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Job Sprawl, Spatial Mismatch and Black Employment Disadvantage

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Abstract

This paper examines the relationship between job sprawl and the spatial mismatch between blacks and jobs. Using data from a variety of sources including the U.S. Census and U.S. Department of Commerce's ZIP Code Business Patterns, I control extensively for metropolitan area characteristics and other factors. In addition, I use metropolitan area physical geography characteristics as instruments for job sprawl to address the problem of simultaneity bias. I find a significant and positive effect of job sprawl on mismatch conditions faced by blacks that remains evident across a variety of model specifications. This effect is particularly important in the Midwest and West, and in metropolitan areas where blacks' share of the population is not large and where blacks' population growth rate is relatively low. Among others, the results also reveal that the measure of mismatch used in this analysis is highly correlated across metropolitan areas with blacks' employment outcomes in the expected direction.

I. Introduction

Scholars and policy makers concerned with racial inequality have long pointed to the racial segregation of African-Americans as a key determinant of black poverty. The confinement of black households to geographically isolated inner-city neighborhoods has been linked to relatively poor employment outcomes, among other factors. During the latter half of the twentieth century, changes in the spatial location of employment opportunities within metropolitan areas have served to increase the physical distance between predominantly black residential areas and the locations of important employment centers. Despite moderately increasing rates of residential mobility to the suburbs over the past few decades, black residential locations have remained fairly centralized and concentrated in older urban neighborhoods of the nation's metropolitan areas, but employment has continuously decentralized towards metropolitan area suburbs and exurbs.

Many argue and document that this "spatial mismatch" between the location of blacks and jobs is partly responsible for the stubbornly inferior labor market outcomes experienced by African-Americans.[1] Given the difficulties of reserve commuting to suburbs in many metropolitan areas especially by public transit, coupled with the fact that high proportions of blacks do not own cars,[2] such spatial mismatch disconnects blacks from many jobs for which they may be suited, thereby increasing their employment difficulties.[3]

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[1] For recent and extensive reviews of the empirical research on the spatial mismatch hypothesis see Ihlanfeldt and Sjoquist (1998) and Pugh (1998).

[2] See Raphael and Stoll (2001) for an analysis of the impact of racial differences in car ownership rates on racial labor market inequality.

[3] There is a large and established literature on why and how space matters in employment. It establishes that time and money costs of travel and information limit the distances workers are willing or able to commute to get to work, especially for those workers that are low-skill or young. Public transit increases the time cost of travel, as does how far workers must commute to employment opportunities. Purchasing and maintaining a car, as well as paying for gas and insurance, increases the money cost of travel. Furthermore, distance from employment opportunities raises the costs of getting information about these jobs. As any of these costs rise, workers will be less willing to travel an additional mile. See Stoll (1999) and Holzer, Ihlanfeldt, and Sjoquist (1994).

This paper provides an analysis of whether job sprawl has a direct effect on the geographic separation of blacks from jobs. There has been growing attention to the varied impacts of sprawl, understood here as low-density, geographically spreading patterns of development. Some have engaged in debate about how to measure sprawl (Lopez and Hynes, 2003; Wolman, et. al., 2002), whether it is increasing (Glaeser and Kahn, 2001), while others have examined its causes, such as the influence of physical characteristics of regions, the role of government policy, and preferences and discrimination (Burchfiled, et. al., 2004; Squires, 2002; Rusk, 1999; Jackson, 1985). Some have attempted to identify the impacts of sprawl, either positive or negative, for example on increasing health problems, pollution, concentrated poverty, and other concerns or on decreasing commute times (Bullard, Johnson, and Torres, 2000; Heinlich and Andersen, 2001; Cieslewicz, 2002; Jargowsky, 2002; Glaeser and Kahn, 2004), but few have focused on its connection to race, with some exceptions (powell, 2002).

This paper seeks to add to this literature by systemically examining the effect of job sprawl on blacks' mismatch conditions. A priori, one might expect a positive effect of job sprawl on blacks' mismatch as the mismatch hypothesis suggests per Kain's (1968) original formulation of the problem. On many accounts, many urban areas continue to exhibit rapid growth patterns, especially over the past few decades (Lopez and Hynes, 2003; Glaeser and Kahn, 2001). To the extent that these growth patterns are characterized by job sprawl, such employment opportunities will locate in areas far from areas where blacks are concentrated, thereby increasing their physical isolation from jobs. This is likely to be especially true if racial segregation remains a strong and persistent feature of metropolitan life.

On the other hand, it is plausible that job sprawl could reduce blacks' physical isolation from jobs, or be negatively related to blacks' mismatch. Some research has identified an

association between low-density metropolitan growth and increased housing affordability. This growth produces housing rapidly relative to demand, thereby lowering housing prices and therefore potentially raising housing consumption, especially that of blacks (Kahn, 2001). To the extent that blacks choose homes that are disproportionately located in sprawling metropolitan suburban areas, their physical proximity to growing suburban employment centers could be improved. In theory, increases in black residential mobility and moderate decreases in racial segregation observed over the 1990s might indicate that job sprawl might reduce spatial mismatch conditions faced by blacks.

In this paper, I estimate the effect of job sprawl on blacks' mismatch from jobs using data from the U.S. Census and U.S. Department of Commerce's ZIP Code Business Patterns files for roughly 300 metropolitan areas in 2000. A key problem in estimating the effect of job sprawl on blacks' mismatch conditions concerns the direction of causation. Job sprawl could affect blacks' distance from jobs in ways implied by the mismatch hypothesis. Alternatively, employers' location decisions may be a function of residential concentration of blacks, thereby implying that mismatch conditions could cause job sprawl. This problem of simultaneity is likely to upwardly bias OLS estimates of the causal effect of jobs sprawl on mismatch.

To address the problem simultaneity and other concerns such as omitted-variables bias, I present a variety of model specifications including OLS estimates with extensive controls for metropolitan area characteristics, two-stage least squares (2SLS) estimates using metropolitan area physical geography characteristics as instruments for job sprawl, and other methods such as first differencing change regressions. In sum, the results are more favorable to the idea that job sprawl exacerbates spatial mismatch conditions faced by blacks in metropolitan areas.

In the remainder of this paper, I discuss the data, definitions of variables and the empirical strategy in section II. I then present the results of the analysis in section III. This section also explores heterogeneity in the effect of job sprawl and investigates whether the measure of spatial mismatch used in this analysis correlates with blacks' actual employment outcomes as the analysis assumes. I then conclude in section IV, while offering a brief discussion of policies that might be used to address the growing connection between job sprawl and blacks' spatial mismatch to improve their spatial access to jobs and economic opportunities more broadly.

II. Data and Definitions of Main Variables

The data are drawn from two primary data sources: the 2000 U.S. Census and the 1999 U.S. Department of Commerce's ZIP Code Business Patterns files. The latter provide information on total employment counts by ZIP code in the U.S. ZIP code business patterns data are extracted from the Standard Statistical Establishments List, a file maintained and updated by the Census Bureau of all known single and multiestablishment companies. These employment data are used to measure job sprawl across the roughly 267 metropolitan areas[4] as the proportion of metropolitan jobs located outside of a 5 mile radius of the metropolitan area's Central Business District (CBD).[5] The CBD is a specific geographic area whose spatial boundaries are defined by the *US Census Bureau* and is that area within the central city of a metropolitan area commonly referred to as downtown. The locations of the CBDs in this analysis are drawn from

[4] The metropolitan areas used in the analysis are Metropolitan Statistical Areas (MSAs) and Primary Metropolitan Statistical Areas (PMSAs) as defined by the Office of Management and Budget (OMB) in 1999 for Census 2000. Consolidated Metropolitan Statistical Areas (CMSAs), which are usually much larger than MSAs or PMSAs, were not included among these metropolitan areas.

[5] I experimented with boundaries that are located outside of a 3 and 10 mile radius centered on the metropolitan area's Central Business District to examine the sensitivity of this 5 mile boundary to alternative distances. These alternative measures of job sprawl were highly correlated with that shown here (though they differed in levels as to be expected) and did not produce qualitatively different results than those presented in this analysis.

the 1982 Economic Census, Geographic Reference Manual (U.S. Bureau of the Census, 1993).[6] This measure of sprawl has been used elsewhere, and is correlated with other measures of sprawl, such as the concentration/centralization of people (since the spatial distribution of all people and jobs is highly correlated), and with measures typically used by economists to measure employment density, such as spatially based employment density gradients (Glaeser and Kahn, 2001; Kahn, 2001).[7]

The job sprawl measure has a straightforward interpretation: higher percentages of a metropolitan area's employment located outside the 5 mile ring around the CBD implies higher sprawl, while lower sprawl is associated with lower percentages of a metropolitan area's employment located outside the 5 mile ring. Using this definition of job sprawl, Table 1 shows that on average in U.S. metropolitan areas, about 64.7 percent of jobs are located outside of the 5

[6] The data to calculate each ZIP code's distance from the CBD ultimately comes from Chenghuan Chu (2000), *Employment Decentralization*, Undergraduate Thesis, Harvard University, Department of Economics, but Matthew E. Kahn at Tufts University graciously provided these data to me.

[7] I explored alternative measures of sprawl to verify the validity of the job sprawl measure employed in the analysis. Panel A in Table A.1 in the appendix shows OLS regressions of the blacks/total jobs mismatch index using three alternative definitions of sprawl. Panel B shows their correlations. Column 1 shows the job sprawl measure used here. Column 2 shows an average population density sprawl measure in metropolitan areas. This measure is calculated as D=P/A, where D is equal to the average density per square mile of a metropolitan area, P is the population of the metropolitan area and A is the land area in square miles of the metro area. Lower values of average density imply lower sprawl. Column 3 presents the population density gradient measure of sprawl most commonly used by urban economists. The population density gradient is measured as $d(u)=d_0e^{-\gamma u\varepsilon}$, where d is the census tract population density at distance u from the center of a city; d_0 is the density at the center; e is the base of natural logarithms; gamma is the gradient, or the rate at which density falls from the center; and ε is the error term. More positive (or less negative) values of the population density gradient are associated with greater sprawl. I calculate the latter two measures using population data from the 2000 *U.S. Census*. Finally, Column 4 shows a sprawl index developed by Lopez and Hynes (2003) that takes into consideration the percentage of a metropolitan area's population that is in high or low-density census tracts. More specifically, it is calculated as Sprawl Index=(((L%-H%)/100+1)) x 50, where L% is the percentage of the metropolitan population in lo-density census tracts and H% is the percentage in high density census tracts. I divide their index by 100 for ease of interpretation of the coefficient. Here, higher values imply higher levels of sprawl. The means (std. devs) of these alternative sprawl variables are included in Table A.2 in the appendix. The results for each of these regressions indicate that sprawl is correlated with blacks' spatial mismatch in a similar direction and are all statistically significant. However, the job sprawl measure used in this analysis explains more of the variation in spatial mismatch as indicated by the adjusted R^2. Thus, these results provide greater confidence in the job sprawl measure used here.

mile ring centered on CBDs of metropolitan areas.[8] Table 1 also shows a sprawl index of 71.1 for larger metropolitan areas indicating that levels of job sprawl are higher in larger metropolitan areas (i.e., those with 500,000 people or more) than average ones and only slightly lower in the Northeast than other regions, results that are consistent with alternative measures of sprawl (Glaeser and Kahn, 2001).

The measure of sprawl used in this analysis has some potential problems, however. Most importantly, this measure could depend on and be correlated with the metropolitan area's population size as shown above and elsewhere (Lopez and Hynes, 2003; Glaeser and Kahn, 2001). For example, in a larger metropolitan area, or as the metropolitan area grows, one might expect that the employment share within the 5 mile radius will be lower. This is because the 5 mile radius around the CBD is fixed, while suburban boundaries may grow. This is of concern because the development patterns informing the growth of larger metropolitan areas need not be characterized by sprawl. I address this issue in the analysis by adjusting estimates of the relationship between sprawl and spatial mismatch for population and land area size, where appropriate. But because metropolitan areas that are large, growing rapidly, or are spread out over large land areas could also have gotten that way through sprawl development patterns, the strength of the relationship between sprawl and mismatch shown here is likely to be conservatively measured once we account for these factors, especially for land area.

Also, the 5 mile CBD boundary used to measure job sprawl may seem arbitrary. To examine the sensitivity of results to alternative CBD distance based job sprawl measures, I experimented with boundaries that were located outside of a 3 and 10 mile radius centered on the

[8] These average sprawl values are weighted by the metropolitan area's population size. Weighting the calculation of the average will place more weight on metropolitan areas with large populations. For example, New York, Los Angeles, and Philadelphia will all receive relatively large weights in the calculation of the sprawl measure, given the relatively large populations of these cities. The weighting permits us to interpret the patterns in Figure 1 as the average degree of sprawl experienced by the typical person in metropolitan area.

metropolitan area's CBD. These alternative measures of job sprawl were highly correlated with that used in this analysis (though they differed in levels as to be expected) and did not produce qualitatively different results than those presented in this analysis. This exercise provides some evidence that the choice of the 5 mile CBD boundary does not appear to bias results in any particular direction.

I measure the spatial imbalance between jobs and residential locations using an index of dissimilarity.[9] The dissimilarity index has mostly been used in the past to measure the extent of housing segregation between members of different racial and ethnic groups within a given metropolitan area. I adopt this measure to describe the imbalance between residential and employment distributions for metropolitan areas in the U.S. The spatial mismatch index is calculated using data on jobs from the same 1999 U.S. Department of Commerce's ZIP Code Business Patterns files and data on people from the 2000 U.S. Census.[10] This mismatch index of dissimilarity measures the degree of segregation between blacks and jobs and has been used elsewhere to measure spatial mismatch (Martin, 2004; Raphael and Stoll, 2002; Martin 2001).

The equation for the dissimilarity index is quite straightforward. Define $Black_i$ as the black population residing in zip code i (where i=(1,...,n) and indexes the zip codes in a given metropolitan area), $Employment_i$ as the number of jobs in zip code i, $Black$ as the total black

[9] The use of an exposure index did not produce qualitatively dissimilar results than those shown here.

[10] One problem in using the 2000 race data is that the U.S. Census for the first time permitted respondents to describe themselves by more than one racial category. In response to this issue, I experimented with three different sets of criteria for defining race. First, I restricted the population counts to those who chose a single racial descriptor only. Second, I defined racial categories in the most inclusive manner possible, counting all respondents who self-identify as white in the white totals, all respondents who self-identify as black in the black totals, and so on. Finally, I used a hierarchical set of definitions to tabulate populations, defining black as all those who self-identify as black, Asians as all those who self-identify as Asian excluding those who also self-identify as black, and whites as all those who self identify as white excluding those who self-identify as either black or Asian. There were virtually no differences in the mismatch dissimilarity indexes when each of these definitions were used. Thus and following convention in this area, I use the single race indicators.

population in the metropolitan area, and *Employment* as the total number of jobs in the metropolitan area. The dissimilarity score between blacks and jobs is given by

(1)

$$D = \frac{1}{2}\sum_i \left| \frac{Black_i}{Black} - \frac{Employment_i}{Employment} \right|.$$

As written, the dissimilarity index ranges between 0 (perfect balance) and 1 (perfect imbalance). Hence, the index value between blacks and jobs for all metropolitan areas in the U.S. describes the extent to which the areas (measured as zip codes) where blacks tend to reside in are different from the areas in which jobs are located. The results from this equation are multiplied by 100 to allow one to interpret the index values as the percent (rather than the proportion) of either of the populations that would have to move to yield perfect balance. Mismatch indexes are also calculated for whites and Latinos for comparisons purposes.

Like the job sprawl measure, there are a number of potential problems with the use of the dissimilarity index to measure mismatch. First, a mismatch dissimilarity index may not actually measure the physical distance between the average member of a given population and jobs. The index measures the imbalance across geographic sub-units of the metropolitan area (for example, zip-codes) between members of the population and jobs. To take an extreme example, suppose that all black residents resided in one zip code of a city while all jobs were located in a different zip code. Whether these two zip codes are one mile apart from one another or 20 miles apart will not influence the dissimilarity measure. In both instances, the dissimilarity index will be equal to 100. Nonetheless, as a summary measure, the dissimilarity measure does allow comparisons across geographic areas.

Another concern is that use of total jobs may bias the extent to which blacks may be in geographic imbalance with low-skill jobs, a major concern of the mismatch hypothesis. To

examine this, I calculated a mismatch index using retail jobs from the Business Patterns Files. Retail jobs are a good indicator of the extent to which blacks are spatially isolated from low-skill jobs since they are disproportionately lower-skilled (Holzer, 1996).[11] Results using the retail jobs dissimilarity mismatch index were qualitatively similar than those shown here for total employment.

Despite this, there are a number of strengths of the dissimilarity index. First, it allows for the spatial mismatch to be measured in a uniform way across metropolitan areas. Most studies of spatial mismatch rely on data from a single or a limited number of metropolitan areas for a variety of reasons, most especially that detailed geographic data on jobs and people are difficult to obtain across metropolitan areas and that the typical measures used to measure mismatch such as employment based density gradients are computationally costly (usually in time such as data collection, programming, etc.). The dissimilarity measure is calculated in the exact way across metropolitan areas using the same data sources and thus allow for direct metropolitan area comparisons.

Further, the actual numerical value of the dissimilarity index has a convenient interpretation. Specifically, the index can be interpreted as the percent of either the black population or of jobs that would have to relocate to different areas to completely eliminate any geographic imbalance. For example, as Table 1 indicates, the 2000 index value describing the imbalance between the residential distribution of blacks and jobs is 53.5 for all metropolitan areas.[12] This indicates that in 2000, about 54 percent of blacks would have had to relocate within

[11] The U.S. Bureau of Labor Statistics for 2001 estimates that retail trade accounts for 18 percent of all jobs.
[12] These mismatch index averages are weighted by the metropolitan area population counts for the racial/ethnic group being described by the index. Again, weighting the calculation of the average will place more weight on metropolitan areas with large populations. For example, New York, Chicago, and Atlanta will all receive relatively large weights in the calculation of the black mismatch measures, given the relatively large black populations of these metropolitan areas. The weighting permits us to interpret the patterns in Table 1 as the average degree of mismatch experienced by the typical member of each group.

metropolitan areas to be spatially distributed in perfect proportion with the geographic distribution of jobs. Table 1 also shows that blacks are the most spatially isolated racial group from jobs, that spatial mismatch is higher for blacks in larger metropolitan areas and in the Northeast and Midwest regions. Thus, the index seems a reasonable way to characterize mismatch, especially since the metropolitan areas that we expect to have high and low levels of mismatch, such as Detroit and Portland, respectively, given common knowledge in this area show up in the mismatch dissimilarity index as such.

The empirical strategy is as follows. First, I examine the basic relationship between job sprawl and the blacks/total jobs mismatch index using regressions analysis. The principal identification problem in detecting the effect of job sprawl on blacks' mismatch conditions is that job sprawl may be caused by blacks' residential location patterns thus causing a potential simultaneous relationship between job sprawl and mismatch. Alternatively, unobserved metropolitan factors, such as development regulations, could affect both job sprawl and blacks' spatial mismatch from jobs. To address these concerns, I first estimate a series of regression models that include an extensive list of metropolitan area control variables. Next, I use data on the physical characteristics of metropolitan areas such as, among others, whether the metro area borders another country or a large body of water to identify the relationship between job sprawl and mismatch. These physical characteristics exogenously influence how a metropolitan area grows or the form that it takes and are largely uncorrelated with whether blacks are located far from jobs within these areas. The physical characteristics of metropolitan areas are thus good instruments for job sprawl.

Next, I further probe the robustness of the results in a variety of other ways. I examine whether the effects of jobs sprawl are found for other racial groups such as whites, who because

of their residential concentration in suburbs should be less affected by job sprawl. Then, I examine whether there are non-linear effects of job sprawl on blacks' spatial mismatch where at the very high tail of the job sprawl distribution job sprawl could potentially lessen mismatch. I then examine the coefficient on job sprawl on blacks' mismatch conditions using 1990 data to examine whether the job sprawl effect declined or strengthened over the 1990s. Finally, I examine a first differencing change regression over the 1990s that eliminates any unobserved time-invariant effects to additionally control for unobserved heterogeneity that may influence the results.

III. Empirical Results

A. Unadjusted Relationship between Job Sprawl and Spatial Mismatch

Figure 1 first presents a scatter plot of the sprawl index values for the roughly 300 metropolitan areas in the sample against the mismatch index values for blacks for these areas in 2000. Each point on the scatter plot represents a single metropolitan area, with its measure of job sprawl noted on the horizontal axis, while its mismatch index between blacks and jobs is indicated on the vertical axis. The scatter plot also includes a trend line that is fitted to the data using a simple linear regression, whose equation is shown in the lower right panel.

The data in Figure 1 clearly indicate that job sprawl is positively and significantly correlated with mismatch conditions for blacks. This finding indicates that metropolitan areas that are characterized by more sprawl are also characterized by greater levels of mismatch between blacks and jobs. This finding strongly suggests that metropolitan decentralization exacerbates the spatial isolation of blacks from jobs as the mismatch hypothesis suggests, and

does not seem to improve mismatch conditions by spurring black residential mobility to jobs-rich suburbs through improved housing affordability as some have suggested.

The regression equation predicting mismatch for blacks as a function of job sprawl indicates that on average an increase in the sprawl index by 10 percentage points is associated with a 3.1 percentage point increase in mismatch conditions for blacks. Moreover, the analysis further reveals that 27 percent, or about a quarter, of the variation in the mismatch index across metropolitan areas in 2000 can be accounted for by variation in the degree of job sprawl alone.

B. Estimating Equations

The preceding analysis demonstrates a strong, positive correlation between job sprawl and spatial mismatch. Of course, there are many factors such as metropolitan area population size that likely mediate this relationship. To address this, I first control for extensive metropolitan area characteristics to estimate the relationship between job sprawl and spatial mismatch. In particular, I estimate the equation:

$$Mismatch_i = JS_i\beta_{11} + \beta'_{12}\, X_i + \varepsilon_{1i} \qquad (2)$$

where i indexes metropolitan areas, JS_i is the job sprawl index, and X_i is a variety of metropolitan area characteristics variables, and ε_{1i} is a mean-zero, randomly distributed disturbance term. OLS regression models are used to estimate Equation (2).

Metropolitan area characteristics that may co-vary with spatial mismatch conditions for blacks and mediate the relationship between mismatch and job sprawl include characteristics such as regions, the age of the oldest, main central city of the metropolitan area, as well as its size, as measured by population and land area. Spatial mismatch conditions for blacks are worse in larger metropolitan areas and those in the Northeast and Midwest regions for example (Raphael and Stoll, 2002). Social and economic characteristics of metropolitan areas also likely

to influence mismatch conditions for blacks as well. These include the percent of the metropolitan area that is black or Latino, the fraction of the population that is over 65 or is college educated, and the percent of employment that is manufacturing, service or retail trade, and the number of municipalities in metropolitan areas. For example, mismatch conditions for blacks are greater in areas with a larger percentage of black residents (Raphael and Stoll, 2002).

Table A.2 in the appendix shows the means of the independent variables used in the analysis, both with and without weights for the metropolitan area's population size. Most of these variables are collected from the 2000 U.S. Census. However, data on the age of the main central city and the number of municipalities in the metropolitan area are from the U.S. Census of Governments Organization file.[13] In the analysis, I use the logs of the metropolitan area population size, the central city's age, the number of municipalities, and land area. Note that the sample size is 267 metropolitan areas. There are potentially about 315 metropolitan areas to include in the analysis. The sample is restricted to those metropolitan areas for which data on all variables examined here are available. This restriction does not appear to bias the sample in any particular direction.[14]

The key problems in identifying the effect of job sprawl on mismatch conditions for blacks are the simultaneous determination of job sprawl and mismatch and concerns about unobserved factors influencing both job sprawl and spatial mismatch. Employment decentralization could exacerbate mismatch conditions for blacks if blacks' residential locations remain centralized. On the other hand, if employers' location decisions are in part influenced by racial considerations such as the residential locations of blacks (in part because they may view

[13] Jordon Rappaport from the Kansas City Federal Reserve Bank graciously provided these data.
[14] For example, there is no statistical difference in the magnitude of the coefficient on job sprawl in equations predicting spatial mismatch for the restricted versus unrestricted sample. This occurred despite the fact that the omitted metropolitan areas were generally of smaller size (with respect to population).

black workers as less desirable (Wilson, 1996)), then mismatch conditions, which of course are influenced by blacks' residential locations, may influence the degree of employment decentralization. Alternatively, job sprawl may be determined in part by unobserved metropolitan area factors that may also be correlated with spatial mismatch of blacks such as development regulation policies. Such policies may limit job sprawl but also affect blacks' residential mobility through affecting housing prices, ultimately affecting blacks' spatial imbalance from jobs. Both of these factors are likely to bias upwards the OLS estimates of job sprawl.

One estimation strategy that would break the simultaneity between job sprawl and mismatch conditions and address the problem of unobserved heterogeneity is to find instruments for job sprawl and re-estimate the jobs sprawl effect using a 2SLS estimator. This approach clearly establishes the direction of causality. I follow this approach using physical geography indicators that directly exogenously influence the extent of job sprawl across metropolitan areas but that are conceptually uncorrelated with mismatch conditions faced by blacks. Physical geography has been linked as determinants of sprawl (Burchfiled, et. al., 2004). These instruments include whether the metropolitan area is adjacent to a major (state or federal) park, military base or reservation, or body of water (such as a lake or ocean), or whether it is located adjacent to another metropolitan area, state or to another country.[15]

[15] Following a strategy employed by Hoxby (2000), I also experimented with a topographical variable measuring the number of rivers as an instrumental variable. The number of rivers data were graciously provided to me by Jesse Rothstein from Princeton University, and come the 1999 Geographic Names Information System. The number of rivers in a metropolitan area could be a good instrument for sprawl since they conceptually exogenously influence urban form either by constraining extensive development or spurring leapfrog development. However, Culter and Glaeser's (1997) work raise concerns about the use of this variable as an instrument for sprawl. They use the number of rivers as an instrumental variable for racial segregation, arguing that rivers have an exogenous influence on segregation by in part increasing costs to blacks of moving across rivers. Since the mismatch of blacks from jobs is influenced by the degree of segregation, then the number of rivers, given Cutler and Glaeser's arguments, would clearly upwardly bias the 2SLS estimates of sprawl.

Equation (3) presents the first stage equation of job sprawl for the 2SLS approach:

$$Job\,Sprawl_i = \beta'_{21} R_i + \beta'_{22} X_i + \eta_{2i} \qquad (3)$$

where *i* indexes metropolitan areas, R is a vector of physical geography variables described above, X is a vector of metropolitan area characteristic variables described above, and η_{2i} is a normally distributed error term. Equation (3) is modeled using OLS. Table A.1 in the appendix shows the means of the instrumental variables used in the 2SLS.[16]

To be suitable instruments, the physical geography variables must not affect blacks' spatial mismatch from jobs other than through the effects of these variables on job sprawl, i.e., the instruments must be correlated with Job Sprawl$_i$, and be uncorrelated with ε_{1i} from Equation (2). It is quite clear that the physical geography variables should have no bearing on the extent of blacks' spatial mismatch from jobs other than through their affects on sprawl and should be uncorrelated with unobserved factors that drive this geographic separation. Blacks' residential choice within metropolitan areas is unlikely to be influenced by whether it is adjacent to another country or a large lake, all else equal.

On the other hand, the physical geography variables appear to be exogenous determinants of sprawl as they are for the most part determined by natural occurrences. One exception is the

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But this method raises the question of whether rivers really exogenously influence segregation or represent a spurious relationship with segregation operating through racial attitudes. Conceptually, rivers, like certain streets or railroad tracks, could be used by society as social markers or boundaries about blacks "place" in society. That is, race relations and social conventions about race in metropolitan area may determine where blacks ought to live, for a variety of well known historical reasons, and rivers may be simply tools used by society to mark the geographic boundaries of these racially defined neighborhoods. In this way, rivers don't cause segregation, racial attitudes do. Still, the IV results using rivers as an instrument for sprawl make this argument moot. While the number of rivers positively and significantly affects the degree of job sprawl in the first stage regression, the coefficient on job sprawl in second stage regression was unaffected with the inclusion of the number of rivers. Because of the potential controversy surrounding use of rivers as an instrumental variable for sprawl, I do not include it in the results shown here, particularly since results were unaffected with its inclusion.

[16] These data were graciously provided to me by Stephen Malpezzi at the University of Wisconsin, Madison, and. Malpezzi collected data on whether the metropolitan area is adjacent to a major park (or military base or reservation) or body of water (such as a lake or ocean) from the U.S. City to City Atlas. He also collected data on whether the metropolitan area is located adjacent to another metropolitan area, state or to another country from U.S. Census maps. Rothstein provided the data on rivers. The data are from the 1999 Geographic Names Information System.

variables measuring whether the metropolitan area is located adjacent to a major park, military base or reservation. The location decisions of these places are clearly social but the factors that determined them are unlikely to be related to factors that are correlated with sprawl. Many national parks and military base location decisions, for example, were made in the 1930 and 40s, well over 50 years ago or more (especially for Native American reservations), and well before the rapid growth of metropolitan areas and concerns about sprawl. Thus, these factors more likely exogenously influence urban form by directly affecting the extent of sprawl.

But the expected direction of the effects of these physical geography variables on job sprawl is not clear. On the one hand, physical constraints such as being located next to an ocean, large river or another country may act to constraint extensive development and encourage density. On the other hand, it is conceivable that these factors, such as a large lake, could influence extensive development patterns if these physical constraints encourage leapfrog development (Burchfield, et. al., 2004).

Table A.3 in the appendix shows the first stage regressions of job sprawl. The instrumental variables are all statistically significant at, at least, the .10 level. The results reveal that metropolitan areas adjacent to a major park, military base, or reservation as well as those adjacent to another country show lower levels of sprawl, implying that these factors constrain the geographic extent of sprawl. On the other hand, whether a metropolitan area is adjacent to a state, another MSA or a large body of water are positively associated with sprawl, perhaps for a variety of reasons including leapfrog development and other development tendencies. Importantly, the results from F-tests of the joint significance of the five instruments are significant at the .001 level with an F statistic of 19.91. Hence, the first-stage relationships are fairly strong.

C. Adjusted Results

Table 2 shows the results of regressions of the blacks/jobs mismatch. Models 1 through 4 are OLS estimates, while Model 5 presents the 2SLS estimate. Model 1 includes only the job sprawl measure and shows a statistically significant, positive coefficient that is identical to that shown in Table 2, Column 1. The OLS estimate in Model 1 predicts a 3.1 percentage point increase in spatial mismatch conditions for blacks given a 10 percentage point increase in job sprawl.

Model 2 adds the metropolitan characteristics to the model specification. With their inclusion, the magnitude of the coefficient on job sprawl is reduced (by 25 percent), indicating that differences in metropolitan are characteristics account for part of association between job sprawl and spatial mismatch. In particular, metropolitan population size and metropolitan areas in the Northeast and Midwest account for much of this. Still, the coefficient on job sprawl remains statistically significant at the .01 percent level with their inclusion. Note that spatial mismatch conditions for blacks are much worse in larger metropolitan areas and for those in the Northeast and Midwest, as evidence by the positive and significant coefficients on these variables.

Model 3 adds social and economic characteristics of metropolitan areas to the equation. The proportion of the population that is black or over 65 years of age are positively and significantly related to mismatch conditions for blacks, while the fraction of employment that is in service is marginally significant and negatively related. With the inclusion of these variables, the statistically significant and positive coefficient on job sprawl is further reduced (by 36 percent), indicating that social and economic factors account for a nontrivial part of association between job sprawl and spatial mismatch.

Model 4 adds a measure of land area to the specification to further account for metropolitan area size given the strong and positive association between job sprawl and metropolitan size.[17] Land area is not statistically associated with blacks' spatial mismatch from jobs and its inclusion does not significantly affect the point estimate on job sprawl. Thus even after controlling for land area, which likely over controls for metropolitan characteristics since job sprawl directly influences the amount of land encompassing metropolitan areas, job sprawl still remains significantly related to job sprawl. In the remainder of the analysis, the land area variable is not included for this reason and because a large share of metropolitan areas in the sample are missing values for this variable.

Finally, Model 5 shows the results of the 2SLS estimate. Since there are five instrumental variables, I perform a test of the implicit overidentification restriction in the model. The overidentification restriction for the model is not rejected (at the 5 percent level). A rejection of the overidentification restriction indicates that the 2SLS estimate is sensitive to the choice of instruments.

Similar to the comparable OLS results shown in Model 3, the 2SLS estimate indicates that job sprawl exerts a positive and highly significant effect on blacks' spatial mismatch. Moreover, it exceeds the OLS estimate. The 2SLS estimate indicates that a 10 percentage point increase in job sprawl would increase the spatial mismatch index by 2.1 percentage points, while the comparable number for the OLS estimate is 1.5 percentage points. Thus, after instrumenting for job sprawl, I find that job sprawl exerts a direct positive effect on blacks' mismatch conditions.

[17] The correlation coefficient between job sprawl and the log of land area is 0.319 and is statistically significant at the .001 level.

I further examine the validity of these results by examining the effect of job sprawl on mismatch for Latinos and whites. Conceivably, sprawl could harm other groups that might experience some residential concentration in the urban core, such as Latinos. Since Latinos are less concentrated in urban areas than blacks, it is expected that job sprawl should affect their mismatch conditions to a lesser extent than that of blacks (Stoll and Raphael, 2000). Job sprawl is unlikely to affect whites' mismatch conditions given their residential concentration in suburban areas.

Table 3 presents the OLS regressions of spatial mismatch for blacks, whites and Latinos. The models are identical to the specification in Model 3 in Table 2. I show this model specification because it presents more conservative estimates of the effect of job sprawl on blacks' mismatch than the 2SLS estimates, though use of the 2SLS estimates did not provide qualitatively different results for whites and Latinos than those shown here. The results show that job sprawl has no statistically significant effect on the spatial mismatch conditions of either whites or Latinos. This is likely true because whites and Latinos are much less residentially concentrated than blacks in the urban core (Iceland, 2004) such that job sprawl is unlikely to have any significant influence on their geographic separation from jobs. There could sub-groups of whites or Latinos that may be more residentially concentrated such as the less-skilled or different national origin Latino groups as Puerto Ricans whose mismatch might be affected by sprawl, but such investigation is beyond the scope of this paper.

D. Further Empirical Probes

Table 4 shows the results of alternative specifications of estimated effect of job sprawl on the blacks/jobs dissimilarity index to better examine the alternative question of whether job sprawl lessens mismatch conditions faced by blacks as some have speculated. Column 1 and 2

examine potential non-linearities in these effects. Column 1 shows results of a model that includes the square of job sprawl that indicates that the strength of the job sprawl effect on blacks' mismatch conditions declines at higher levels of job sprawl. More importantly, column 2 examines whether at higher levels of job sprawl, the effect of job sprawl on blacks' mismatch conditions becomes negative (as interpreted though the coefficient on jobs sprawl cubed). This result would be consistent with some who suggest sprawl could lessen mismatch conditions faced by blacks by spurring black residential mobility to suburbs through lower housing prices. Though the sign on the job sprawl cubed variables is negative indicating some support for this hypothesis, it is not statistically significant.[18]

Column 3 presents results using 1990 data for the exact model using 2000 data shown in Model 3, Table 2. If sprawl lessens mismatch conditions faced by blacks, then evidence consistent with this idea would show that the coefficient on job sprawl would become smaller over time or that the coefficient on job sprawl would be smaller in magnitude in 2000 than in 1990. The results show no support for this hypothesis as the job sprawl coefficient in 2000 is larger in magnitude than that in the earlier 1990 period.

Finally, columns 4 and 5 show results from first differencing regressions that eliminate the unobserved time-invariant effects from the equations that also influence the degree of mismatch conditions faced by blacks. Column 4 shows first differences estimates for the absolute change in the blacks/jobs dissimilarity index between 1990 and 2000 as a function of the absolute change in job sprawl, as well as the change in all other relevant time varying variables listed in Table 4. Column 5 shows these first differences estimates for the percent

[18] Because of the high degree of correlation between the squared and cubed job sprawl variables, I took the predicted probabilities of the blacks/jobs dissimilarity index generated by Model 3 in Table 2, calculated the deciles of these and plotted them to see whether the effect of job sprawl on blacks' mismatch conditions changed directions (and became negative) at higher levels of job sprawl. It did not, it only became flat, corroborating results from the regression with job sprawl cubed shown here.

change in the blacks/jobs dissimilarity index between 1990 and 2000. The means and standard deviations of the main variables in all of these models are provided in appendix Table A.2.

In general, the results of both first differences regressions show virtually little support for the hypothesis that job sprawl lessens mismatch conditions faced by blacks (nor for the hypothesis that job sprawl exacerbates mismatch conditions), though the coefficient on the absolute change in job sprawl is negative and nearly statistically significant at the .10 level.[19] A possible explanation for why the results of the first differences equations differ from the cross-sectional results is that there is less variation across metro areas in the change in spatial mismatch and job sprawl over the decade than across metro areas in the degree of mismatch and job sprawl in one time period. A longer time period over which changes in the mismatch and jobs sprawl measures are observed could help increase this variation. Unfortunately, the 1990 data is the earliest period available to measure these variables because of data availability constraints.

E. Heterogeneity in the Effect of Job Sprawl

To explore heterogeneity in the effect of job sprawl, Table 5 presents OLS regression results of blacks' spatial mismatch from jobs disaggregated by region, metropolitan population size, the percent of the metropolitan area that is black, and the percent change (1990 to 2000) of the metropolitan area that is black. All control variables included in Model 3 in Table 3 are included in these regressions though their results are not shown. The results in Panels A show a positive coefficient on job sprawl for each region, but are much stronger in the Midwest and

[19] Hanushek (1986) critiques these first differences change regressions because they assume that the change over the decade is independent of the starting level of spatial mismatch (in 1990). To address this, I regressed spatial mismatch for blacks in 2000 on the level of spatial mismatch for blacks in 1990 and on the change in all other relevant time varying variables including the change in job sprawl. The results of these regressions were no different that than shown here. Also, the coefficient estimate on the level of spatial mismatch for blacks in 1990 was less than one, indicating that the change in mismatch over the decade was not independent of its starting level. It indicates that metro areas with high levels of spatial mismatch at the beginning of the period had smaller increases over the decade.

West. The coefficients are not statistically significant in the South or Northeast, though limited statistical power in the Northeast sample size is probably influencing this result.

Panel B shows the results with metropolitan areas stratified by metropolitan area population size and shows no effect of job sprawl in either small or large (population over 500,000) metropolitan areas, suggesting that all of the effect of job sprawl on blacks' mismatch conditions is driven by differences in moving from smaller to larger metro areas.

Panel C shows the results for metropolitan areas stratified by the percent black of their populations. The coefficients on job sprawl are all positive and significant in all cases, but are statistically significant and much larger in magnitude in metropolitan areas with small (< 5 percent) and moderate (.05 to .10 percent) percentages of the population being black. Panel D shows that the effect of job sprawl on blacks' spatial mismatch is most important in metropolitan areas where black population growth is limited (< .10 percent). Thus, these results suggest that the effect of job sprawl on blacks' spatial mismatch from jobs is much stronger in metropolitan areas where the share of the population that is black is small to moderate or where black population growth is limited, perhaps because blacks' residential mobility to suburban areas in these areas is more limited.[20]

[20] These findings suggest that racial segregation is one potential mechanism that could influence the relationship between mismatch and sprawl. The degree of spatial mismatch experienced by blacks across metropolitan areas is strongly related to the extent of racial segregation. Raphael and Stoll (2002) demonstrate that in 2000, 50 percent of the variation in mismatch conditions faced by blacks (as measured by the spatial mismatch index used in this analysis) in metropolitan areas is accounted for by racial segregation between blacks and whites (as measured by the index of dissimilarity between whites and blacks). Though not shown here, I estimated the effect of job sprawl on racial segregation between blacks and whites (the index of dissimilarity with 2000 U.S. Census data) using OLS and the 2SLS estimates and including the same metropolitan area characteristics controls. In both models, job sprawl has a direct effect on worsening racial segregation between whites and blacks, though the effect of sprawl on segregation is larger in magnitude in the 2SLS than the OLS estimates. The important point is that the significant effect of job sprawl on racial segregation does not imply that the association between mismatch and job sprawl is a spurious one, operating instead through segregation. Both job sprawl and racial segregation have significant, independent effects on blacks' spatial mismatch when both are included in the regression s of blacks' spatial mismatch. Still, mismatch and segregation are very highly correlated and thus the inclusion of the segregation variable in to the equation introduces multicollinearity concerns.

F. Spatial Mismatch and Blacks' Employment Outcomes

Finally, this section examines the degree to which the measure of spatial mismatch used in this analysis correlates with blacks' actual employment outcomes. So far, I have assumed that worsening spatial mismatch conditions (as measured in this analysis) implies worsening employment outcomes for blacks, or vice-versa. This section provides a direct test of this assumption. Table 6 provides estimates of regression equations of blacks' employment-to-population ratios, for all blacks and stratified by sex and educational attainment. All control variables listed in Model 3 in Table 3 (except job sprawl) are included in the analysis. The metropolitan area employment-to-population ratios (for blacks) are calculated using the 2000 Census Public Use Microdata (5%) Samples. The sample is restricted to those between 21 and 65 years of age who are out of school and have no reported disability. Means (std. devs) of these ratios are presented in the appendix Table A.1.

The results in Table 6 confirm the reasonableness of the assumption. They indicate that blacks' employment-to-population ratios are significantly and negatively related to the blacks//total jobs mismatch index as the spatial mismatch hypotheses suggests. Model 1 for all blacks indicates that a 10 percentage point increase in mismatch conditions faced by blacks is associated with a 1.4 percentage point reduction in their employment-to-population ratio. For a variety of reasons not explored here, the remaining models indicate that mismatch conditions are more important to males' than females' employment-to-population ratios and those considered less-educated (i.e., those with a high school degree or less). These results are consistent with the mismatch literature (Ihlanfeldt and Sjoquist, 1998; Pugh, 1998).

IV. Conclusions

This paper has provided an analysis of the relationship between job sprawl and the spatial mismatch between blacks and jobs. Much attention has been recently paid to the question of sprawl, especially whether it is increasing and what its impacts are on certain dimensions of social and economic life, such as health problems, pollution, concentrated poverty, and other concerns. But there is little evidence on the question of how and in what ways job sprawl is connected to questions of race.

A major concern in estimating the effect of job sprawl on blacks' mismatch conditions is that the direction of causality in the relationship is not clear. On the one hand, sprawl could affect blacks' distance from jobs in ways implied by the mismatch hypothesis. On the other hand, factors underlying spatial mismatch conditions may spur job sprawl. For example, employers may view black workers less desirable for a variety of reasons, and thus may locate to the outer fringe of metropolitan areas far from areas with concentrations of blacks.

To address this problem of simultaneity, I used measures of a metropolitan area's physical geography as instruments for job sprawl in two-stage least squares regressions as well as other model specifications. Measures of metropolitan areas physical geography are good instruments for job sprawl since they exogenously influence urban form and have little to do directly with blacks' geographic separation from jobs. After instrumenting for job sprawl in this manner, I still find a strong, significant and direct negative effect of job sprawl on the mismatch conditions faced by blacks. Analysis further demonstrates that this effect is particularly important in the Midwest and West, and in metropolitan areas where blacks' share of the population is not large and where blacks' population growth rate is relatively low, perhaps because black residential mobility is lower in these areas.

Taken together, the results of this paper are more favorable to the idea that job sprawl exacerbates certain dimensions of racial inequality in America: job sprawl influences greater mismatch conditions for blacks, thereby resulting in greater employment challenges faced by blacks in more sprawled areas. Thus, the idea that sprawl could reduce blacks geographic separation from jobs by spurring black residential mobility through lower housing prices is not well supported in this analysis.

What do these results imply for policy? They suggest that efforts aimed at limiting the extent of job sprawl should have some potentially beneficial effects on improving blacks' spatial access to employment, among other factors. These activities could include regional coordinating efforts that may, for example, forge the development of urban growth boundary policies. But because of political fragmentation, such efforts are likely to prove politically difficult as many have documented. Still, arguments for increasing regional coordinating efforts that move beyond the "suburbs gain when central cities do well" variety to include identifying problems of unemployment, poverty and race that confront both suburbs and central cities alike are likely to be more politically potent.

Of course, limiting sprawl could have some potentially negative consequences as well, such as, among other factors, decreasing housing affordability. These consequences are likely to disproportionately negatively harm blacks, possibly including reducing their residential mobility to suburban job rich areas. But the promotion of smart growth development strategies in central cities and inner ring suburbs could mitigate these potential negative effects as well as generate positive ones. Targeting development smartly in these areas where abandoned buildings and/or vacant land exists could be particularly effective at mitigating these negative effects. Smart growth development efforts are also likely to disproportionately benefit blacks, who are over

reliant on public transportation to get to work, especially if such development is placed near public transit routes.

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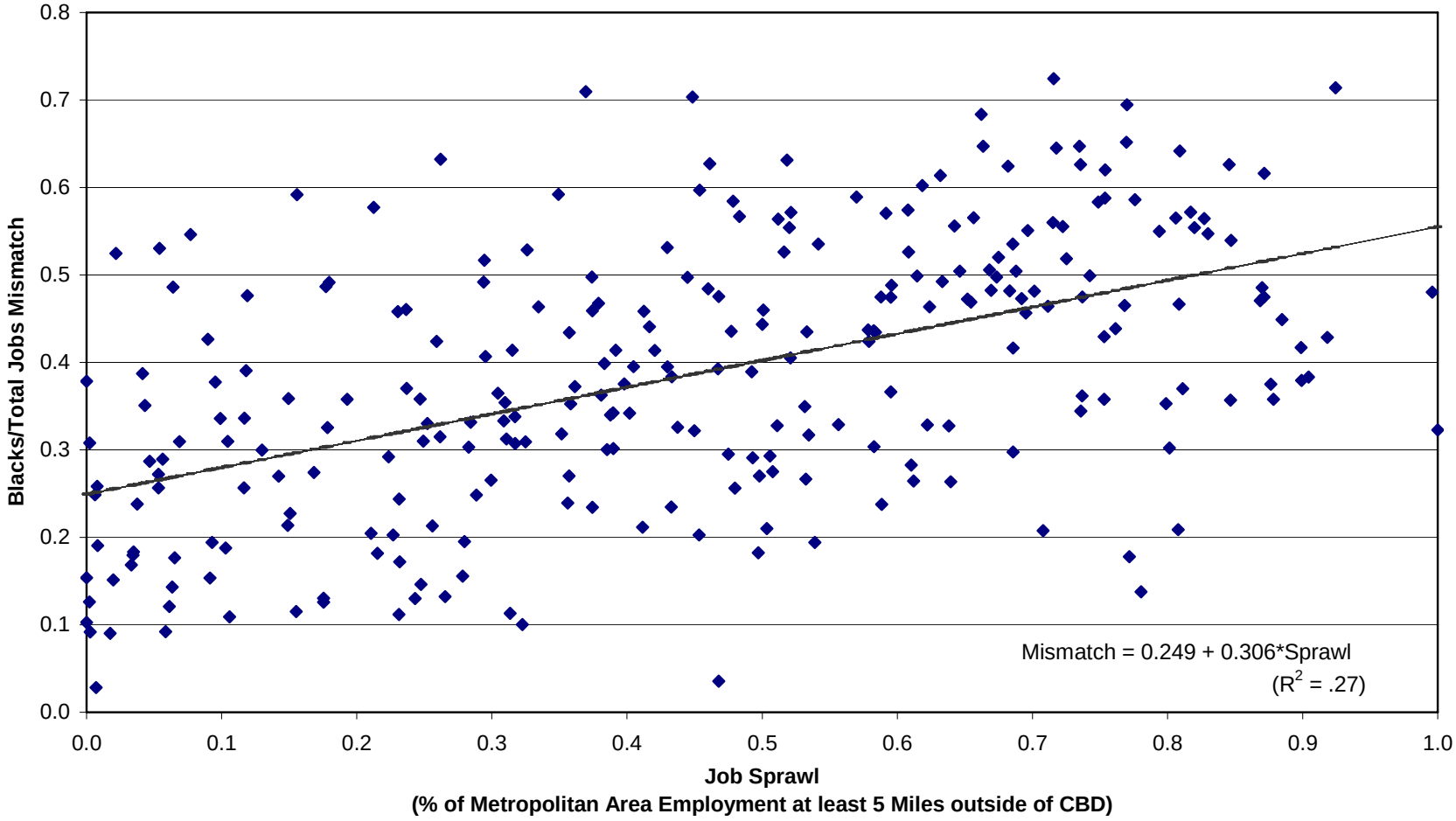
Figure 1
Blacks/Jobs Mismatch Versus Job Sprawl in U.S. Metropolitan Areas, 2000



Note: Correlation is statistically significant at below the 0.001 percent level.

Table 1
Average Levels of Job Sprawl and Mismatch by Metropolitan Area Characteristics, 2000

		Total Jobs Mismatch:		
	Job Sprawl	Blacks	Whites	Latinos
All MSAs	64.7	53.5	33.8	44.1
Larger MSAs (500,000 People or More)	71.1	56.5	35.6	45.8
Region:				
Northeast	59.4	64.2	32.7	54.6
Midwest	65.3	61.4	31.6	48.8
South	65.7	45.9	35.8	38.7
West	66.5	52.1	34.7	44.0
Percent Black:				
0 - < .05	48.2	38.1	29.2	36.3
.05 - < .10	65.4	51.7	32.8	44.8
> .10	68.9	54.4	35.7	46.9

Notes: Job sprawl is defined as the fraction of jobs in metropolitan areas that is located outside of a 5 mile radius centered on the Central Business District.
The job sprawl average is weighted by metropolitan area total population size.
The people/jobs mismatch average for each racial/ethnic group is weighted by each respective racial/ethnic groups metropolitan area population size.
N=267 metropolitan areas.

Table 2
OLS and Two Stage Least Squares Regressions of Blacks/Jobs Mismatch

	(1)	(2)	(3)	(4)	(5)
Job Sprawl	0.305***	0.228***	0.147***	0.139***	--
	(0.030)	(0.032)	(0.037)	(0.044)	
Job Sprawl – Instrumented (2SLS)	--	--	--	--	0.225***
					(0.079)
Log (Population Size)	--	0.061***	0.059***	0.070***	0.058***
		(0.009)	(0.012)	(0.015)	(0.012)
Northeast	--	0.107***	0.172***	0.165***	0.190***
		(0.029)	(0.038)	(0.047)	(0.036)
Midwest	--	0.063***	0.092***	0.090***	0.110***
		(0.018)	(0.027)	(0.033)	(0.036)
West	--	-0.026	0.012	-0.005	0.006
		(0.022)	(0.027)	(0.035)	(0.028)
Log (city age)	--	-0.036	-0.114***	-0.107	-0.123***
		(0.034)	(0.039)	(0.047)	(0.041)
Percent Black	--	--	0.435***	0.336***	0.412***
			(0.116)	(0.137)	(0.121)
Percent Latino	--	--	0.084	0.043	0.058
			(0.070)	(0.083)	(0.077)
Percent over 65 years old	--	--	0.675**	0.603*	0.537
			(0.312)	(0.348)	(0.365)
Percent with college degree or more	--	--	0.354*	0.056	0.301
			(0.209)	(0.291)	(0.223)
Share of employment in manufacturing	--	--	-0.146	-0.132	-0.194
			(0.185)	(0.226)	(0.197)
Share of employment in retail trade	--	--	-1.035	-1.192	-1.013
			(0.690)	(0.773)	(0.697)
Share of employment in service	--	--	-0.507**	-0.330	-0.515**
			(0.226)	(0.263)	(0.229)
Log (number of political jurisdictions)	--	--	0.011	0.003	0.001
			(0.011)	(0.014)	(0.017)
Log (land area)	--	--	--	-0.004	--
				(0.018)	
Adj. R^2	0.270	0.403	0.420	0.332	0.408
N	267	267	267	200	267

Note: ***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively
Std. errors in parentheses.
Constant included in regressions but not shown.
First stage OLS regression of job sprawl is shown in the appendix, Table A.2.

Table 3
OLS Regressions of Totals Jobs Mismatch by Race

	Total Jobs Mismatch:		
	Blacks	Whites	Latinos
	(1)	(2)	(3)
Job Sprawl	0.147***	-0.031	0.022
	(0.037)	(0.021)	(0.030)
Log (Population Size)	0.059***	0.063***	0.052***
	(0.012)	(0.015)	(0.016)
Northeast	0.172***	-0.046**	0.133***
	(0.038)	(0.021)	(0.031)
Midwest	0.092***	-0.054***	0.018
	(0.027)	(0.015)	(0.022)
West	0.012	0.005	0.044**
	(0.027)	(0.015)	(0.022)
Log (city age)	-0.114***	-0.024	-0.086***
	(0.039)	(0.022)	(0.032)
Percent Black	0.435***	0.211***	0.415***
	(0.116)	(0.066)	(0.095)
Percent Latino	0.084	-0.025	0.182***
	(0.070)	(0.040)	(0.058)
Percent over 65 years old	0.675**	0.106	0.466*
	(0.312)	(0.177)	(0.255)
Percent with college degree or more	0.354*	0.132	0.502***
	(0.209)	(0.118)	(0.172)
Share of employment in manufacturing	-0.146	-0.232**	-0.094
	(0.185)	(0.104)	(0.151)
Share of employment in retail trade	-1.035	-0.083	-0.029
	(0.690)	(0.390)	(0.564)
Share of employment in service	-0.507**	-0.038	-0.456***
	(0.226)	(0.127)	(0.184)
Log (number of political jurisdictions)	0.011	0.026***	0.014
	(0.011)	(0.006)	(0.009)
Adj. R^2	0.420	0.330	0.343

Note: ***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively.
Std. errors in parentheses.
N=267.
Constant included in regressions but not shown.

Table 4
Alternative Specifications of Job Sprawl Effect on the Blacks/Jobs Dissimilarity Index

	(1)	(2)	(3)	(4)	(5)
Job Sprawl	0.370*** (0.118)	0.015 (0.263)	--	--	--
Job Sprawl Squared[a]	-0.237** (0.120)	0.719 (0.643)	--	--	--
Job Sprawl Cubed[a]	--	-0.681 (0.450)	--	--	--
Job Sprawl – 1990[b]	--	--	0.130*** (0.042)	--	--
Absolute Change in Job Sprawl 1990 to 2000[c]	--	--	--	-0.190 (0.132)	--
Percent Change in Job Sprawl 1990 to 2000[c]	--	--	--	--	0.031 (0.065)
Adj. R^2	0.463	0.469	0.381	0.067	0.072
N	267	267	267	267	267

Note: ***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively
Std. errors in parentheses.
[a]Includes all control variables listed in Model 3 in Table 2.
[b]Includes all control variables listed in Model 3 in Table 2 but measured with 1990 values.
[c]Includes time varying control variables including relevant changes between 1990 and 2000 in log population size, percent metropolitan area that is black, percent metropolitan area that is Latino, percent population over 65 years old, percent population that are college graduates, percent employment in manufacturing, percent employment in retail trade, and percent employment in service. Dependent variables are absolute change in blacks/jobs mismatch between 1990 and 2000 (column 4) and percent change in blacks/jobs mismatch between 1990 and 2000 (column 5), respectively.
Constant included in all regressions but not shown.

Table 5
OLS Regressions of Blacks/Total Jobs Mismatch by Metropolitan Area Characteristics

	(1)	(2)	(3)	(4)
A. Region	Northeast	Midwest	South	West
Job Sprawl	0.123 (0.160)	0.173** (0.071)	0.021 (0.053)	0.201** (0.098)
R^2	0.339	0.541	0.309	0.683
N	30	73	92	47
	(1)	(2)		
B. Population Size	Less than 500,000	Greater than or equal to 500,000	--	--
Job Sprawl	0.006 (0.053)	0.001 (0.064)	--	--
R^2	0.193	0.452	--	--
N	148	94	--	--
	(1)	(2)	(3)	
C. Percent Black	Less than .05 percent	.05 to .10 percent	Greater than .10 percent	--
Job Sprawl	0.150* (0.082)	0.121* (0.072)	0.042 (0.051)	--
R^2	0.300	0.263	0.517	--
N	74	67	101	--
	(1)	(2)	(3)	
D. Percent Change in Black Population (1990 to 2000)	Less than .10 percent	.10 to .20 percent	Greater than .20 percent	--
Job Sprawl	0.102** (0.050)	0.118 (0.074)	-0.019 (0.071)	--
R^2	0.582	0.386	0.421	--
N	94	61	87	--

Note: ***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively.
Std. errors in parentheses.
Includes all control variables listed in Model 3 in Table 3.
Constant included in regressions but not shown.

Table 6
OLS Regressions of Employment-to-Population Ratios for Blacks

	Employment to Population Ratio for:						
	All Blacks	Males	Females	No High School Degree	High School Degree	Some College	College Degree or More
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Blacks/Total Jobs Mismatch	-0.140***	-0.225***	-0.026	-0.131***	-0.189***	-0.084	0.014
	(0.0523)	(0.065)	(0.052)	(0.050)	(0.074)	(0.058)	(0.067)
Adj. R^2	0.189	0.206	0.077	0.158	0.096	0.072	0.031

Notes: ***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively.
All Models include control variables listed in Model 3, Table 3, except the job sprawl variable.
Constant included in all regressions but not shown.
Std. errors in parentheses.
N=267.

Table A.1
Linear Regression of Blacks/Total Jobs Mismatch using Alternative Sprawl Measures
(and their Correlations)

A. Regressions[a]

	(1) Job Sprawl	(2) Average Density	(3) Population Density-Distance Gradient	(4) Sprawl Index (Lopez and Hynes, 2003)
Coefficient (std. error)	0.147*** (0.037)	-3.27e-05*** (5.75e-06)	0.901*** (0.117)	0.245*** (0.044)
Adj. R^2	0.420	0.305	0.330	0.310

B. Correlations of Sprawl Measures

	Job Sprawl	Average Density	Population Density-Distance Gradient	Sprawl Index (Lopez and Hynes, 2003)
Job Sprawl	1.00	0.108*	0.665***	0.213***
Average Density	0.108*	1.00	0.129**	0.579***
Population Density-Distance Gradient	0.665***	0.129**	1.00	0.122**
Sprawl Index (Lopez and Hynes, 2003)	0.213***	0.579***	0.122**	1.00

Notes: ***, **, and * indicates statistical significance at the .01, .05, and .10 percent level, respectively.
Std. errors in parentheses.
[a]Includes all control variables listed in Model 3 in Table 2.
N=267.

Table A.2
Means (std. devs.) of Variables

	(1) Unweighted	(2) Weighted by Population Size
Log (Population Size)	12.887	14.249
	(1.052)	(1.180)
Northeast	0.127	0.173
	(0.334)	(0.379)
Midwest	0.300	(0.243
	(0.459)	(0.430)
South	0.390	0.341)
	(0.489)	(0.475)
West	0.184	0.242
	(0.388)	(0.429)
Log (city age)	5.128	5.186
	(0.330)	(0.363)
Percent Black	0.112	0.142
	(0.104)	(0.092)
Percent Latino	0.099	0.143
	(0.150)	(0.153)
Percent over 65 years old	0.117	0.111
	(0.029)	(0.028)
Percent with college degree or more	0.169	0.189
	(0.051)	(0.050)
Share of employment in manufacturing	0.141	0.130
	(0.067)	(0.054)
Share of employment in retail trade	0.122	0.116
	(0.0138)	(0.012)
Share of employment in service	0.427	0.432
	(0.050)	(0.038)
Log (number of political jurisdictions)	2.995	3.826
	(1.177)	(1.180)
Log (land area)	2,303.904	4,203.161
	(3,094.133)	(4,880.430)
Adjacent to Park	0.227	0.227
	(0.420)	(0.419)
Adjacent to Major Body of Water	0.259	0.429
	(0.439)	(0.496)
Adjacent to MSA	0.738	0.865
	(0.440)	(0.342)
Adjacent to State	0.379	0.426
	(0.486)	(0.495)
Adjacent to Another Country	0.038	0.030
	(0.191)	(0.170)

(table continues)

Table A.2 Cont'd	(1)	(2)
	Unweighted	Weighted by Population Size
Log (Number of Rivers/Streams)	4.563 (1.051)	5.099 (1.047)
Average Density	1,198.35 (1,450.88)	2,730.90 (4,178.10)
Population Density-Distance Gradient	-0.115 (0.074)	-0.075 (0.046)
Lopez and Hynes (2003) Sprawl Index	0.664 (0.202)	0.506 (0.237)
Employment-to-Population Ratio for Blacks:		
All Blacks	0.594 (0.103)	0.615 (0.051)
Males	0.581 (0.129)	0.608 (0.061)
Females	0.618 (0.093)	0.622 (0.044)
Less than High School Degree	0.539 (0.097)	0.561 (0.048)
High School Degree	0.575 (0.139)	0.0586 (0.058)
Some College	0.672 (0.105)	0.697 (0.049)
College Degree or More	0.807 (0.115)	0.827 (0.041)
Job Sprawl – 1990[a]	0.427 (0.258)	0.623 (0.210)
Blacks/Jobs Mismatch – 1990[b]	0.422 (0.159)	0.569 (0.134)
Absolute Change in Job Sprawl 1990 to 2000[c]	0.018 (0.033)	0.021 (0.028)
Absolute Change in Blacks/Jobs Mismatch 1990 to 2000[d]	-0.039 (0.066)	-0.036 (0.058)
Percent Change in Job Sprawl 1990 to 2000[c]	0.074 (0.200)	0.047 (0.103)
Percent Change in Blacks/Jobs Mismatch 1990 to 2000[d]	-0.073 (0.234)	-0.059 (0.186)
N	267	267

Notes: [a]Weighted by population size in 1990.
[b]Weighted by black population size in 1990.
[c]Weighted by population size in 2000.
[d]Weighted by black population size in 2000.

Table A.3
First Stage Regression of Job Sprawl

Log (Population Size)	0.144*** (0.020)
Northeast	-0.247*** (0.065)
Midwest	-0.220*** (0.046)
West	0.071 (0.049)
Log (city age)	0.087 (0.070)
Percent Black	0.275 (0.201)
Percent Latino	0.225* (0.134)
Percent over 65 years old	1.143 (0.542)
Percent with college degree or more	0.594* (0.360)
Share of employment in manufacturing	0.563* (0.321)
Share of employment in retail trade	0.711 (1.235)
Share of employment in service	0.239 (0.396)
Log (number of political jurisdictions)	0.119*** (0.017)
Adjacent to Park, Military Base, or Reservation	-0.063* (0.036)
Adjacent to Major Body of Water	0.085*** (0.031)
Adjacent to MSA	0.124*** (0.032)
Adjacent to State	0.045* (0.028)
Adjacent to Another Country	-0.108* (0.061)
Adj. R^2	0.437
N	267

Note: Constant included in model but not shown.
***, **, and * indicates statistically significant at the .01, .05, and .10 percent level, respectively.
Std. errors are in parentheses.