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Methods to Test the Spatial Mismatch Hypothesis

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Abstract: The spatial mismatch hypothesis postulates that employment deconcentration within U.S. metropolitan areas goes some way toward explaining higher unemployment and lower wages among ethnic minority groups, since these groups are more likely to reside in central-city areas. However, little consensus has emerged on the importance of spatial mismatch in explaining disadvantage in the labor market. This article argues that conflicting evidence is the result of the variety of methods that have been used to test the spatial mismatch hypothesis. Moreover, it draws attention to a number of hitherto uncovered flaws in some of these methods that introduce systematic biases against finding evidence in support of the hypothesis. In light of these flaws, favored methods for future research are highlighted. Drawing on evidence from British conurbations that display similar spatial inequalities to U.S. metropolitan areas despite much smaller ethnic minority populations, the article contends that race does not lie at the heart of the spatial mismatch problem. Three areas in which the spatial mismatch hypothesis should be reconceptualized are identified: first, its emphasis should be on spatial, not racial, inequalities; second, it needs to differentiate between residential immobility and residential segregation, which are quite different; and third, it needs to recognize that the *extent* and the *effect* of spatial mismatch are distinct and should be measured separately.

Key words: Britain, methods, race, spatial mismatch, unemployment, United States, wages.

The spatial mismatch hypothesis has generated considerable academic research and debate on the causes of labor market disadvantage among ethnic minority groups and central-city residents more generally. The hypothesis postulates that employment deconcentration within U.S. metropolitan areas goes some way toward explaining higher unemployment and lower wages among ethnic minority groups, since these groups, particularly African Americans, are more likely to reside in central-city areas. According to the hypothesis, racial segregation in U.S. metropolitan housing markets prevents African Americans from migrating to suburban locations to obtain employment.

Despite over 30 years of research on the spatial mismatch hypothesis, little consensus has emerged on the importance of spatial mismatch in explaining disadvantage in the labor market. Conflicting evidence has been gathered, some suggesting a negligible impact of spatial mismatch (e.g., Cohn and Fossett 1996) and some pointing toward a relatively strong effect. For example, Ihlanfeldt and Sjoquist (1990) and Raphael (1998) both concluded that spatial mismatch accounted for up to 50 percent of racial difference in labor market indicators in Philadelphia and San Francisco, respectively. Much of this conflicting evidence is likely to be the result of the variety of methods that are used to test the spatial mismatch hypothesis, many of which have a number of flaws.

This review article differs from previous reviews of the literature on the spatial

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mismatch hypothesis in three respects. First, it focuses exclusively on methodological issues. The earlier methods that were used to test the spatial mismatch hypothesis have already been subjected to critique (see, e.g., Holzer 1991; Kain 1992; Ihlanfeldt and Sjoquist 1998). In addition to reviewing these arguments, the article identifies additional flaws in a number of the methods that have been used to test the hypothesis, paying particular attention to explaining problems with recent studies that have used poorly specified measures of job proximity. Furthermore, it argues that these flaws introduce systematic biases against finding evidence in support of the spatial mismatch hypothesis.

Second, the article incorporates relevant literature from outside the United States, mainly from Britain. British evidence shows that spatial mismatch is not exclusively a racial issue, but one of employment decentralization in the context of residential and commuting immobility, which low-skilled groups face irrespective of their skin color. Conurbations in northern Britain, despite their small ethnic minority populations compared to U.S. cities, still display marked labor market disadvantage in their inner-city areas.

Third, the article argues that methodological weaknesses stem from the underconceptualization of the hypothesis, specifically in relation to the distinct but often conflated issues of race and space. In this regard, the spatial mismatch hypothesis should be recast in terms of spatial, rather than racial, inequalities. Some racial or ethnic groups may be particularly affected by spatial inequalities because of their residential location, but so, too, are white residents of central-/inner-city areas.

The article reviews a number of studies of spatial mismatch, grouped according to a fivefold classification of the methodology that was used. It then highlights seven key methodological challenges, most of which cut across a number of the five methods. Conclusions are drawn regarding the implications for future research on the spatial mismatch hypothesis and principles around which the hypothesis should be reconceptualized. First, however, the following section outlines the context in which the spatial mismatch hypothesis has developed on both sides of the Atlantic.

Development of the Spatial Mismatch Hypothesis

The spatial mismatch hypothesis has developed out of John Kain's seminal 1968 article, "Housing Segregation, Negro Unemployment and Metropolitan Segregation," which was published at the height of the civil rights movement that campaigned for the equal treatment of blacks and whites and for the more serious tackling of racial discrimination. Although it did not deny the existence of racial discrimination in housing and labor markets, Kain's article represented a countervailing view—one that emphasized structural causes of disadvantage among African Americans, particularly the movement of manual jobs out of U.S. central cities. This structural view helped counterbalance the antidiscrimination rhetoric of the time. This interpretation of the emergence of the spatial mismatch hypothesis is not intended to deny that African Americans and other ethnic minority groups in the United States and other countries did, and still do, suffer from racial discrimination, but to argue that it was a response to an antidiscrimination discourse that did not allow sufficient scope for structural explanations of poverty.

The hegemonic status of the liberal antidiscrimination view may have caused resistance to other explanations of racial disadvantage, such as that offered by the spatial mismatch hypothesis. Perhaps this resistance explains Ellwood's (1983, 57) provocative and much-quoted statement that "It's not space, it's race." Any perception that the spatial mismatch hypothesis implies that racial discrimination is not a problem or that African Americans are in some way to blame for their economic plight is erroneous. Spatial mismatch and discrimination can simultaneously affect members of ethnic minority groups. Indeed, the spatial mismatch hypothesis emphasizes the role of racial discrimination in suburban housing markets in creating racial segregation.

However, its emphasis on race may have hindered the spatial mismatch hypothesis from developing a coherent conceptual framework that incorporates wider structural and spatial issues. The focus on race, rather than on central-city residence, has clouded the theoretical basis of the hypothesis in the United States as well as in Britain. In the words of Arnott (1998, 1172), "Lurking behind the hypothesis is some conception of how urban housing and labor markets work, and how their operation is affected by housing discrimination and job suburbanization." Cooke and Shumway (1991, 311) identified the focus on race as part of this problem, arguing that "the confusion over the role of race and space stems from an over-emphasis on race in the spatial mismatch hypothesis."

For example, the relative importance of the location and characteristics of jobs in relation to the location and characteristics of the workforce in general, moving beyond questions of race, in explaining unemployment has not been given as much prominence as might have been expected. More specifically, is central-city unemployment (irrespective of race) caused by economic restructuring or by the skills and employability of the residents? Studies that have examined spatial mismatch versus skills mismatch have tackled this question to some extent, although race has often been considered to be an important variable related to employability (e.g., Immergluck 1998). Structural accounts of multiple disadvantage, for example, that relate to poverty, social and family breakdown, and casualization/unattractive working conditions (Kasarda 1990; Wilson 1987, 1997), have not found their way into the mainstream literature on the spatial mismatch hypothesis, which has remained remarkably wedded to the centrality of residential segregation in causing labor market disadvantage.

In the 1970s, the issue of spatial mismatch in British urban areas appeared in the guise of the entrapment hypothesis[1] (Cheshire 1979). This was the notion that low-income groups, particularly those living in public rented housing, were trapped in the inner city (or "central city" in U.S. parlance) and were thus suffering as a result of employment deconcentration. Tenants of public housing in Britain have low rates of migration between local authority districts (Hughes and McCormick 1981; Minford, Peel, and Ashton 1987). Since British metropolitan areas contain a number of districts (several in London) and public rented housing is disproportionately found in metropolitan areas (Maclennan 1999), housing tenure may represent a barrier to migration within British metropolitan areas, as racial discrimination in suburban housing markets is thought to in U.S. metropolitan areas. One of the reasons for low migration rates in British public housing is that the allocation rules favor those who are currently resident (or homeless) in a housing authority's geographic area of jurisdiction. In addition, mono-tenure housing estates tend to segregate public-sector tenants from households in other housing tenures within districts (Forrest and Murie 1994), and allocation procedures tend to segregate the most disadvantaged tenants within the least-popular public rental housing estates (Lee 1994). It would be misleading to suggest, however, that "social" housing in Britain plays a central role in creating spatial inequalities or even in restricting residential mobility—there is also substantial spatial and social stratification within and between owner-occupiers and private renters.

It is interesting that the British entrapment hypothesis focused not on ethnic minority groups, but on inner-city populations as a whole (see Burridge and Gordon 1981; Gordon 1987). As such, it engaged with the broader question of employment versus workforce influences in explaining spatial variations in unemployment rates

[1] The term *entrapment hypothesis* is more commonly applied to the disadvantage experienced by groups with low commuting mobility, particularly women.

within metropolitan areas. Although these studies have tended not to make explicit reference to the spatial mismatch hypothesis, many of the methodological issues (and flaws) are the same.

The British entrapment hypothesis did not spark a large volume of research (although some work was carried out in Australia; e.g., Vipond 1980, 1984; Forster 1983) and was rejected fairly quickly, actually on limited evidence (e.g., McGregor 1977). A consensus emerged that geographic variations in the demand for labor explained interregional variations in unemployment, while *intraregional* variations were attributable to the housing system segregating populations according to their labor market characteristics, in particular those related to skills and employability (Cheshire 1979). In other words, metropolitan areas were considered to be coherent local labor market areas, within which all workers could commute to any job. Geographic variation in labor market outcomes was thought to be indicative of residents of different neighborhoods having different skills and employability, some of which disadvantage people in obtaining jobs. This conclusion diminished the role of space in causing labor market disadvantage to neighborhoods acting merely as a set of containers for collections of residents with various individual characteristics. According to this view, it was individual-level characteristics that explained labor market disadvantage, rather than space per se.

A number of more-recent British studies have emerged that relate directly to ethnic minority groups and make explicit reference to the U.S. spatial mismatch hypothesis (e.g., Fieldhouse and Gould 1998; Thomas 1998; Fieldhouse 1999; Owen and Green 1999). In addition, the issue of the geography of localized economic disadvantage in more general terms is also receiving increasing research attention in Britain once again (e.g., Green 1995; 1998; Bailey and Turok 2000), as is the extent to which transportation represents a barrier to employment (see McQuaid, Greig, and Adams 2001).

There are a number of reasons to assume that spatial mismatch would affect inner city manual workers of all races in Britain. First, higher proportions of British inner-city populations than of U.S. central-city populations are white (Peach 1998). In the United States, central-city deprivation and African American disadvantage are almost synonymous, whereas many British inner-city areas that are suffering economic distress are composed of largely white working-class communities. Second, although members of ethnic minority groups in Britain disproportionately reside in inner-city locations, cultural preferences for these locations are regarded as the main causes (Peach 1998), rather than racial discrimination in suburban housing markets. Third, in the British context, residential immobility that is associated with public rental housing, which is disproportionately found in inner-city locations, restricts the migration of inner-city residents, irrespective of race, to areas of job growth. In any case, members of ethnic minority communities in Britain are underrepresented in public rental housing (Phillips 1998). Furthermore, some U.S. studies have concluded that central-city white manual workers are also affected by spatial mismatch (e.g., Ihlanfeldt and Sjoquist 1990). These factors suggest that there is merit in applying the spatial mismatch hypothesis more widely, since it addresses fundamental questions about the role of space in metropolitan labor markets.

The emphasis on racial segregation as the primary cause of spatial mismatch presupposes that in the absence of racial discrimination in the housing market, ethnic minority groups would migrate to be closer to suitable job openings. This presupposition reflects the unrealistic assumptions (when applied to migration decisions) of markets finding equilibrium that are based on perspectives from neoclassical economics. The fact that white people who live in the cores of metropolitan areas in both the United States and Britain do *not* suffer racial discrimination in suburban housing markets but are also economically disadvantaged suggests that racial segregation is not at the core of the spatial mismatch problem.

This section has outlined the background of the spatial mismatch hypothesis, highlighting some concerns with its theoretical basis (or lack of). Several methodological weaknesses emerge from these concerns, particularly the hypothesis's overemphasis on race and segregation. The next section examines the logic behind each of the five main methodologies that have been used to test the spatial mismatch hypothesis.

Methods to Test the Spatial Mismatch Hypothesis

Methods to test the spatial mismatch hypothesis have evolved, reflecting the shifting emphasis within the hypothesis from residential segregation along racial lines to issues of commuting; employment deconcentration; and, more recently, understanding the nature of specific spatial barriers to employment, such as the role of job search. In broadly chronological order, the following five methodologies can be distinguished that have been used to test the spatial mismatch hypothesis: (1) analysis of the labor market impact of residential segregation, (2) comparison of commuting times, (3) comparison of earnings, (4) measures of job proximity, and (5) spatial experiments.

The logic behind each of these five methods is explained in this section, illustrated with a number of examples. This overview section is brief, although more attention is paid to the "spatial experiment" studies because they have not been covered by previous reviews. The following section identifies key methodological challenges in testing the spatial mismatch hypothesis, highlighting how some or all of these five methods either do or do not address each challenge.

Analysis of the Labor Market Impact of Residential Segregation

The analysis of the labor market impact of residential segregation is the methodology used by many of the earliest studies of spatial mismatch, following from Kain's (1968) emphasis on the role of residential segregation and racial discrimination in U.S. suburban housing markets. The logic behind this methodology is that a high degree of segregation is indicative of the restricted residential choice faced by a particular ethnic group and thus the ability of members of that group to migrate closer to suitable job openings. Therefore, if ethnic groups with high levels of segregation also have high unemployment rates, it is argued, this is evidence of spatial mismatch causing unemployment. In effect, the extent of residential segregation is being used as a crude substitute for the proximity of suitable jobs. Nevertheless, this method has found some evidence in support of the spatial mismatch hypothesis (e.g., Leonard 1987).

Comparison of Commuting Times

The comparison of community times is widely used in the spatial mismatch literature, again particularly the earlier studies (Holzer 1991). The concept behind this methodology is that if there is spatial mismatch between the residences of the unemployed in metropolitan cores and appropriate lower-skilled and manual employment opportunities in metropolitan rings, then core residents, ceteris paribus, shall commute farther (and hence have greater commute times) than their counterparts in the ring, owing to the greater distance between where lower-skilled and manual workers live and where lower-skilled and manual job openings are more plentiful (McLafferty and Preston 1997). The results of these studies have been mixed, with some studies finding that members of high-unemployment groups and neighborhoods have higher-than-"expected" commutes and others finding that these groups have lower-than-"expected" commutes (Cooke and Ross 1999; DeRango 2001).

Comparison of Earnings

The spatial mismatch hypothesis states that low job access may result in low wages in addition to, or instead of, unemployment.

Therefore, a number of studies have compared the wages of African American residents of central cities with those of African Americans in the suburbs or the wages of African Americans with those of whites in the central city. However, the methodological issues are not straightforward. Kain (1992) was particularly scathing in his critique of most of these studies (although not the logical basis of the methodology per se), stating that "almost none of the studies that claim to have examined the effect of spatial mismatch on wages or earnings have been properly done" (p. 405).

To measure wage adjustment directly, it is more appropriate to measure workplace-based, rather than residence-based, wages, but data related to workplace-based wages are limited, particularly for small geographic units (Ihlanfeldt and Sjoquist 1989). Zhang (1998) derived data on workplace-based earnings for Cleveland from the Ohio Bureau of Employment Services' tax records of unemployment compensation filed by firms. Wage gradients with distance from the central business district (CBD) were insignificant for most industries and were negative, rather than positive, for some industries, as the spatial mismatch hypothesis would predict.

Ihlanfeldt and Young (1994) compared wages paid for similar jobs in 102 fast-food restaurants throughout the city of Atlanta. They found that wages increased with distance from the CBD after controlling for individual and establishment characteristics, which indicates that suburban Atlanta had a tighter local labor market than did central-city Atlanta for low-skilled jobs.

Measures of Job Proximity

Studies published since the mid-1990s have increasingly used direct measures of the proximity of jobs to high unemployment areas and the geographic accessibility of those jobs (e.g., Hanson, Kominiak, and Carlin 1997; Rogers 1997; Immergluck 1998). The logic behind using a measure of job proximity is transparent and is on a stronger conceptual footing than the previous three methodologies because it directly measures the degree of spatial mismatch between the location of jobs and the location of the unemployed. The job-proximity approach directly introduces the local demand for labor. The strength of the relationship between local unemployment and the local demand for labor is a good measure of "spatial mismatch" unemployment at a point in time. Models that also include variables to describe the characteristics, skills, and employability of neighborhoods' workforces thus clearly differentiate between the influence of the demand for and supply of labor on neighborhood unemployment rates and incorporate both the skills-mismatch and spatial-mismatch perspectives.

Spatial Experiments

The previous four methodologies generally use individual or aggregate cross-sectional data. Thus, although they are potentially able to determine the overall importance of space in determining labor market outcomes at a point in time, they do not shed much light on the mechanisms that create mismatch and prevent people from overcoming it. For example, little is known about the relative importance of commuting constraints, residential mobility, and job search or recruitment in producing "spatial mismatch unemployment" (Houston 1998, 2001, 2005; O'Regan and Quigley 1998). Longitudinal approaches offer the potential to gain a richer understanding of the processes at work in local labor markets and to shed light on the relative importance of these possible spatial barriers to employment within metropolitan areas.

One approach that incorporates both longitudinal and individual-level data is to exploit naturally occurring "spatial experiments." Certain changes in urban structure constitute a change in the spatial relationship between home and workplace while *nothing else changes*, and these changes can be regarded as naturally occurring spatial experiments (Fernandez 1994). The three principal means by which such exogenous spatial changes occur are (1) significant improvements to the transportation infrastructure, such as a new highway, a river crossing, or a rail line; (2) forced housing relocation, for example, as the result of housing demolition programs; and (3) the relocation of firms, that is, the movement of firms into new premises within the same metropolitan area.

These spatial experiments focus on a *fixed set of particular individuals* and follow their responses *through time* to a spatial change in the relationship between home and workplace. The significance of space for workers' commuting and residential mobility is isolated by virtue of the fact that all other factors are held constant (i.e., the same people with the same characteristics and the same jobs with the same characteristics).

Spatial experiments have not often been exploited to assess spatial barriers to employment and hence reflect a relatively innovative methodology by which to test the spatial mismatch hypothesis. The following three subsections outline examples of studies that have used each of the three types of spatial experiment to test the significance of space in determining labor market outcomes. Some of these studies have not made explicit reference to the spatial mismatch hypothesis, being rooted in more general theories of local labor markets and urban form. However, the methodological issues are similar.

Transport Improvements. Gore and Herrington (1997) assessed the labor market impact of the opening of the South Yorkshire Supertram (SYS) in Sheffield, England. They compared the journey to work of those who were employed with certain employers prior to the opening of the SYS with that of those who were recruited since the tram started running. Their hypothesis was that those who were recruited after the tram system opened would live farther from work because of the enhanced accessibility of employment brought by the tram. Gore and Herrington showed that people who were recruited since the SYS opened travel, on average, much farther to work than do those who still have the same jobs that they had before the SYS opened (see Table 1). This finding suggests that the construction of the SYS has opened up new labor markets to people in Sheffield.

Forced Housing Relocations. A number of large-scale housing relocations have taken place over recent decades, most notably the Gautreaux and Yonkers assisted housing programs in the United States and post–World War II slum clearance programs in the United Kingdom. Following the apparent success of the Gautreaux and Yonkers programs, the U.S. Department of Housing and Urban Development (HUD) implemented a scheme of housing vouchers to promote residential mobility and, more recently, estab-

Table 1

Distribution of Distance to Work of Retained Staff and New Recruits (N = 16,000)

Distance ("Crow-Flight" km)	Retained Staff (Percentage)[a]	New Recruits (Percentage)[b]	Difference (Percentage Points)	Difference (Percentage Change)
<5	53.8	43.7	–10.1	–18.8
5–9	28.2	21.8	–6.4	–22.7
10–19	14.1	14.0	–0.1	–0.7
>20	3.9	20.5	16.6	425.6
Total	100.0	100.0		

Source: Gore and Herrington (1997).

[a] Those who were still with their 1994 employers in 1996.

[b] Those who were recruited by their 1996 employers between 1994 and 1996.

lished a number of Moving to Opportunity demonstration projects. In contrast, British slum-clearance projects are generally thought to have been less successful because of their negative impacts on community cohesion and social capital (Malpass 1999). Although the demolition of public-sector housing continues in some metropolitan areas in the United Kingdom (ironically including many of the high- and low-rise blocks into which slum clearance residents were rehoused in the 1950s and 1960s), efforts are now being made to rehouse tenants locally, with the emphasis on creating mixed neighborhoods in terms of socioeconomic status and housing tenure (Atkinson and Kintrea 2000).

A number of studies have found evidence of improvements in labor market participation among those who have moved under the Gautreaux program, the HUD housing-voucher scheme, and Moving to Opportunity demonstration projects (Popkin, Rosenbaum, and Meaden 1993; Rosenbaum 1995; Rosenbaum and Harris 2001). The impact on social networks (a potential source of information about jobs), in contrast, has generally been more limited, with studies showing little or no improvement among those who have been moved to suburbs compared to those who have been moved to central-city locations (Rosenbaum, Popkin, Kaufman, and Rusin 1991; Rosenbaum 1995) and compared to those who have not been relocated (Briggs 1998).

Kasper (1973) measured the labor market costs of forced housing relocation within public rented housing in Glasgow, Scotland. At that time, the housing authority took no account of where residents worked in deciding where to rehouse them, making this a good spatial experiment in terms of its impact on the labor market. Kasper's method was to compare forced movers with voluntary movers in terms of the impact the move had on journey-to-work costs, earnings, housing costs, and unemployment. He found that the forced movers experienced an adverse impact on all four of these categories compared to voluntary movers.

To date, most studies of housing relocation have focused on improvements in housing conditions, social networks, and educational attainment. While a number of studies have considered the impact on labor market participation, none has included the proximity of jobs to the areas to which residents have been relocated in the analysis. Thus, these studies have not provided direct tests of the spatial mismatch hypothesis. However, the data collated for monitoring the impact of housing relocation programs is a valuable and underused resource for testing the spatial mismatch hypothesis, since information on the proximity of jobs could be incorporated from other sources.

Relocation of Firms. The relocation of firms provides an opportunity to measure directly workers' ability to commute or migrate to distant jobs, and hence the relative importance of commuting and migrating as spatial barriers to employment can be assessed. The relocation of firms has an advantage over the other two types of spatial experiment in that these relocations occur with much greater frequency and therefore offer a more practical research tool.

Zax and Kain (1996) studied the impact of a firm's relocation from downtown to suburban Detroit on whether the employees left their jobs or changed their residence to reduce their commute. They classified employees as either "gainers" or "losers," depending on whether their commute was shortened or lengthened by the relocation. They hypothesized that if the losers' quit rate increased around the time of the relocation, it was evidence of the constrained ability to commute, which would have a deleterious effect on the employees' labor market position.

Zax and Kain (1996) estimated that, overall, 11.3 percent of black workers quit their jobs as a result of the relocation, although they did not make a similar estimate for white workers. They presented quit and move rates for two periods—two years prior to the relocation and two years after the relocation (the employees were notified of the pending relocation two years before it took place). These rates are summarized in Table 2.

Of particular significance were the considerably higher move and quit rates among black losers than among black gainers in all cases except for post-relocation move rates. This finding indicates that black people are constrained in how far they can commute (since more than half the losers quit during the four-year period compared to less than a third of the gainers), but are able to move in response to those constraints in considerable numbers (with 60.2 percent of the losers moving over the four-year period compared to 43.7 percent of the gainers). However, Zax and Kain (1996) did not state or analyze the length, orientation, or impact of the residential moves on the commuting distance.

Houston (2001) used the firm-relocation methodology, based on 16 firms that relocated within West Central Scotland (the largely metropolitan area surrounding Glasgow) between 1995 and 1997. Overall, 11.9 percent of the workforce left their jobs because of the relocations, although half of them had found alternative employment within an average adjustment period of 23 months. Of those who left their jobs and did not find alternative employment, half took early retirement, a quarter were unemployed, and a quarter moved onto state sickness-related benefits. Few, if any, people were persuaded to move because their jobs relocated, although a small proportion of those who were moving for other reasons took the opportunity to move closer to work.

Methodological Challenges in Testing the Spatial Mismatch Hypothesis

Testing the spatial mismatch hypothesis presents a number of key methodological challenges. Some of these challenges are related to generic issues of spatial analysis, such as how the "friction of distance" is conceptualized and measured. Others are more specific to the spatial mismatch hypothesis, such as the identification of the mechanisms through which space acts as a barrier to employment.

These issues are not merely of technical or incidental concern but, as is argued in this section, many have served to introduce systematic biases against finding evidence in support of the spatial mismatch hypothesis in much of the research that has been conducted. This section assesses the five methodologies in relation to the following key methodological challenges: (1) measuring spatial mismatch, (2) categorizing labor market segmentation, (3) identifying the impact of spatial mismatch, (4) measuring the friction of distance, (5) taking account of residential mobility, (6) taking account of contextual factors, and (7) identifying the mechanisms through which space acts as a barrier to employment.

Table 2

Move and Quit Rates

	Pre-relocation Period (1972–74)				Post-relocation Period (1974–76)			
	Move Rate		Quit Rate		Move Rate		Quit Rate	
Ethnic Group	Gainers	Losers	Gainers	Losers	Gainers	Losers	Gainers	Losers
Blacks	0.143	0.333	0.214	0.313	0.294	0.269	0.118	0.231
Whites	0.289	0.295	0.324	0.280	0.303	0.305	0.185	0.240

Source: Zax and Kain (1996).
Note: The move plus quit rate for black losers over the four-year period totals more than 1.0 because a small proportion moved and then quit and some moved more than once. Also note that the data relate only to employees who were with their firms since the start of the period of analysis.

Measuring Spatial Mismatch

The foundation on which the spatial mismatch hypothesis is built says that there is a mismatch between the location of the unemployed and the location of suitable jobs. Therefore, the most obvious method to test the hypothesis is to measure the proximity of jobs to different neighborhoods across a metropolitan area or areas and to examine the relationship between this measure and the labor market status of the neighborhoods' residents. Although job proximity is relatively simple in conceptual terms, its measurement is not straightforward. Consequently, the measurement of spatial mismatch may account for much of the variation in the conclusions of spatial mismatch studies. As Holzer (1991, 109) argued, "perhaps the most important dimension along which these studies differ is in the specification of 'mismatch' or job access as the independent variable."

The first three of the five methods that have been used to test the spatial mismatch hypothesis have their own logic behind the indirect measurement of the seemingly simple concept of job proximity. The fourth uses direct measures, but, as is demonstrated, this can also be problematic.

Analysis of the Labor Market Impact of Residential Segregation. The logic behind this method is that residential segregation prevents certain groups from migrating closer to areas of job growth. However, segregation is not an accurate measure of spatial mismatch because it takes no account of the location of jobs. A particular ethnic group could be highly segregated from the rest of society but live in close proximity to employment opportunities. Although a group in this scenario would register high on segregation indices, it would not suffer from spatial mismatch. Kain (1992, 387) was critical of methodologies that test the spatial mismatch hypothesis on the basis of measures of segregation, arguing that "by themselves, segregation indexes provide no information about the relationship between black residential areas and the spatial distribution of jobs within metropolitan areas. Their use to test the spatial mismatch hypothesis is clearly inappropriate."

The spatial scale at which segregation indices are calculated has an important bearing on their correspondence to proximity to employment. Specifically, if the areal units for which segregation indices are calculated are much smaller than the average distances commuted, then the resultant segregation indices are unlikely to be closely correlated with access to employment. This point was encapsulated by Kain (1992, 380): "A pattern of racial segregation that resembled a checkerboard would eliminate the spatial access problem, even if the segregation was total within each block or spatially dispersed black community."

Comparison of Commuting Times. The logic behind this method is, on the face of it, unambiguous—that employed residents of "job-poor" neighborhoods will commute farther than will residents of "job-rich" neighborhoods and therefore that the average commuting distance is negatively correlated with the proximity to jobs. However, there are three problems associated with this logic: constrained opportunity, variation between groups' propensity to commute, and sample selection bias.

First, long commutes can be evidence either of high mobility (such as that enjoyed by highly paid workers) or of spatial mismatch between workers and jobs. If mismatch is severe, then residents of inaccessible neighborhoods may be constrained to a small number of local jobs, resulting in shorter commutes (Fernandez 1994). This can be termed "constrained opportunity." Thus, it is possible that spatial mismatch could either increase or decrease average commutes. This notion was summarized by Ihlanfeldt and Sjoquist (1998, 853): "A commuting response to spatial mismatch may be short-circuited by poor or nonexistent public transportation from the inner city to the suburbs . . . therefore, the failure to find differences in commuting times or distances between black and white workers does not necessarily mean that spatial mismatch does not exist."

DeRango (2001) formulated a more general statement of the "constrained opportunity" problem, demonstrating mathematically that increased spatial mismatch can either increase or decrease the average commutes of central-city residents. Specifically, if the proportion of central-city residents who "reverse commute" declines at a greater rate than employment decentralizes with respect to distance from the CBD, then employment deconcentration will result in shorter average commutes from the central city. Conversely, if many central-city residents reverse commute, then employment deconcentration is more likely to result in lengthened average commutes from the central city.

The second problem with the methodology of comparing commuting times is that different groups have different propensities to commute. It has been well documented that the following groups have lower propensities to commute: lower-skilled workers (Gordon, Kumar, and Richardson 1989), lower-income workers (Ihlanfeldt 1993; Holzer, Ihlanfeldt, and Sjoquist 1994), and women (Madden 1981; Hanson and Pratt 1988; Hanson, Kominiak, and Carlin 1997; Cooke 1997). It has been argued that low commuting propensity contributes to the disadvantage experienced by these groups in the labor market because they have less potential jobs within their job search radii (Thompson 1997). In some sense, this argument is in direct contradiction to the commuting times methodology, which assumes that *long* commutes, ceteris paribus, reflect labor market disadvantage (Wyly 1996). It stems from the lack of distinction in some research between physical mismatch in geometric terms and the variable ability of workers to overcome that mismatch by commuting. This can be a severe problem, since some studies have shown that black people in U.S. metropolitan areas actually live in closer physical proximity to jobs than do white people but have longer commutes when measured in terms of travel time (e.g., Boardman and Field 2002). Hence, whether measures of distance or time are used can lead to diametrically opposed conclusions. Although Boardman and Field's finding may be the result of racial discrimination in hiring practices that cause black people to have to commute farther to find "black friendly" employers, rather than the result of spatial mismatch, blacks' greater reliance on public transportation can explain much of this difference.

The mode of travel to work is a vital consideration, since average travel speeds by car are generally significantly higher than average travel speeds by public transportation and central-city residents have substantially lower rates of car ownership (Ihlanfeldt and Sjoquist 1990; Shen 1998). While many studies have included car ownership and various measures of socioeconomic status in multivariate models, not all have done so, and, in any case, the high degree of correspondence between these variables and commuting time can make robust estimates of the effect of a particular variable difficult to obtain in multivariate analysis (Rosenbaum 1995).

The third difficulty with using commuting time as an indirect measure of spatial mismatch is the fact that models of commuting time relate to the characteristics and commuting behavior of the *employed*, whereas the spatial mismatch hypothesis seeks to explain why particular groups in particular locations are more likely to be *unemployed.* Because the characteristics and the potential commutes of the unemployed are different from those of the employed, the use of this methodology causes sample selection bias and biased estimates of the effect of particular variables on the propensity to commute (Cooke and Ross 1999). For example, Cooke and Ross (1999) showed, in relation to the Boston metropolitan area in 1990, that the influence of not having an automobile on commuting time is underestimated in models of commuting time because the unemployed, who are substantially less likely to have automobiles, are excluded from the models. What is more pertinent, the effect of not having an automobile on employment prospects is greater for African Americans than for white Americans, so sample selection bias is greater for African Americans. Thus, how far unemployed people could be expected to commute is overestimated by a greater margin for African Americans than for whites (Cooke and Ross 1999).

Comparison of Earnings. Again, this methodology does not actually directly measure the extent of spatial mismatch in different locations; rather, it is assumed that the relative abundance of local jobs will manifest in spatial variation in wage levels within a metropolitan area. Kain (1992, 405) cited "uncritical comparisons of the wages and earnings of blacks living in central cities and suburban areas" as "the most common errors" among this family of spatial mismatch studies.

Spatial comparisons of workplace-based earnings are more meaningful than are those of residence-based earnings, although they are based on the strong assumption that the wages offered by employers are a reflection of the balance between the demand and supply of labor in different locations within a metropolitan area. In reality, a number of other factors are likely to influence wage levels, particularly the profitability of different locations to firms, which is likely to vary considerably within a metropolitan area, especially in the retail sector that serves local markets.

Measures of Job Proximity. The so-called job-access measures that are increasingly being used in studies of spatial mismatch are on a strong conceptual footing in that they represent a direct, rather than an indirect, measure of spatial mismatch. However, three technical and data constraints often limit the robustness of measures of job proximity: the specification of competing labor, the treatment of distance decay, and the limited availability of data on job vacancies in small areas. As Ihlanfeldt and Sjoquist (1998, 861) noted, "Job accessibility in the physical or geographical sense, while a simple notion conceptually, is exceedingly difficult to quantify."

Variation in the level of locally competing labor complicates the specification of measures of job access. Access measures need to measure jobs per worker, not simply the number of jobs. A factory located in a central-city neighborhood that employs 1,000 people sounds less impressive when it is considered that 10,000 workers may live within a kilometer of it. Those 1,000 factory jobs would be "worth" more to the locality if only 5,000 workers lived within a kilometer.

Therefore, when designing a measure of geographic accessibility to employment, the amount of competition for jobs needs to be taken into account. Not all studies of spatial mismatch have done so. For example, Hanson, Kominiak, and Carlin (1997) measured accessibility simply as the number of jobs within the mean commuting times of workers in different segments of the labor market (for example, 2.86 miles in the case of part-time suburban women) without taking account of different levels of competition.

Since population density is greater in metropolitan cores than in the rings, central-city residents face greater competition for jobs than do suburban residents. Thus, a jobs-only measure overstates access to jobs in the core, thereby introducing a bias against finding evidence in support of the spatial mismatch hypothesis.

Shen (1998) provided a good specification of a job-access measure that incorporates the location of competing workers, as shown in Equation 1:

$$A_i = \sum \frac{J_j f(T_{ij})}{C_j},\ C_j = \sum W_k f(T_{jk}) \qquad (1)$$

where A_i is the accessibility to employment from area i (i = 1, 2, 3, . . . n), J_j is the jobs in each other area surrounding area i ($j = i - 1, \ldots n - 1$), T_{ij} is the travel time from area i to each other surrounding area, C_j is the competition for jobs in area j, and W_k is the workforce in each other area surrounding area j ($k = j - 1, \ldots n - 1$).

Equation 1 reflects the spatial distribution of competing workers, as well as the spatial distribution of jobs. Given that the commuting flow from j empirically displays negative exponential decay with respect to distance from j, the competition to a resident of i from workers who live close to a job in j is greater than the competition from workers who live further from j. Thus, this "distance decay" effect amplifies the spatial variation in the level of competing labor arising from variation in population density within a metropolitan area.

The treatment of distance decay presents a further challenge to the meaningful measurement of job access (Webster 1994; Shen 1998). It can be done by applying an inverse-square or negative-exponential function that attaches less weight to more-distant jobs. However, some measures that have been used in research on spatial mismatch have simply used an arbitrary cutoff and thus have only counted the number of jobs that are available within a certain distance of a given neighborhood and have ignored the rest (e.g., Immergluck 1998). The use of an arbitrary cutoff can be a problem, for example, in cases in which a large cluster of jobs lies just outside the radius specified, particularly if the jobs are well linked by virtue of being located on a key transport corridor.

The third problem with using measures of job proximity to test the spatial mismatch hypothesis is the availability of data. Information on the location and characteristics of job vacancies is often limited, both in the United States (Ihlanfeldt and Sjoquist 1998) and in the United Kingdom (Gore and Herrington 1997). Therefore, information on jobs is usually used as a proxy for job vacancies (although information on the characteristics of jobs can also be limited). This represents a problem because job seekers apply for job vacancies, not for jobs (Ihlanfeldt and Sjoquist 1998; Immergluck 1998).

The use of jobs as a proxy for vacancies in accessibility measures causes a bias because, a priori, declining occupations and firms will, ceteris paribus, have lower vacancy rates than will those that are expanding. Because employment is deconcentrating within metropolitan areas, the use of jobs as a proxy for vacancies overstates the availability of vacancies to residents of metropolitan cores. Another bias is caused by variation in the turnover rate of workers in different types of jobs. Since staff turnover is generally higher in lower-skilled jobs (Immergluck 1998) that are located in declining industrial metropolitan cores, this understates the availability of vacancies to residents of metropolitan cores. Because these biases operate in opposite directions, it is unclear to what extent they are a problem.

These constraints on data result in it being simpler to measure the characteristics of the workforce in a neighborhood than it is to measure the accessibility to employment from that neighborhood. Thus, the skills of the workforce are more accurately measured in many studies than are demand-side job-access measures. Measures of skills are direct and relatively unambiguous (for example, "x percent of a neighborhood's workforce is unskilled"), whereas demand-side measures are usually proxies for job vacancies, often of dubious direct relevance or accuracy.

For example, in a study that is often cited in rejection of the "entrapment hypothesis" in Britain in the early 1980s, Metcalf and Richardson (1976) examined cross-sectional variations in unemployment rates among the 32 London boroughs in 1971. They used the following independent variables that are related to the characteristics of the workforce: age profile, percentage who are married, the child dependency ratio, percentage of immigrants, and percentage who are unskilled. They used three variables related to job access: (1) 1966 employment in manufacturing (based on the fact that many manufacturing jobs were lost between 1966 and 1971); (2) the number of male redundancies, 1966–69; and (3) the number of male redundancies in 1970. Clearly, these job-access variables are indirect proxies for the actual availability of work, whereas the workforce variables are much more accurate measures of the characteristics of boroughs' workers. Thus, the use of indirect job-access variables introduces a bias against finding an effect of job access on boroughs' unemployment rates.

Geographic information systems (GIS) are increasingly being used to measure proximity to employment (e.g., Shen 1998; Shanchez 1999; Van Ham, Hooimeijer, and Mulder 2001). While the spatial analyses available within a GIS are not conceptually different from those that are possible using other data formats, the common georeferencing framework of a GIS, the algorithms contained within the software, and the spread in the availability of GISs on desktop personal computers in recent years have certainly made these analyses easier and less time consuming to carry out. The availability of GISs should make thorough job-access measures, such as those developed by Shen (1998), easier to use in the future, although GIS should not be seen as a tool that can, in itself, make job-access measures any more robust.

Categorizing Labor Market Segmentation

Notwithstanding the measurement issues outlined in the previous section, establishing the extent of the spatial separation of jobs from different groups of people raises two important further issues, namely, which jobs and which groups? The extent of segmentation that there is deemed to be in a local labor market has clear implications for which jobs should be considered when measuring spatial mismatch. Studies that have examined the location of all jobs in relation to the location of the unemployed have implicitly assumed that unemployed workers potentially have access to all jobs within a metropolitan area (subject to spatial constraints), irrespective of the skills, qualifications and experience required. Many such studies have categorized variables describing the occupational group of an individual or the occupational composition of a neighborhood as reflecting skills and employability, thus concluding that skills mismatch is more important than spatial mismatch (e.g., Immergluck 1998).

Other studies that have focused on the location of certain types of jobs, such as blue-collar jobs or unskilled jobs, have recognized that the labor market is segmented and there are structural constraints to workers moving between segments. Consequently, issues of labor market segmentation are categorized as affecting job access; thus, these studies are more likely to conclude that spatial mismatch plays a role in causing inner-city unemployment (e.g., Shen 1998).

Related to the issue of labor market segmentation in terms of the location of different types of jobs is the issue of labor market segmentation in terms of the location of different types of workers. Specifically, which groups are most appropriate to consider in terms of spatial mismatch? To some extent, the selection of the most appropriate type of worker is determined by the selection of labor market segments in terms of jobs. For example, it would be logical to analyze the location of blue-collar jobs in relation to the location of blue-collar workers and the spatial distribution of unemployment rates found among blue-collar workers. However, there are other disadvantaged groups in the labor market who do not correspond as clearly to segments in the job market, for example, in terms of race, gender, housing tenure, and geographic location. If we are interested in examining the impact of spatial mismatch on black workers, for example, what type of jobs would it be most appropriate to consider? Similarly, if we are interested in understanding the unemployment rates of different neighborhoods, what type of jobs should be included in a measure of spatial mismatch?

Whether nonspatial barriers to certain types of jobs are considered to be the product of skills mismatch or deeper structural issues that are associated with labor market segmentation is a moot point. Although in practice, a degree of subjectivity is required in drawing this distinction, the basis on which different labor market segments are identified (or, in some cases, are not identified) for the purposes of measuring spatial mismatch needs to be spelled out as far as possible (for good examples, see Ihlanfeldt 1993; Cooke 1997; Shen 1998; Kawabata 2003; and Parks 2004). However, many studies have examined the proximity to particular types of jobs or have focused on particular groups of workers, without setting out a rationale for the categories they have used. A meaningful categorization of labor market segments should display greater job-transfer rates within than between the identified segments, although such data are generally not readily available.

In terms of methods to test the spatial mismatch hypothesis, the key point to consider is that the narrower the labor market segments that are analyzed, the more likely it is to come to a "spatial mismatch" conclusion. Conversely, if all jobs and workers are considered in the specification of a job-access measure, the more likely it is to come to a "skills mismatch" conclusion.

Identifying the Impact of Spatial Mismatch

Low spatial access to jobs may result in a number of labor market outcomes for an individual, principally a higher risk of unemployment, lower wages, longer commutes, and/or reduced housing costs (Zax 1991). For example, workers on lower wages may be partially "compensated" with lower unit housing costs and shorter commutes (Zax 1991; Gabriel and Rosenthal 1996). Thus, an observed difference in pay between locations may overstate the actual difference in the socioeconomic status of workers. Therefore, "to capture the full impact of employment deconcentration on the welfare of central city workers, earnings should be measured net of both housing and commuting costs" (Ihlanfeldt and Sjoquist 1989, 117). However, not all studies of the spatial mismatch hypothesis have examined all of these outcomes; some have relied on only one measure of the impact of spatial mismatch.

For example, spatial mismatch studies that have examined groups with long commutes have suggested that people, although spatially removed from job opportunities, are able to overcome that distance. Thus, longer commutes from the central city may show that there is a geographic mismatch, but they do not show that it causes unemployment. Therefore, the relationship between commuting time from neighborhoods and neighborhood unemployment rates must be established to determine if inaccessibility does indeed constitute a problem (Cooke 1997). Unfortunately, not all studies have done so (e.g., Johnston-Anumonwo 1995; McLafferty 1996).

Similarly, spatial mismatch studies that focus on earnings face the problem that in many situations, wages may not be responsive to labor demand-and-supply conditions, particularly in slack labor markets and at the submetropolitan scale. Wage nonadjustment has been well documented in the labor economics literature, particularly that wages are "downwardly sticky." It was captured by Ihlanfeldt and Sjoquist (1989), who stated that "employment deconcentration can disadvantage central city workers by reducing their wage rates if wages are flexible, causing unemployment if wages are rigid, or lengthening their commute" (p. 117). Ihlanfeldt and Sjoquist (1989) argued that because wages are "downwardly sticky," the housing market is more likely to provide adjustment in response to spatial mismatch.

Measuring the "Friction of Distance"

The measurement of the friction of distance is another key challenge in testing the spatial mismatch hypothesis and has particular consequences for studies that rely on comparisons of commuting or job-access measures. In terms of the spatial mismatch hypothesis, is it most appropriate to measure the friction of distance in terms of straight-line distance, road distance, travel time, travel cost, or a combination of these measures? In addition, should separate measures be specified for different modes of transportation?

The total travel burden is comprised of travel time, pecuniary cost, and inconvenience (Bruzelius 1979). Thus, time, cost, or distance, especially straight-line distance, are all incomplete measures. Time, cost, or distance, but particularly distance, are not only poor *absolute* measures of the total travel burden, but also poor indicators of *relative* differences between the friction of difference between different points, because correlation between them is not likely to be strong owing to barriers, such as rivers and spatial variation in average travel speeds across a metropolitan area.

Furthermore, systematic biases are introduced by the use of distance, particularly straight-line distance, that mask evidence of the spatial mismatch hypothesis (Houston 1998). Straight-line distance is obviously an underestimate of the distance that is actually traveled on the ground. It approximates to the actual distance traveled more closely for longer trips because detours around obstacles tend to be smaller relative to the length of the trip. On longer trips, some portions are able to be made in a straight line or by deviating relatively less from the straight-line path (Webster 1994). So, straight-line distances understate actual travel distance proportionately more for shorter trips. Thus, if suburban residents travel farther to work than do residents of the core, as is generally the case, then core residents' job accessibility has been given relatively more weight in job-access measures, once more introducing a methodological bias against finding evidence in support of the spatial mismatch hypothesis.

Distance is not a good proxy for the total travel burden. It is not closely correlated with time spent traveling, since congestion is experienced in different magnitudes in different parts of an urban area. This point applies disproportionately to residents of high-unemployment inner-city areas, who are more likely to experience congestion over a greater proportion of their journey to work than are suburban residents.

Distance is not closely correlated with the financial cost of travel either, particularly by public transportation where a flat fare can apply over a considerable distance. Furthermore, when considering trips by public transportation, the orientation of trips is important. Many public transportation services radiate out from metropolitan cores. Trips to be made by public transportation that are not along such radial axes may require travel toward the center and then interchange with another service or the use of a low-frequency service which does link such adjacent areas. Since inner-city residents use public transportation for a higher proportion of their trips than do suburban residents, using distance as a proxy for the costs and time of travel underestimates the travel barriers that inner-city residents face more than it does those of suburban residents. Thus, in job-access measures that use distance, the availability of jobs to inner-city areas is further overstated.

The availability of a car for commuting trips obviously reduces the friction of distance, since average speeds are considerably higher. Therefore, it is important that measures of the friction of distance differentiate between trips by public transportation and trips by car. Indeed, the substantially greater accessibility afforded by travel by car (e.g., see Shen 1998) means that access to a car can allow people to commute substantially farther. The increased mobility brought by car travel has led some authors to dub the commuting problem faced by the urban unemployed as "automobile mismatch" rather than spatial mismatch; for example, Taylor and Ong (1995, 1471) concluded that "the importance of the automobile in providing employment access to lower-skilled, low-waged labor can hardly be overstated." This statement is consistent with other work that has concluded that access to a car is a more important determinant of spatial access to jobs than is the actual proximity of jobs or spatial variation in the availability of public transport (Houston 2001; Cervero, Sandoval, and Landis 2002).

GIS is useful in two respects in measuring the friction of distance. First, distances between points can be readily calculated by GIS in georeferenced data sets (see, e.g., Lin, Allan, and Penning 2002). Second, a network-based GIS can be used to calculate travel times between points on the basis of average travel speeds that are associated with different types of transportation links (e.g., see Kwan 1999) and for different modes of transportation (e.g., see Shen 1998). While distances could be calculated or measured from paper maps and travel times between areas could be obtained from data from travel surveys the use of a GIS allows this to be done with much greater ease.

A more sophisticated measure of the friction of distance is required that takes account of the time, cost, inconvenience, and unpredictability of travel. One such measure is generalized travel cost, which measures travel time between two points, applies a monetary value on travel time to that figure, and then adds the pecuniary monetary costs of travel, such as fares, fuel, and parking. Time spent walking and waiting for public transportation is included in generalized travel cost, and the mode of public transportation and interchange penalty factors can be applied (Bruzelius 1979). These penalty factors take account of, for example, the unpredictability of travel times involved in public transportation and the inferiority of the comfort and convenience of public transportation compared to car travel. Values of time for different parts of trips, such as time spent in a car, on a bus, or waiting for a bus, have been derived from surveys that have compared travelers' choices between cheaper, slower routes or modes and more expensive, faster routes or modes. For example, if a car driver chooses a route to avoid a $1 bridge toll that takes 10 minutes longer, it implies that the individual values his or her time at less than $6 per hour. When many such choices, or "revealed preferences," are analyzed, average values of time can be calculated. In addition, surveys of stated preferences (e.g., MVA Consultancy 1987) have also been used to assess the value of travel time by asking people whether they are willing to pay for hypothetical savings in travel time.

Generalized travel cost is used by transportation planners in mode-choice models for a particular metropolitan area and is validated against observed travel choices. Adjustments may be made to some values of time or to a "mode penalty factor" that is applied to a particular mode of travel's generalized cost to reflect actual travel choices that are known from travel surveys in a given metropolitan area. Generalized travel cost is thus "behaviorally relevant." In other words, it is based on actual travel choices and "perceived" values of travel time, rather than on "resource" values of travel time, such as those based on average hourly earnings, which are used to evaluate the direct economic benefits of proposed investments in the transportation infrastructure.

Generalized travel cost does not take direct account of nontravel elements of the friction of distance, such as cognitive maps and spatial aspects of a job search. However, it represents the friction of distance considerably more accurately than do measures that are based only on distance. In addition, nontravel aspects of the friction of distance are reflected, to some extent, in the observed travel volumes and flows that are used in estimating generalized travel cost.

Taking Account of Residential Mobility

Although the spatial mismatch hypothesis tends to emphasize residential segregation, it is residential immobility, not segregation per se, that presents a problem in the face of employment deconcentration. Certain individuals and groups are less able than others to migrate in response to the changing location of jobs, thus increasing through time the spatial separation between themselves and suitable jobs. As Cooke and Shumway (1991, 311) put it, "the key point in the formation of spatial mismatch is that low-wage labor is spatially immobile." But segregation and immobility are not the same thing. Low mobility need not necessarily segregate a group from the rest of a population; indeed, low mobility could prevent clustering from becoming established in the first instance. Similarly, a highly mobile group, such as young educated white men, could become highly clustered in locations that offer employment opportunities; indeed, the mobility of such groups may enable them to segregate themselves.

An additional and more intransigent methodological problem in relation to residential mobility is that the spatial mismatch hypothesis assumes that residential location influences employment prospects but not vice versa. However, residential location is not exogenous from employment status (Fernandez 1994). In other words, causality operates in both directions, with residential location being influenced by employment status (and employment location) as well as the other way around. Specifically, a central-city resident who moves from unemployment to employment or increases his or her wages by changing jobs may then be able to migrate to the suburbs (Ihlanfeldt and Sjoquist 1990). In addition, if a central-city resident obtains a job that is located in the suburbs, then the incentive to reduce his or her commute makes a residential move to the suburbs more likely (Houston 2001).

If one reason for moving out of the core of a metropolitan area were to reduce a commute to a decentralized job and if suburbanizing migrants were more skilled than their nonmigrant counterparts, then the deconcentration of employment would be partly causing the poor skills profile of the metropolitan core. Such employment-led selective migration would challenge the skills mismatch perspective because it would be, in part, the local availability of jobs that is creating the poor skills profile found in areas of high unemployment.

Congdon and Champion (1989) showed that out-migration from inner London boroughs is partially employment driven and is selective of those with greater skills. Thus, the deconcentration of employment in this case is partially creating the poor skills profile of inner London. It will result in a spuriously exaggerated relationship between skills and unemployment in studies that look for a simple relationship between skills and unemployment using cross-sectional spatial data at a point in time, since the deconcentration of jobs is contributing to the depletion of the skills profile of high-unemployment inner London boroughs.

Because most suburban areas are net exporters of commuters to city centers (i.e., have an excess of workers over local jobs), a geographic study using cross-sectional data that examines the relationship between proximity to jobs and neighborhood unemployment rates may find that low-unemployment suburban neighborhoods actually also have a low proximity to jobs (Coombes and Raybould 2001). This is the result of the endogeneity of suburban residential location to employment status explained earlier and the fact that higher incomes enable people to support longer commutes.

Two points need to be made in relation to this effect. First, it may apply only to the upper parts of the labor market. In other words, low-skilled workers, who bear the brunt of unemployment, may not earn enough to support long commutes or to move to the suburbs, at least not to areas of the lowest density that tend to be the greatest net exporters of commuters. Therefore, it is important for spatial mismatch studies that use a cross-sectional approach to identify segments within the labor market who are not likely to be overly affected by this issue, such as unskilled workers. This point amplifies the arguments made earlier in relation to labor market segmentation. Ihlanfeldt and Sjoquist (1990) addressed this problem by restricting their analysis to youths on the basis that few youths will have had an opportunity to make residential moves, but, of course, this does not resolve the problem for older workers.

The second point that needs to be made in relation to this effect is that it can be controlled for, to some extent, by measuring neighborhoods' accessibility to employment *growth*, rather than simply to employment availability at a point in time. This point is consistent with the spatial mismatch hypothesis, which emphasizes the role of employment *deconcentration*, that is, change through time. Because, in the *long term*, a large proportion of people adjust to changes in the location of jobs, the *change* in the local availability of employment opportunities may be more important in explaining local unemployment rates than the absolute availability of employment opportunities at a point in time. Some, but by no means all, spatial mismatch studies have done so (see, e.g., Rogers 1997).

Taking Account of Contextual Factors

Part of the reason for the mixed evidence in relation to the spatial mismatch hypothesis is that the impact and the extent of spatial mismatch vary between metropolitan areas and through time (Fernandez 1994). In the United States, core-ring inequalities are generally greater in Rust Belt cities (Kasarda 1990), but job access is generally a greater problem in Sun Belt cities for those without a car (Kawabata 2003). It has been suggested that the greater problem in job access is due to the lower density and sprawling structure of Sun Belt cities, but this and other possible explanations have not been systematically investigated. A useful starting point would be to differentiate between the *extent* and the *effect* of spatial mismatch.

The *extent* of spatial mismatch could be expected to be less in smaller metropolitan areas, higher-density metropolitan areas, areas with more mixed land-use patterns, areas where employment deconcentration has been less severe, and areas with higher levels of residential mobility. The *effects* of spatial mismatch could be expected to be less marked in metropolitan areas with higher levels of car ownership and in those with better-developed public transportation systems.

A comparison of U.S. and British metropolitan areas is useful in identifying the key aspects of "context" that affect the extent and effect of spatial mismatch in different cities. At the outset, it is worth noting that core-ring inequalities in British metropolitan areas are similar to those in U.S. Sun Belt cities but less severe than those for Rust Belt cities. However, the polycentric nature of many British conurbations masks finer-scale inequalities. As the "cores" of smaller settlements have been subsumed by the sprawl of a larger city, they become pockets of high unemployment in the "ring," for example, the industrial towns surrounding Glasgow and Sheffield and the mill towns surrounding Leeds and Manchester.

In terms of the extent of spatial mismatch, five issues should be considered in comparing British and U.S. metropolitan areas. First, British metropolitan areas are generally smaller than are those in the United States. Second, British metropolitan areas are generally of higher density (Downs 1999). Third, land-use patterns are more mixed, which means that homes and workplaces are situated, and different socioeconomic groups live, in closer proximity to each other, although not to the same degree as in many continental European metropolitan areas (Downs 1999). Fourth, metropolitan deconcentration, although considerable, is not as far advanced in Britain as in the United States (Summers 1999). Finally, residential mobility is generally greater in the United States than in Britain (Clarke 1998). The first four of these factors suggest that spatial mismatch may be less significant in Britain than in the United States, while the fifth suggests the opposite.

In terms of the effect of spatial mismatch, two issues should be considered. First, car ownership rates are higher in the United States than in Britain (Downs 1999), suggesting that residents of U.S. metropolitan areas should be more able to overcome spatial mismatch than residents of British metropolitan areas. Second, most metropolitan areas in Britain have more-extensive public transportation systems than is generally the case in the United States, certainly in relation to Sun Belt cities (Downs 1999), suggesting that spatial mismatch may be more of a problem in the United States than in Britain.

The extent and effect of spatial mismatch may vary through time, as well as between cities. For instance, in periods of full employment, employers may advertise vacancies more widely and pay wages that are sufficient to attract workers from farther afield. These other factors that influence the labor market make it particularly difficult to interpret comparisons of earnings (Fernandez 1994).

Such wider contextual information can be lacking, particularly in studies that exploit so-called spatial experiments, since these experiments relate to specific neighborhoods, groups of people, firms, or improvements in transportation. Responses to the "spatial shocks" of such experiments are contingent upon the prevailing economic conditions that vary across space and through time. For example, the propensity of individuals to leave their jobs because their employers have relocated or because they are forcibly required to move may be influenced by the level of alternative employment opportunities that are available to them locally (Zax 1989). Similarly, in the case of improvements in transportation, an individual who resides in a job-rich neighborhood may not need to take advantage of the increased mobility brought by the new transportation infrastructure (Zax 1990).

Another related point is that a spatial experiment provides information only on the impact on a group of individuals who are affected by a particular change in urban structure, making it difficult to generalize from the findings. The spatial experiment methodology investigates the effects of spatial mismatch, rather than the overall extent of spatial mismatch. Chiefly because of their longitudinal nature, spatial experiments provide an accurate assessment of the significance of different types of spatial barriers to employment for different groups of people. For example, a firm-relocation study can assess the proportion of affected workers who quit their jobs or move to be closer to their employer's new location, thus going some way toward identifying the magnitude of commuting and residential mobility as barriers to employment (see Fernandez 1994; Houston 2001).

Identifying the Mechanisms Through Which Space Acts as a Barrier to Employment

The spatial mismatch hypothesis initially emphasized the role of residential segregation as the key mechanism by which space constituted a barrier to employment. It implicitly assumed that commuting is also a barrier to jobs, because if people could readily commute to decentralized jobs, then residential segregation would not present a problem. However, space does more than merely present friction to mobility, whether it is commuting or migrating. Specifically, the spatial openness or fluidity of a metropolitan area influences how people find out about housing and job opportunities across space within their social network, how they evaluate and perceive other places within their cognitive map of a metropolitan area, and what social obstacles are presented to them in accessing opportunities (for example, racial discrimination in suburban markets in the United States or "postcode" discrimination of residents of stigmatized social housing estates by British employers). In relation to the spatial mismatch hypothesis, three key spatial barriers have been identified: commuting, migration, and information (Ihlanfeldt and Sjoquist 1998). However, the precise nature and magnitude of these spatial barriers has not been the subject of much empirical research.

Issues of job search and recruitment are important in relation to the role of place, information, and social networks in producing and maintaining spatially differentiated patterns of labor market disadvantage. Specifically, do certain groups work close to home because they search for work close to home or because information about distant job vacancies is limited, rather than due to spatial constraints on commuting per se? Clearly, job-search decisions will be influenced by how far an individual anticipates being able to commute, but spatial job search does constitute a particular mechanism through which space may act as a barrier to employment.

Stoll and Raphael (2000) found that blacks and Latinos in Los Angeles were more likely to search for jobs in areas where there were fewer jobs. Although over half this difference was the result of these groups living in neighborhoods with fewer jobs (i.e., as a result of spatial mismatch), nevertheless, this finding indicates that their job-search strategies were less well focused than the strategies of other groups.

In terms of recruitment, there is also evidence that employers who are faced with a set of hirable applicants prefer to recruit local residents (Russo, Rietveld, Nijkamp, and Gorter 1996), thus reinforcing the effects of spatial mismatch on employment prospects. However, residents of certain central-city neighborhoods are discriminated against by employers, as Kasinitz and Rosenberg (1996) and Wilson (1987, 1997) found in relation to blacks in the United States. Similarly, in the context of Britain, McGregor (1977) found that residents of a stigmatized public rental housing estate near Glasgow were less likely to be hired by an employer.

In summary, spatial patterns of job search and recruitment reflect, to some extent, spatial mismatch between the location of applicants and the location of jobs. However, other elements of job search that are not directly related to spatial mismatch (for example, access to information networks) lead members of disadvantaged groups to search for jobs in certain areas, rather than others. Similarly, employers may discriminate against applicants from particular neighborhoods, as well as on grounds of race, class, and family status (such as single parents). These issues are related to "area effects" resulting from concentrated deprivation, depleted social capital, and stigmatization, which can occur in disadvantaged neighborhoods *irrespective* of the proximity to jobs. In this sense, studies of job search and recruitment or hiring have investigated issues that are broader than spatial mismatch.

Studies of spatial experiments have the benefit of looking at changes through time, so they capture some of the processes of choices of residential location and job search and recruitment, rather than looking only at cross-sectional data at a point in time. By using individual-level data over time, researchers can investigate people's responses to overcoming space in different ways. In other words, the relative importance of commuting and migrating can be assessed as spatial obstacles to employment within metropolitan areas. For example, in the case of the relocation of firms, if commuting is not a barrier to employment, then people will commute to the new sites. If residential migration is not a barrier, then people will move to overcome commuting constraints. In addition, the recruitment patterns of employees can be analyzed to shed light on the role of job search or recruitment as a spatial barrier to employment (for a fuller explanation of this point, see Houston 2001).

Conclusions

The methods used to test the spatial mismatch hypothesis have evolved from focusing on racial segregation, through detailed analyses of commuting and earnings to direct measures of job access and, more recently, to spatial aspects of job search, recruitment, and social networks. This article has identified five methods that have been used to test the spatial mismatch hypothesis, as well as seven key methodological challenges in testing the hypothesis. The main strengths and weaknesses of each method are summarized in Table 3.

The following section draws attention to three hitherto uncovered implications of flaws with the misspecification of job-access measures and highlights two preferred methods for future research. The final section concludes by identifying three areas in which the spatial mismatch hypothesis should be reconceptualized.

Methods to Test the Spatial Mismatch Hypothesis

Many recent spatial mismatch studies have used direct measures of job proximity. Although these measures are more robust than earlier methods that are based on segregation, commuting, and earnings, three issues arise in relation to the measurement of spatial mismatch using direct measures of job proximity. First, since popu-

Table 3

Weaknesses and Strengths of Methods to Test the Spatial Mismatch Hypothesis

Method	Weaknesses/Pitfalls	Strengths
Analysis of residential segregation	Segregation does not correspond closely with spatial mismatch. Segregation is not necessarily indicative of residential immobility. Spatial scale affects the degree of correspondence with spatial mismatch. Cannot reveal the mechanisms through which space acts as a barrier to employment.	Comprehensive coverage of a metropolitan area. Focus on segregation, which is an important component of the spatial mismatch hypothesis.
Comparison of commuting times	Constrained opportunity (i.e., some people may be restricted to local jobs). Does not always fully control for different groups' propensity to commute. Sample selection bias. Does not always take account of impacts on earnings and housing costs. Inaccurate measurement of the friction of distance (e.g., straight-line distance). Selective migration may be partially employment led. Cannot reveal the mechanisms through which space acts as a barrier to employment.	Comprehensive coverage of a metropolitan area. Focus on commuting, which is an important component of the spatial mismatch hypothesis.
Comparison of earnings	Wages may not respond to all labor demand-and-supply conditions. There are other reasons for suburban employers to pay higher wages. Does not always take account of impacts on commuting and housing costs. Selective migration may be partially employment led. Cannot reveal the mechanisms through which space acts as a barrier to employment.	Comprehensive coverage of a metropolitan area. Earnings are potentially a good indicator of the balance between labor demand and supply if other factors can be controlled for.
Measures of job proximity	Competing labor not always included. Choice of distance-decay function is ambiguous. Jobs, rather than job vacancies, are used to calculate accessibility. Categorization of labor market segments is ambiguous. Inaccurate measurement of the friction of distance (e.g., straight-line distance). Selective migration may be partially employment led. Cannot reveal the mechanisms through which space acts as a barrier to employment.	Comprehensive coverage of a metropolitan area. Conceptually transparent. Directly measures the extent of spatial mismatch.
Spatial experiments	Limited generalizability of results. Some people who leave their jobs may be able to do so because they have alternative employment opportunities available closer to home. The results are sensitive to the economic cycle and the tightness of the local labor market in which a particular firm-relocation study is carried out.	The problem of selective employment-led migration is controlled for. The mechanisms through which space is a barrier to employment can be investigated, particularly commuting and migration. Longitudinal approach allows processes through time to be captured. Qualitative element allows decision-making processes to be analyzed. Largely avoids the problem of multicollinearity by having built-in controls for the characteristics of the workforce. Differences in mode of travel and propensity to commute are automatically controlled for in the experiment.

lation density is greater in central-city areas, these areas have greater levels of competing labor; therefore, job-access measures that do not take account of competing labor overstate the availability of jobs to central-city residents. Second, measures that do not differentiate between trips by car and public transportation overstate the availability of jobs to central-city residents as well because of lower levels of car ownership in the central city. Third, measures that use distance, rather than those that incorporate travel time, also overstate the proximity of jobs to central-city residents since central-city residents are likely to travel by slower modes and experience congestion over greater proportions of their trips to work than are their suburban counterparts.

Although these measurement issues have been identified by a number of authors in a technical sense, the key issue that they overestimate the proximity of jobs to central-city residents has been overlooked. The implication of this overestimation is that spatial mismatch is a greater problem than has previously been acknowledged.

Two preferred methods for future research can be identified. First, robust measures of job proximity that accurately take account of competing labor, travel time, mode of travel, and the growth and turnover of jobs, such as the measure that was pioneered by Shen (1998), are well placed to provide a more-detailed understanding of which groups of people in different cities and parts of cities are most affected by spatial mismatch. GIS has great potential to facilitate the extensive manipulation and computation of data that are required to produce such job-access measures. A key issue is the extent to which the labor market is segmented; specifically, should job-access measures relate to the location of all jobs or be restricted to particular labor market segments, such as blue-collar or unskilled jobs? The critical point here is that the more narrowly labor market segments are defined, the more likely a study is to come to a "spatial mismatch" conclusion, while studies that measure access to all jobs, including, for example, downtown professional jobs, are more likely to come to a "skills mismatch" conclusion.

Second, longitudinal data sources and spatial experiments present good opportunities to investigate the nature and relative importance of different types of spatial barriers to employment, something that the predominantly cross-sectional approaches to date have not been able to tackle to any significant extent. The recent and ongoing Moving to Opportunity schemes in the United States present an opportunity to make use of such approaches, although to test the spatial mismatch hypothesis directly would require data from other sources on the location of different types of jobs to be incorporated. Although the demolition of low-quality public-sector housing continues in Britain, people tend to be rehoused locally, making these schemes less suitable as spatial experiments, at least in the context of testing the spatial mismatch hypothesis. However, studies of the relocation of firms also have the potential to shed light on the three main types of spatial barriers to employment (commuting, migration, and information) on the basis of the rationale that the people and jobs involved are held constant and people's responses to the experiments in terms of commuting, migration, and patterns of job search and recruitment can be investigated.

Reconceptualizing the Spatial Mismatch Hypothesis

The focus on race and racial segregation in the spatial mismatch hypothesis has meant that the role of space has remained underconceptualized. Three areas in which the spatial mismatch hypothesis should be reconceptualized have been identified in this article. If these conceptual issues are incorporated, the design of methods to test the hypothesis should become less problematic.

First, the emphasis should logically be on spatial, rather than racial, inequalities. Second, the hypothesis needs to differentiate between residential immobility and residential segregation, which are different.

Finally, the spatial mismatch hypothesis needs to recognize that the *extent* and the *effect* of spatial mismatch are distinct and should be analyzed separately. These three issues are now discussed in turn.

The spatial mismatch literature has not quite made up its mind whether it seeks to explain racial or spatial variation in labor market outcomes. On the one hand, the hypothesis, as originally postulated, is inherently about race, arguing that racial segregation, specifically into central-city areas, plays an important role in explaining labor market disadvantage among racial minority groups in the context of employment deconcentration within metropolitan areas. On the other hand, the very statement of the hypothesis in terms of a spatial mismatch between the location of certain groups of people and suitable jobs implicitly assumes that space, specifically the lack of proximity to decentralized jobs, is a key source of racial disadvantage (otherwise central-city residence would not have an impact on individuals' labor market status). In this context, it is not clear why white central-city residents would not also be adversely affected by the lack of proximity to decentralized low-skilled jobs. The situation in many northern British conurbations, which have relatively small ethnic minority populations but stark spatial inequalities in labor market outcomes between inner and outer areas, underlines that race is not at the heart of the spatial mismatch problem. This conclusion is backed up by a number of U.S. studies that have established which white central-city residents are also affected by spatial mismatch.

That whites are also affected by spatial mismatch challenges the notion, central to the spatial mismatch hypothesis, that residential segregation is the main mechanism through which distance acts as a barrier to employment. The spatial mismatch hypothesis assumes that racial segregation prevents black people from migrating to the suburbs to be closer to suitable jobs. But this is an incomplete account of segregation, assuming that central-city residents would *want* to move to the suburbs if they were able to; in this respect, the spatial mismatch hypothesis is influenced by the unrealistic assumption from neoclassical economics that people will migrate in response to spatial differences in unemployment and wages. Segregation is related to certain areas being "off-limits" to certain groups—in the case of the spatial mismatch hypothesis, suburbs being off-limits to racial minorities owing to discrimination. This much may be so, but it neglects the "stickiness" of areas in which certain groups currently live; the problem is as much, if not more so, that certain groups are immobile, rather than that there are restrictions on the range of possible destinations. Central-city neighborhoods have a range of benefits to many (but, of course, by no means all) of their residents. For example, family ties, social networks, access to local facilities, good transportation links, and familiarity make staying put an attractive option for low-skilled groups—why move to the suburbs for a dead-end job stacking shelves? This situation is true for all low-skilled groups, not just racial and ethnic minority groups. However, even if a group has a high degree of residential mobility, constraints imposed by segregation may limit their choice of destination. Thus, the spatial mismatch problem is about both residential immobility and residential segregation, but the causes of each are different.

Some studies have suggested that there is not a spatial mismatch problem on the basis that some central-city areas actually have better access to jobs than do many suburban locations. However, this does not take account of the variation among different groups' ability to overcome spatial mismatch through commuting. Car owners may live far from jobs but not be affected by spatial mismatch, and those who are dependent on public transportation may actually live relatively close to jobs but be unable to reach them (Shen 1998). In other words, the *extent* of spatial mismatch and the *effect* of spatial mismatch are distinct. In methodological terms, the first, and inescapable, stage in testing the spatial mismatch hypothesis is to measure the *extent* of spatial mismatch by examining the location of jobs in relation to the location of people, differentiating between labor market segments in terms of occupation, skill level, gender, race, and those with and without access to a car. The second stage is to determine what *effect* spatial mismatch has on these groups in terms of unemployment and wage levels. The extent of spatial mismatch is likely to vary among cities according to their size, density, degree of land-use mixing, degree of employment deconcentration, and level of residential mobility. The effect of spatial mismatch is likely to vary among cities according to the level of car ownership, the nature of the public transportation system, and the spatial extent of social networks.

Spatial mismatch is not a problem that is confined to racial minority groups or to the United States. The similarity in the pattern of disadvantage that has been found in British and U.S. metropolitan areas, including the conurbations of northern Britain with relatively small ethnic minority populations, suggests that race is not at the heart of the spatial mismatch problem. Rather, immobility, in terms of commuting and residence, leaves low-skilled groups less able to gain access to decentralized employment. The implication is that space, rather than race, and immobility, rather than segregation, need to be given greater emphasis in the spatial mismatch hypothesis.

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