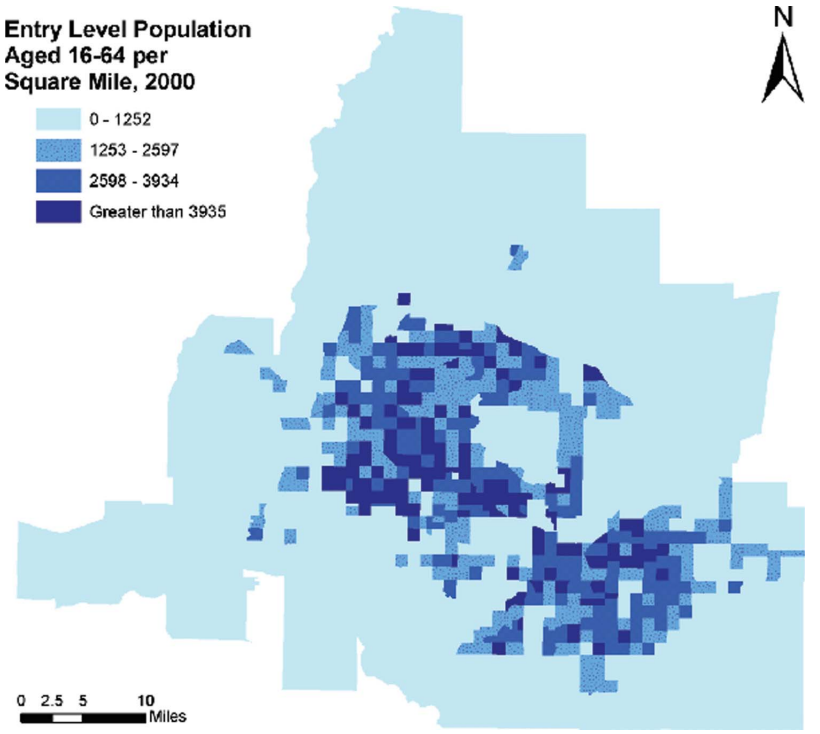


**FIGURE 2** Distribution of Low-Skill, Working-Aged Adults, per Square Mile, in Greater Phoenix, 2000.

Source: Authors' computation from the U.S. Census, 2000.

This distribution is not systematic in such a manner as to suggest spatial exclusion of low-skill workers from entry-level jobs. But, people do not live and work only within the confines of one census tract; instead they may cross the metropolitan area for work, and many do. This observation motivates our more nuanced measure of accessibility.

Table 1 describes our scale of job accessibility, which accounts for spatial stickiness and job competition. In general, the average census tract's entry-level job accessibility measure is about half that of its overall job accessibility measure (this is in line with what Shen [1998] found in his study of Boston). Whereas overall job accessibility increased in all census tracts between 1995 and 2000, some census tracts experienced a decrease in entry-level job accessibility between these years. Figure 5 shows the spatial distribution of entry-level job accessibility in 2000. It reflects greater accessibility in the central part of the metropolitan area, with generally decreasing access moving outward.

In brief, the figures suggest that Phoenix is fundamentally different from other cites where the spatial mismatch hypothesis, narrowly or broadly defined, clearly operates. That is, both low-skill workers and entry-level

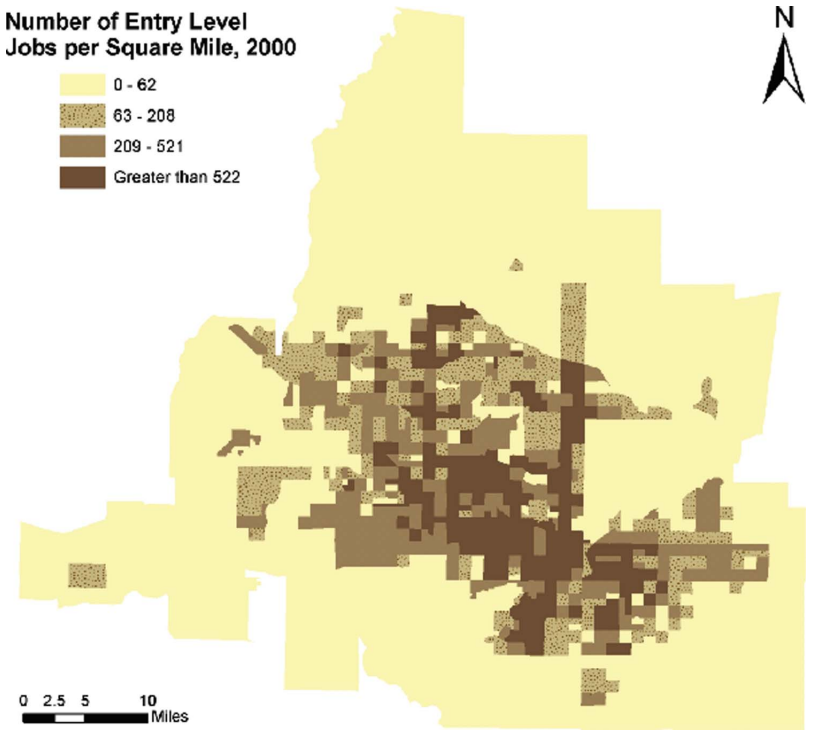


**FIGURE 3** Distribution of Entry-Level Jobs, per Square Mile, in Greater Phoenix, 2000.

Source: Authors' computation from the Maricopa Association of Governments' 2000 Employer Database, 2002.

jobs both exist and have been growing in numbers all over the metropolitan area. Although there is some clustering apparent in the jobs-to-workers ratio (Figure 4), the accessibility measure shows greater accessibility to entry-level jobs among low-skill workers (considering distance decay and worker competition) in the central urban area (Figure 5), something that is exactly the opposite of what we might expect in a typical Rustbelt city. That is, we might predict greater accessibility in the outer ring, leaving disadvantaged workers stranded in the core with few job opportunities and high worker competition for those few jobs.

Next, our regressions explore the extent to which job accessibility influences the labor market. With job accessibility as an explanatory variable, we control for other neighborhood characteristics in predicting labor force participation (Table 2) and unemployment (Table 3). Although the level of accessibility in 1995 and in 2000 is not associated with the level of labor force participation in census tracts, we observe that *changes* in accessibility have a relatively large influence on *changes* in tract-level labor force participation.[11]

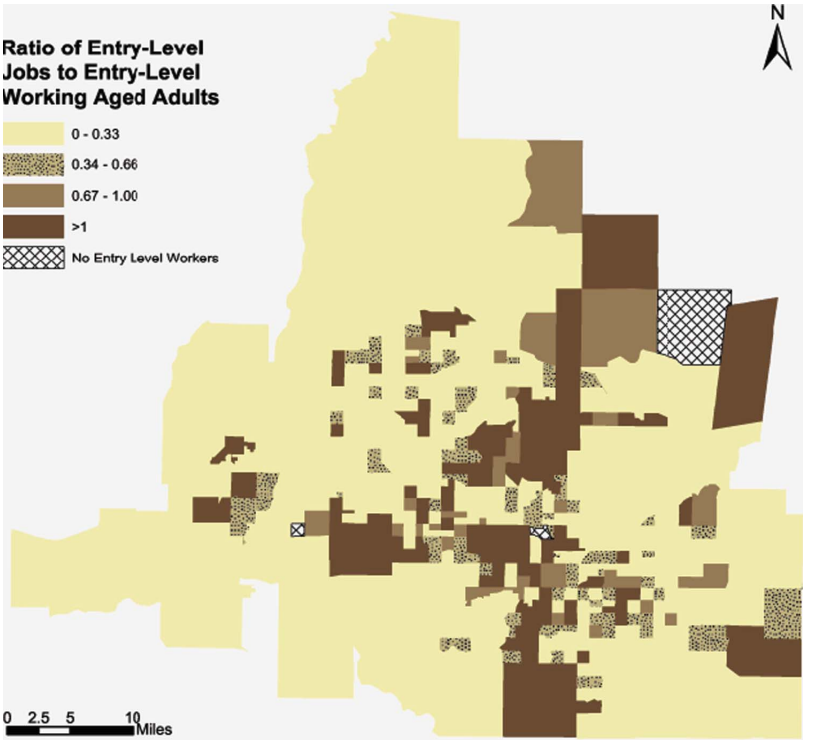


**FIGURE 4** Distribution of the Ratio of Entry-Level Jobs to Low-Skill, Working-Aged Adults in Greater Phoenix, 2000.

Source: Athors' computation from the U.S. Census, 2000, and the Maricopa Association of Governments' 2000 Employer Database, 2002.

**TABLE 1** Values of Job Accessibility

| Accessibility measure | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Overall, 1995 | 0.60 | 0.13 | 0.46 | 1.15 |
| Overall, 2000 | 0.70 | 0.14 | 0.52 | 1.37 |
| Entry-level, 1995 | 0.32 | 0.07 | 0.21 | 0.53 |
| Entry-level, 2000 | 0.37 | 0.07 | 0.24 | 0.67 |
| Overall change | 0.10 | 0.02 | 0.06 | 0.22 |
| Entry-level change | 0.05 | 0.03 | –0.03 | 0.20 |
| Overall % change[a] | 16.90% | 3.6% | 6% | 31.8% |
| Entry-level % change | 15.10 | 8.7 | –7.1 | 43.5 |

[a]Computed at the census tract level, percentage change is the difference between the two time points (the 2000–1995 percentage point difference) divided by the first time point (the 1995 value).

Although the main coefficients of interest in Table 2 are those associated with accessibility, it is worth noting that the tract-level race and ethnicity variables operate as expected, with tracts with a higher proportion of Whites having relatively greater labor force participation than any other race

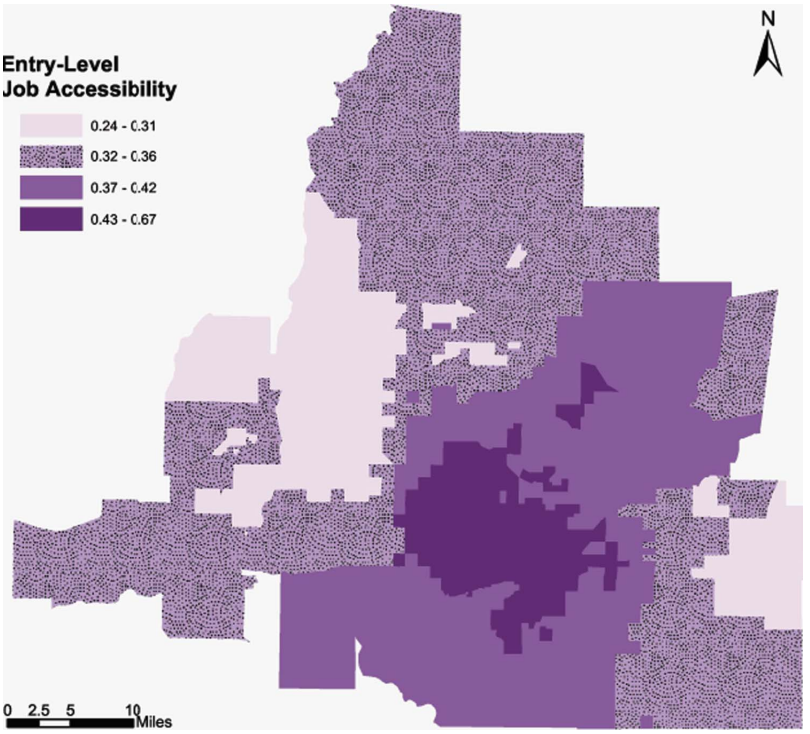


**FIGURE 5** Distribution of the Entry-Level Job Accessibility in Greater Phoenix, 2000.

Source: Authors' computation from the U.S. Census, 2000, and the Maricopa Association of Governments' 2000 Employer Database, 2002.

or ethnicity, controlling for accessibility and education. Next, tracts having some high school or having completed high school results in greater labor force participation, as expected, relative to those tracts with lower education. Tracts' residents having completed some college, however, relative to having the lowest education, is associated with lower tract-level labor force participation. This can be explained as an "in school" effect; that is, while students are in college, they are less likely to be working. In sum, what these models reveal is that, cross-sectionally, accessibility to jobs has no influence on labor force participation while other factors are more important. Over time, however, changes in job accessibility are associated with a reduction in labor force participation, *ceteris paribus*. The coefficient is 0.17, which, relative to the dependent measure's mean (of 66.0%), represents about a 25% effect; as entry-level job accessibility increases, labor force participation declines. This effect may be specific to the greater Phoenix metropolitan area or it may be common among growing cities where residents and jobs are increasing all over.

Next, Table 3 shows that both levels and changes in job accessibility are influential in explaining the levels and changes, respectively, in census

**TABLE 2** Effects of Entry-Level Job Accessibility on Labor Force Participation

| Explanatory variables[a] | Logit level model 1995 | Logit level model 2000 | OLS change model 1995–2000 |
|---|---|---|---|
| Job accessibility | | | |
| Entry-level level | −0.07 | 0.05 | |
| Entry-level change | | | −0.17*** |
| Race/ Ethnicity[b,c] | | | |
| White | (excluded) | | |
| African American | 0.01 | −0.06 | 0.00 |
| American Indian | −0.16*** | −0.18*** | −0.02 |
| Asian/Pacific | −0.40*** | −0.37*** | 0.00 |
| Other race | −0.31** | −0.34*** | 0.10** |
| Hispanic | −0.53*** | −0.51*** | −0.16*** |
| Education level[d] | | | |
| No high school | (excluded) | | |
| Some high school | 0.47*** | 0.77*** | 0.08 |
| High school/GED | 0.21*** | 0.28*** | 0.17* |
| Some college/AA | −1.05*** | −0.82*** | −0.06*** |
| Bachelor's degree | −0.09 | −0.02 | 0.00 |
| Pseudo $R^2$ | 0.559 | 0.539 | |
| Adjusted $R^2$ | | | 0.066 |

*Notes:* Sample is the 656 census tracts in the greater Phoenix-Mesa, AZ, MSA. Parameter estimates are standardized and therefore comparable across models.

[a]Explanatory variables are measured in levels for the 1995 and 2000 level models, and they are measured in percentage change units for the change model.

[b]This is not a mutually exclusive category; people of Hispanic ethnicity can be of any race. The two race categories, White and African American, are specifically non-Hispanic.

[c]People of "other race" include those who self-identify as "two or more" races in the 2000 census.

[d]Level of educational attainment is measured among those who are 25 years and older.

***$p < 0.01$.

**$p < 0.05$.

*$p < 0.10$.



tracts' unemployment. As expected, those tracts with higher levels of accessibility have lower levels of unemployment in both 1995 and 2000; and as census tracts' accessibility has increased between 1995 and 2000, their unemployment levels have decreased. Controlling for race, ethnicity and education within census tracts, it appears that job accessibility is an important predictor of some labor market outcomes, but the direction of influence is not completely clear. Higher accessibility is associated with lower labor force participation (Table 2); whereas higher levels of accessibility and increases in accessibility are also associated with less unemployment (Table 3).

To further explore how accessibility functions in Phoenix, it might be useful to explore what factors have an influence on accessibility. Table 4 reports the results of regression analyses that do just that. The observations that census tracts with greater proportions of poor residents, greater proportions non-Whites, with the least level education, and with greater proportions

**TABLE 3** Effects of Entry-Level Job Accessibility on Unemployment

| Explanatory variables[a] | Logit level model 1995 | Logit level model 2000 | OLS change model 1995–2000 |
|---|---|---|---|
| Job accessibility | −0.21*** | −0.14*** | −0.07** |
| Entry-level level | | | |
| Entry-level change | | | |
| Race/Ethnicity[b,c] | | | |
| White | (excluded) | | |
| African American | −0.14*** | −0.13 | −0.01 |
| American Indian | −0.16*** | −0.13*** | −0.01 |
| Asian/Pacific | −0.11** | −0.10*** | −0.02 |
| Other race | −0.25** | −0.07** | −0.04 |
| Hispanic | 0.38** | 0.28** | −0.16*** |
| Education level | | | |
| No high school | (excluded) | | |
| Some high school | 0.05 | 0.06 | 0.25*** |
| High school/GED | 0.33*** | 0.44*** | 0.17*** |
| Some college/AA | 0.72*** | 0.54*** | −0.14*** |
| Bachelor's degree | 1.42*** | 1.22*** | −0.17*** |
| Pseudo $R^2$ | 0.679 | 0.556 | |
| Adjusted $R^2$ | | | 0.194 |

*Notes:* Sample is the 656 census tracts in the greater Phoenix-Mesa, AZ, MSA. Parameter estimates are standardized and therefore comparable across models.
[a]Explanatory variables are measured in levels for the 1995 and 2000 level models, and they are measured in percentage change units for the change model.
[b]This is not a mutually exclusive category; people of Hispanic ethnicity can be of any race. The two race categories, White and African American, are specifically non-Hispanic.
[c]People of "other race" include those who self-identify as "two or more" races in the 2000 census.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.10$.



in renter occupied housing (and with lower housing values) are associated with having *greater* access to entry-level jobs suggests a complicated story for Phoenix, and likely for similarly rapidly growing areas. Although this evidence indicates that lack of access to work for low-skilled workers is likely not a problem in Phoenix, it also raises new questions. In brief, census tracts with more advantaged residents are the ones with less accessibility to entry-level jobs.[12] The next section speculates about what these findings mean and offers directions for future research.

## DISCUSSION AND CONCLUSION

The rapid growth in the greater Phoenix metropolitan area has meant that, most importantly, the industrial restructuring that took place in many cities

**TABLE 4** Determinants of Entry-Level Job Accessibility

| Explanatory variables[a] | OLS level model 1995 | OLS level model 2000 | OLS change model 1995–2000 |
|---|---|---|---|
| Race/Ethnicity[b,c] | | | |
| White | (excluded) | | |
| African American | 0.12 | 0.15 | 0.14 |
| American Indian | 0.14 | 0.12*** | 0.00 |
| Asian/Pacific | −0.13 | −0.06*** | 0.07*** |
| Other race | −0.27*** | −0.08** | −0.07** |
| Hispanic | 0.35 | 0.22** | 0.20* |
| Travel mode to work | | | |
| Drive alone | (excluded) | | |
| Public Transit | 0.07 | 0.19 | 0.14*** |
| At home | 0.16*** | −0.02*** | −0.10** |
| Other | 0.16 | 0.08*** | 0.07* |
| Education level | | | |
| No high school | (excluded) | | |
| Some high school | −0.16 | −0.34*** | −0.28*** |
| High school/GED | −0.22*** | −0.31*** | −0.34*** |
| Some college/AA | 0.53*** | −0.26*** | −0.21** |
| Bachelor's degree | 0.03 | −0.26* | −0.52*** |
| Work and poverty | | | |
| People < poverty line | 0.03 | 0.21 | −0.04 |
| HH w/cash assistance | −0.01 | 0.03 | 0.07 |
| People in labor force | −0.03*** | −0.01*** | −0.17*** |
| People unemployed | −0.08 | −0.05 | 0.07 |
| Housing characteristics | | | |
| Renter occupied | | | −0.11 |
| Average value | 0.18*** | 0.11** | −0.06** |
| Costs/month . . . | −0.28*** | −0.2*** | 0.01 |
| > = 20% of income | −0.00 | −0.06 | |
| Adjusted $R^2$ | 0.384 | 0.397 | 0.485 |

*Notes:* Sample is the 656 census tracts in the greater Phoenix-Mesa, AZ, MSA. Parameter estimates are standardized and therefore comparable across models.

[a]Explanatory variables are measured in levels for the 1995 and 2000 level models, and they are measured in percentage change units for the change model.

[b]This is not a mutually exclusive category; people of Hispanic ethnicity can be of any race. The two race categories, White and African American, are specifically non-Hispanic.

[c]People of "other race" include those who self-identify as "two or more" races in the 2000 census.

***$p < 0.01$.

**$p < 0.05$.

*$p < 0.10$.

of the midwest and northeast in the 1970s and 1980s simply has not affected Phoenix, which resembles many other western and southwestern cities in this regard. Ihlanfeldt and Sjoquist (1998) recognize that the spatial mismatch hypothesis might not operate in all kinds of cities, but they assert that "spatial mismatch may be exclusively a big city problem" (p. 881). Phoenix is undoubtedly a "big city"—ranked sixth in the United States with 3.5 mil-

lion residents—and lack of evidence of a traditional mismatch there suggests that a new hypothesis may be needed.

Moreover, in assessing the literature, Ihlanfeldt and Sjoquist (1998) take as given some assumptions about cities that seem not to encompass cities of the southwestern United States: stagnant growth; large concentration of African Americans and poverty in central cities; density; and central business districts or industrial cores or ports. Not just one of these but *all* of these assumptions are inapplicable to southwest cities. For example, Phoenix's population is less than 3% African American, and they are not concentrated in a central city. Like Phoenix, Las Vegas and Los Angeles, for example, also have pockets of wealth (that Detroit does not have) in their downtown areas; and they generally have lower densities of populations (and commerce) with more spatial patchwork (rather than concentration) of poverty. Characteristically, Phoenix has no traditional central business district; instead it has several concentrations of employment, none of them particularly industrial or affected by industrial restructuring. The areas in the country experiencing the most growth do not share the spatial patterns and trends of older, more stagnant, cities. Nevertheless, poverty and employment remain concerns. While spatial mismatch research among other cities has offered evidence about one important cause of poverty, evidence from our research suggests that spatial mismatch between entry-level jobs and low-skill workers is not a primary reason for poverty in Phoenix. Because of this finding, the earlier noted concern of the simultaneity of residential and job locations seems of little concern here.

Although this study of Phoenix reveals that rapid growth of both residents and jobs supports relatively solid accessibility to jobs, conditions in Phoenix are by no means ideal for low-skill workers. Although they may be more favorably situated across the metropolitan area to access entry-level jobs, low-skill workers may be restricted in other ways, in particular with regard to housing and transportation, in line with the Alonso-Muth-Mills formulation of tradeoffs in urban space (Glaeser, 2007). Greater job accessibility may suggest that low-skill workers have less choice in housing and may be restricted by transportation. This project's analyses have shown that worker movement to the large pockets of affordable single-family homes in the northwest and east portions of the MSA have driven up worker competition, consequently driving down accessibility in these areas. While further study is needed to resolve this relationship, our analysis suggests that continuing development of the urban fringe areas for more affordable housing could present significant transportation and other burdens on low-skill workers. Just as Kain's original (1965, 1968) research included a housing discrimination dimension, we hypothesize that the system of housing market development in Phoenix may preclude low-skill workers from having much choice about their housing. Whereas in some cities this might isolate disadvantaged workers from jobs, Phoenix's rapid growth has meant that access to

jobs is not the problem. It is likely that this finding from our analysis of Phoenix would extend to other, similar cities that have experienced rapid growth.

This study suggests a number of policy implications. As noted above, census tracts with high proportions of low-skill workers have generally higher accessibility to entry-level jobs, which may, in part, be due to the limited housing and transportation choices of those workers, a tentative observation that requires further inquiry. If this is the case, then these low-skill workers could face significantly decreased accessibility to entry-level jobs if the spatial mismatch hypothesis begins to operate in Phoenix as growth slows or becomes more systematic in favoring the urban fringe. Given current activity in Phoenix, specifically, that involves vitalizing a downtown area, such a shift is unlikely, at least in the short-term. But urban sprawl has meant that both residential and some commercial development will continue to expand the boundaries of the metropolitan area. If this is the case, then urban planning must consider both housing access and transportation issues. Increasing housing and transportation options for low-skill workers in the places they currently reside (where access to jobs appears sufficient) might involve increasing density (in lieu of sprawl). Presenting housing choices that move low-skill workers toward owning a home on the urban fringe should be discouraged given the lower job accessibility and increased transportation expense, among other negative policy and environmental consequences. Cities and regional planning authorities in the greater metropolitan area should work collaboratively to create regional planning and zoning policies to this end.

We have asserted that our measure of job accessibility is a solid one, based on prior scholars' advances. One limitation of the current research, however, is that it has measured distance as a straight line. Phoenix has natural features that make some of those straight lines impossible (for example traveling along streets from Ahwatukee to downtown Phoenix is impeded by South Mountain despite the straight-line distance being relatively short). In addition, Phoenix's public transportation network is sparse, implying that different distance decays must exist for drivers as opposed to bus drivers. Moreover, Phoenix's highway system is organized such that few people who use it travel in a straight line from home to work. These shortcomings suggest that further refinement of the accessibility measure, to account for transportation issues, is warranted (Shen, 1998). Nevertheless, it seems unlikely that these enhancements would change meaningfully our analytic results.

In sum, this research has been motivated by the quest to identify whether an important cause of poverty as identified in stagnant cities operates as well in growing cities. We find no evidence to support a systematic mismatch between low-skill workers and entry-level jobs in the greater Phoenix metropolitan area. In fact, those with less advantaged characteristics may actually have better access to jobs. As Shen's findings corroborate, the implication of our results is that policy and planning should help

residents "utilize—rather than abandon—their locational advantage" (1998, p. 358). Further, this is useful to know because it eliminates one possible cause of poverty. However, our findings leave us on a continued quest to understand how best to respond to the problem of poverty when lack of job access is not to blame.

## NOTES

1. Our intent is not to conduct a new review of this well-documented literature but instead to draw on some specific observations about the nature of the metropolitan areas examined in much of the mismatch literature and propose a new analysis that examines one yet not fully-tested piece of the hypothesis.

2. Source: U.S. Census Bureau, PHC-T-2 Table 3 and PHC-T-3 Table 5.

3. Source: U.S. Census Bureau, P60-214 report, Tables A and D.

4. The U.S. Census Bureau draws cartographic boundaries between census tracts that places between 4,000 and 10,000 people into each census tract. In a rapidly growing city like Phoenix, census tracts often become split into two or more parts during subsequent Censuses making longitudinal comparisons very difficult. The NCDB has the advantage of having data from previous Censuses (in our case, the 1990 Census) disaggregated through an algorithm into smaller units and re-aggregated to 2000 census tract boundaries based on their spatial location.

5. For a full derivation of the gravity-based job-accessibility index, see Wang and Minor (2002, 442–443) or Shen (1998, 349–351), for example.

6. Our $\beta$ is computed using ordinary least squares regression, estimating the number of commuters (C) as a function of the number of working-aged people (W), the number of jobs (J), and the distance (d) between them. Specifically, we log-transform our original model, $C_{ij} = aW_i J_j d_{ij}^{-\beta}$ into the following for ease of estimation: $\ln[C_{ij}/(W_i J_j)] = \ln(a) - \beta\ln(d_{ij})$ . Phoenix's resulting $\beta$ is 1.12, which, when used in the computation of the access measure (raising distance to the negative $\beta$), suggests the extent of the "stickiness" or friction associated with travel in Phoenix. For instance, if the sum of the distance from one census tract's center to all other tracts' centers were 40 kilometers, its $d_{ij}^{-\beta}$ value would be 0.016; whereas the tract situated 80 kilometers from other tracts would have a $d_{ij}^{-\beta}$ value of 0.007. While the ratio of the raw distance is 2 (80:40), the ratio of their friction-adjusted distances is 0.460. In other words, people who are further from jobs, or jobs that are further from people, are increasingly less accessible to one another over space. The value of $\beta$ likely has a relatively minor effect on the access measure (Wang and Minor, 2000), but it more accurately reflects the effects of varying distance over space in computing individuals' access to employment.

7. Data from MAG include Department of Labor classifications (SIC and SOC codes and titles), but these do not indicate anything about the requirements of holding jobs. Using national data from DOL's Bureau of Labor Statistics (BLS), we identified the number of jobs that require "Zone 1" skills, defined as follows: "No previous work-related skill, knowledge, or experience is needed," training needed ranges "anywhere from a few days to a few months," work involves "following instructions and helping others" and may require a high school diploma, GED certificate, or formal training to obtain a license, and examples include general office clerks, home health aides, and restaurant service staff. We selected only Zone 1 jobs because Zone 2 jobs *usually* require a high school diploma and sometimes may require an associate's or bachelor's degree. Because the BLS data includes Zone levels by category, along with the number of jobs available in each category nationally, we summed up the number of Zone 1 jobs in each SIC and then divided this sum by the total number of jobs in the SIC. The result is that we know the proportion of low-skill jobs within each SIC, and we used this percent to estimate from the MAG data how many metropolitan Phoenix jobs, in these categories, would require low skills. Five SIC codes are missing from the national data: four agricultural codes, and the U.S. Postal Service. We use the

percent low-skill jobs in the other agricultural code (61.0%) for the four missing agricultural SICs; and we use the percent of low-skill jobs in the "Business Services" SIC (40.1%) for the U.S. Postal Service (because these services include mailing, delivery and supply). Our estimate of the number of low-skill jobs in Phoenix is based on the assumption that the distribution of low-skill jobs across industry in Phoenix is similar enough to the distribution of these jobs nationally to make a useful projection. Raphael (1998b) makes a similar assumption in his distribution of industrial codes across Bay Area neighborhoods. We would both prefer more place-specific data but use these reasonable assumptions in lieu.

8. As a proxy for skill level, we include those working-aged individuals (16–64 years) who have earned a high school degree or GED certificate at most. Census data identifies educational attainment for those aged 25 years and older. For the younger group, we assume that all 16 and 17 year-olds fall into this low skill category, and we assume that those between age 18 and 24 show the same proportion of educational attainment as those aged 25 years an older.

9. Some scholars have suggested that a correction for spatial autocorrelation is necessary with this type of data (because neighboring geographic units are more similar to each other than they are to distant tracts). We have reason to believe that this is important for our analysis as well, but our analysis program—The SAS System—does not offer the option to compute the relevant Moran's I statistic, so we have not made any correction. The implication is that our standard errors will be biased downward, and therefore we run the risk of identifying coefficients as statistically significant when they are not. As such, we might recommend using a higher threshold for statistical significance when examining and interpreting the regression coefficients. As Newman and Harkness (2002), coefficients from spatial analyses may be biased by about 20 percent and should be adjusted accordingly where robust standard errors can not be computed (as in nonlinear specifications).

10. Some reviewers note specific concern about American Indian residents living on their reservations. The Fort McDowell Yavapai Nation has a low-skill worker to entry-level job ratio of greater than one, a favorable indicator for that population. We do not examine reservation land separately because of the observation that people can and do move across space for work, and new, perhaps casino-related, employment on reservation lands is appropriately considered with the location and density and competition among low-skill workers.

11. In fact, Raphael (1998b) suggests that examining employment levels can be misleading and that growth is a more appropriate measure to indicate the extent of a spatial mismatch.

12. Analyses of the overall job accessibility measure (not shown) reveal the same basic story: census tracts with less advantaged characteristics have better accessibility to jobs.

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# APPENDIX A

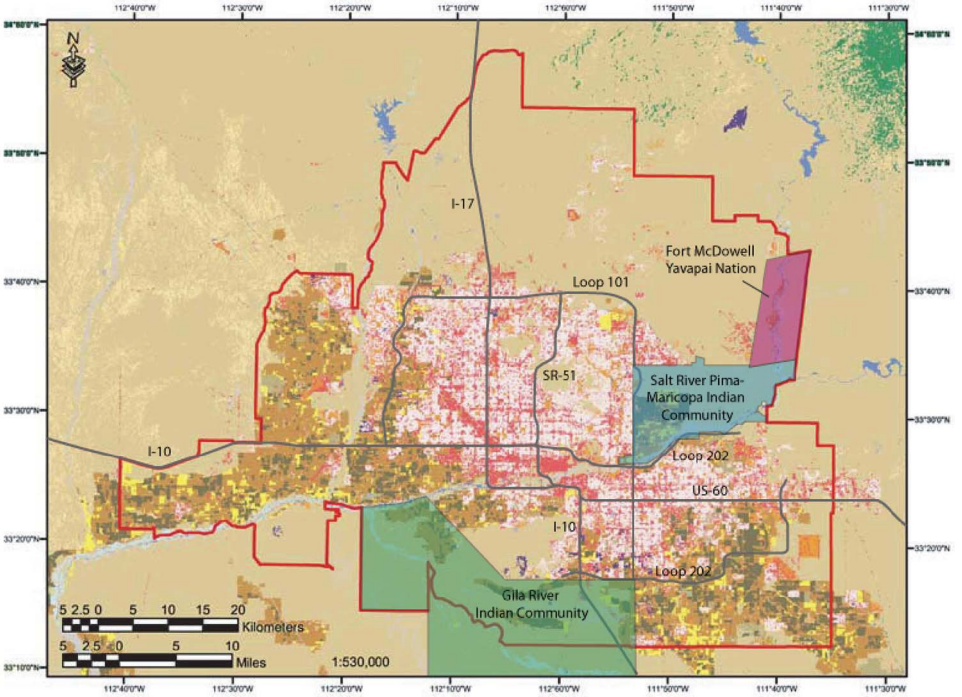


**FIGURE A1** Greater Phoenix, 2000.