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Race, Spatial Mismatch, and Job Accessibility:

Evidence from a Plant Relocation

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Abstract

One of the most prominent explanations for minority underachievement in the labor market is what has been termed the spatial mismatch hypothesis. This paper reports the results of a case study designed to test this important hypothesis within the context of a longitudinal analysis of a relocating food processing plant. Because the workers in this study did not choose the firm's new location, the relocation is experienced as an exogenous, demand-side shock to the local labor market. Because the circumstances of this move make us confident that the firm is not moving to rid itself of minorities, we are assured that any disparate racial impacts induced by the move are not due to the firm using space as a tool for racial motives. Thus, this natural experiment design avoids the main threats to validity in extant spatial mismatch studies. We find significant support in favor of the spatial mismatch hypothesis. Despite the firm's best intentions and work to minimize the impact of the spatial disruption, we find evidence that because of racial residential segregation, minorities were more constrained than whites in their reaction to the firm relocation.

One of the most prominent explanations for minority underachievement in the labor market is what has been termed the spatial mismatch hypothesis. Indeed, this theory supplies an important piece of the puzzle in Wilson's (1987, 1996) theory of minority underachievement. This theory states that a major cause of minority employment difficulties is the relocation of employers from areas where these minorities have traditionally lived (typically, the inner city) to the suburban ring. Because of housing segregation in the suburbs of most metropolitan areas, minorities are less likely than non-Hispanic whites to move closer to the new jobs. This leaves minorities little choice but to commute, often unreasonable distances. The net result is increased costs of employment for minorities relative to non-minorities and, consequently, greater joblessness for minority workers.

Although there has been a long tradition of research on this topic within sociology, geography and economics (for reviews, see Fernandez and Su 2004; Ihlanfeldt and Sjoquist 1998), key issues remain unresolved. While there have been numerous studies documenting a pattern of spatial gaps between minority residences and areas of employment, these analyses have tended to be based on static comparisons of cross-sectional data. The results of such analyses, however, can confound multiple processes that are correlated with space. A common finding is that minorities who are located closer to areas of employment (typically in the suburbs) have better labor market outcomes (e.g., Kasarda 1985, 1988); however, this pattern could result from the selective migration of more employable minorities to the suburbs. While various research strategies have been employed to minimize the impact of this confounding factor (reviewed below), other issues remain to be addressed. Among the most important of these is the question of what is behind observed spatial patterns of racial differences in labor market outcomes. While most economic treatments of spatial mismatch have assumed that employers are race-neutral in their spatial behavior, research by sociologists and geographers have shown the ways that employers can *use* space as a means of avoiding minorities.

This paper reports the results of a case study designed to address these gaps in our understanding of these processes within the context of a longitudinal analysis of a relocating food processing plant. In 1993, a food-processing plant moved from Milwaukee's Central Business District (CBD) to its suburban ring in order to build a "greenfields" site for a modernized production facility. I surveyed the company's employees prior to the start of the move and interviewed workers approximately one year after the closing of the downtown plant. Thus, one important contribution of this study is that its natural experiment design solves the major problem vexing even the best extant studies of the spatial mismatch hypothesis. Because it is the plant that is moving, this study avoids the main threat to validity in extant

spatial mismatch studies, i.e., the problem of self-selection of minorities to the suburbs (Jencks and Mayer 1990). In contrast, for the workers in this company, there is no issue of self-selection. Since workers did not choose the firm's new location, the relocation is experienced as an exogenous, demand-side shock to the local labor market. While previous empirical studies of spatial mismatch report analyses designed to simulate an exogenous demand-side shift in the spatial location of jobs, the workers at this company experienced such a shift in a dramatic way.

Also, because the circumstances of this move make me confident that the firm is not moving to rid itself of minorities (see below), I am assured that the disparate racial impacts induced by the move are not due to the firm using space as a tool for racial motives. As such, this study distills the essence of the spatial mismatch theory, and provides a unique opportunity to closely observe workers' experiences adjusting to the spatial disruption caused by the plant's move. Moreover, because the plant also has a good representation of minority workers, the study can directly assess the racial impacts of the firm relocation. In order to be certain that the changes documented here can be attributed to the firm's move *per se*, I contrast the pre (1991) and post-move (1994) changes in the factory with the baseline of changes occurring at the factory in the period immediately *prior* to the factory's move (1989-1991). Thus, this study provides an exceptionally clean setting in which to observe the key mechanisms alleged to be operating in the spatial mismatch account of growing minority employment difficulties.

Race and Spatial Mismatch

First articulated by the late John F. Kain (1965, 1968), the spatial mismatch hypothesis argues that geographical locations of employment diminish minorities' access to job opportunities, resulting in greater joblessness for minorities compared with non-minorities. On the demand (job) side of the market, there has been rapid job growth in the suburbs of many urban areas, and slow or negative job growth in many central cities. On the labor supply side, minorities tend to be concentrated in many central cities, with African Americans showing relatively low rates of suburbanization. These trends lead minorities to be increasingly concentrated in residential areas where job opportunities are least likely to be found. Racial housing segregation in the suburbs of many metropolitan areas (e.g., Massey and Denton 1993), makes it difficult for minorities to overcome the mismatch between the location of jobs and their homes by moving their residence closer to the centers of job growth.

According to the theory, because minorities are constrained with respect to housing mobility, they have little choice except to absorb the spatial mismatch along dimensions other than the housing market. First, minority workers

might seek new jobs and look for more local employment opportunities. Minorities' job searches are less likely to lead them to come across spatially distant suburban job opportunities. This would lead to increased competition for inner-city jobs, lowering wages, and driving up unemployment. A second option is to absorb the spatial disruption by commuting farther. In this case, the high cost of commuting, especially when considered against the reality that these jobs are often low-wage, is likely to discourage many minorities from searching in the suburbs.

Kain's key insight, then, was that in the presence of frictions in the housing market, one needn't posit racial discrimination in the labor market to observe large race differences in employment. In his account, employers—both suburban and urban—are racially neutral in their hiring behavior. Employers are not choosing to locate in the suburbs in order to avoid minorities. Consequently, firms could simply be hiring racial groups in proportions in which they are observed in their application pools (for a discussion of the racial implications of application pools in hiring, see Fernandez and Fernandez-Mateo 2006). While the employers are racially neutral in the spatial mismatch hypothesis, actors in the housing market are decidedly not so. Specifically, racial segregation in the housing market introduces a key frictional factor which prevents minorities from improving access to job opportunities by relocating residences closer to suburban jobs.

A large number of studies have appeared both supporting and refuting Kain's central thesis. Space limitations prevent me from reviewing all these studies.¹ The goal here is to highlight two key issues that have emerged as the literature on spatial mismatch has evolved, i.e., the issues of selective migration and employers' motives and behavior.

Many studies have focused on a key component of the theory, i.e., the idea that job accessibility is at least partly reflected in the spatial arrangement of racially segregated residences in the United States. One prominent strategy that has been employed for testing for spatial mismatch is to hold constant race, and to then examine how spatial access and employment outcomes compare for African Americans living in the suburbs and the inner-city. A few studies using this strategy have found that spatial access has little relationship with employment patterns for blacks (e.g., Cohn and Fossett 1996; Ellwood 1986), while others have shown the opposite to true (e.g., Kasarda 1985, 1988; see Fernandez and Su 2004). As Jencks and Mayer (1990) point out, however, even when spatial mismatch effects are observed, the

¹ For a recent review of the large empirical literature on the spatial mismatch, see Fernandez and Su (2004). Earlier reviews by Jencks and Mayer (1990), Holzer (1991), Kain (1992) and Ihlanfeldt and Sjoquist (1998) present a good representation of how the state of knowledge evolved in this area.

divergence in inner-city and suburban black employment rates might be due to selective migration of more employable African Americans to the suburbs. Since many studies have only sparse controls, space might be serving as a proxy for characteristics that employers might find desirable.

Later research by Ihlanfeldt and Sjoquist (Ihlanfeldt 1988, 1992; Ihlanfeldt and Sjoquist 1989, 1990, 1991a, 1991b, 1993) has included a much more ample set of controls. They also have tended to focus on teenagers since, unlike their parents, teenagers do not choose their place of residence (e.g., Ellwood 1986). While this strategy cannot address family level factors that might affect both location and job status of teens, it does temper problems of possible “simultaneity bias” associated with adults (Ihlanfeldt and Sjoquist 1991a:256).

Another strategy for dealing with the issue of selective migration is to employ longitudinal data which can be used to improve controls by eliminating the influence of fixed, unmeasured characteristics. Mouw (2000) uses a fixed effects, intra-metropolitan model of changes in employment opportunities and unemployment rates at the census tract level in Detroit and Chicago. His results further show that the number of employment opportunities available per worker is correlated with black unemployment rates. He found that a 10 percent decrease in job access is associated with a 3.5 percent increase in black joblessness in Detroit and a 2.4 percent in Chicago. Consistent with the spatial mismatch hypothesis, white neighborhoods did not experience higher levels of unemployment as job access declined.

Another approach for solving the selective migration challenge is to exploit occasions of “natural experiments.” Jeffrey Zax’s study of a firm relocation from the central city to the suburbs of the Detroit area (Zax 1989, 1990; Zax and Kain 1991; 1996) treats the firm’s move as an exogenous shock to the local labor market, and then compares data on individuals’ quitting, commuting behavior, and household relocation before and after the move. Because it is the firm that is moving, any minority disemployment that results will not be due to worker’s selective migration. While this study is limited in some ways (see Fernandez 1994), the results showed evidence that residential segregation constrained blacks’ options in adjusting to the relocation of the firm. A comparison of the pre- and post-move data showed that as commuting times increased, and residential relocation closer to the new firm was not a viable option for many blacks. African Americans were apparently being forced to commute to jobs to which whites would not commute. In addition to commuting, changing residence and quitting are also readjustment mechanisms for workers. Blacks, again, appeared to be more constrained than whites in using these options for resolving the spatial disruption that the firm’s relocation had imposed. Moves and quits were directly substitutable reactions to the relocation for

whites, but this was not the case for African Americans. Therefore, the article argues, the quit rate among African Americans would have been lower in the absence of the segregated housing market in the Detroit area.

Some natural experiment studies have taken the opposite of Zax's approach, studying household relocation as an exogenous bump to the housing market, looking for minorities' responses in commuting and on the labor market. Rosenbaum and Popkin (1991) studied Chicago's Gautreaux program, which administers Section 8 vouchers to mainly African American welfare recipients so that they might relocate from low-rent housing (also see Rosenbaum 1995). The program has a quasi-experimental design in that Gautreaux program participants are relocated to suburban or city housing at random. Consequently, if those who move to the suburbs are more successful at getting jobs than those who move within the city, then these results cannot be dismissed as being due to selective migration. The results show that, indeed, a greater percentage of suburban movers than city movers held jobs after participation in the program (64 vs. 51 percent). Studies of a similar program (i.e., MTO, or Moving to Opportunity) operating in Boston (Katz et al. 2001; Kling et al. 2004) and Chicago (Rosenbaum and Harris 2001) showed quite different results, however. Families were assigned Section 8 housing vouchers allowing them to relocate to suburban locations by lottery. Their analysis showed no significant differences between the employment levels of experimental and control groups. Indeed, Rosenbaum and Harris (2001) find insignificant negative effects of the program after controls are added (but see, Clampet-Lundquist and Massey 2006).

In addition to issues related to selective migration, extant research is limited in other ways. While studies often find spatial effects, they are often unclear on the particular mechanisms producing racial disparities. Specifically, there is debate about the role that employers play in producing spatial mismatch. Kain's argument is that in the presence of a racially segregated housing market, racially-neutral employers—who are moving to the suburbs for good profit-maximizing reasons—are unwittingly erecting employment barriers for minorities. Although a few studies have looked at spatial mismatch from the employer's perspective (Ihlanfeldt and Young 1994; Holzer and Ihlanfeldt 1996), a number of studies by sociologists and geographers have shown employers to be more attentive to the labor market consequences of spatial arrangements than posited by Kain. For example, some of Chicago's inner-city employers revealed in interviews that they take note of the address of job candidates during screening, assuming that residents of public housing projects are unlikely to be good workers (Kirschenman and Neckerman 1991; Neckerman and Kirschenman 1991). Hanson and Pratt (1995:228) report that "...address alone [is] enough to disqualify [a candidate]

for a job in their establishment” for some employers in Worcester, Massachusetts. Employers in Newman’s (2000) important study of Harlem’s low-wage service workers tend to hire workers from outside the local area in an effort to avoid hiring the nearby residents of public housing (for a similar argument, see Sullivan 1989). Iceland and Harris (1998) studied employers’ relocation intentions and found that employers expressed a desire to move away from areas with increasing black populations in two of the four cities (Boston and Los Angeles) in the Multi-City Study of Urban Inequality (MCSUI).² Finally, Cole and Deskins (1988:17-18) show evidence that Japanese auto firms routinely avoid locating in areas with large concentrations of blacks when making site location decisions.

All of these stories of employers’ behavior suggest mechanisms that might produce racially disparate spatial employment patterns consistent with spatial mismatch predictions. Even if we accept that spatial mismatch between residences and workplaces have placed extra burdens on minorities, there is the question of what is behind the mismatch. If—contrary to Kain—we assume that most firms move to the suburbs to avoid minorities for reasons of taste, then space would have to be seen as a *tool* to achieve this goal. In this case, policies that aim to improve the access of inner-city workers to suburban jobs by means of transportation improvements (see Hughes 1991, 1995) would not be effective. So too would policies that try to break down residential segregation in the suburbs (e.g., Massey and Denton 1993). Those African Americans who do overcome spatial barriers would still not be hired.

Contrast this situation with one where we knew that firms locate in the suburbs because they want to exploit the selectivity of black migrants to the suburbs. It is, in fact, common for employers to cite “workforce quality” as a reason for moving to the suburbs. Here too, space is being used as a tool, but to a very different end. In this case, space might be being used as a screening device, as suggested by the Kirschenman and Neckerman (1991) and Hanson and Pratt (1995) studies cited above. Under this set of circumstances, transportation policies to make the suburbs more accessible to inner-city African Americans would also be undermined at the hiring stage by employers statistically discriminating on the basis of the candidate’s address. But housing-related policies, that offer non-stigmatized addresses, would be much more likely to be effective. Although both these mechanisms might produce results consistent with spatial mismatch, neither of these mechanisms are what Kain had in mind. If the third scenario—Kain’s race-neutral employers moving to the suburbs in pursuit of lower land prices and better infrastructure—were to prevail,

² For a discussion of the potentially discriminatory consequences of firm relocations, see Squires (1984).

then both transportation and housing solutions might be viable.

Of course, all three scenarios might be operating simultaneously. While different empirical studies take different approaches to the problem of spatial mismatch, they commonly start with Kain's original assumption that employers are race-neutral in their location decisions, but that the housing market works behind employers' backs to produce racially disparate outcomes. However, in light of the evidence cited above that at least some employers are not the ones envisioned by Kain, it becomes difficult to distinguish the Kain's "the housing market done it" version of the hypothesis from other explanations where employers are more purposive in producing spatially-related racial disparities. While lots of research has shown that space matters, it is hard to understand *why* space matters if we do not know what is motivating employers to move to the suburbs.

Similarly, the strongest empirical studies in this area—Zax's studies of the Detroit-area firm relocation—are also vulnerable to concerns about the employer's motives in the move. Zax provides little information on why the firm chose to move to Dearborn, but he does mention that "black employees filed suit against the company, alleging discrimination against black employees in the general terms and conditions of employment, and discriminatory intent in the relocation" (Zax 1989, 473). Indeed, the data were obtained as a part of the discovery process for the lawsuit, and was pending during most of the period Zax analyzed. Without presuming to judge the validity of the lawsuit's claims, it is at least possible that the suit affected the quitting behavior of workers, as well as the hiring of new employees. More important, perhaps is the fact that we have little information on what motivated the firm to move. This makes it difficult to choose among the scenarios described above.

In this paper, I present the results of a "best case" study of a firm relocation designed to examine the mechanisms at work in Kain's original formulation of the spatial mismatch hypothesis. While the case study approach raises some extra methodological issues,³ the unique features of this study solve the major challenges to the validity of

³ Specifically, issues of generalizability need to be carefully considered when using a case-study approach. On the one hand, like other spatial mismatch studies, the general temporal and regional context of these studies is always an issue. I address this by discussing the relevant features of the Milwaukee metropolitan area. But there is also the deeper question of the representativeness of the particular firm being studied. My strategy here is to conceive of the firm relocation as a best-case study. The study should not be used to make inferences about the behavior of "average" firms and workers in different settings. Rather, the purpose is to ask whether spatial variables matter in a scenario where the employer is not running away from minority workers (see below). While such firms might be empirically rare, the special circumstances of this case offer unique insight into the processes at work in spatial mismatch by allowing me to hold constant the influence of factors that usually confound empirical analyses in this area (e.g., selectivity of suburban

past studies in this area. Because it is the plant that is moving, and since workers did not choose the firm's new location, the relocation is experienced as an exogenous, demand-side shock to the local labor market. Thus, this study avoids the problem of self-selection of minorities to the suburbs. Furthermore, I have good evidence that the firm is *not* moving in order to change its work force (see below); thus I am quite confident that the employer is not using space as tool of racial discrimination, neither for reasons of taste, nor signaling. In this setting, policies that increase minorities' access to suburban jobs, such as policies to open up the housing market or transportation policies to facilitate reverse commuting, are not likely to be undone by this employer's behavior. Since the firm has a good representation of minority workers, this study provides unique insight into racial differences in the mechanisms by which workers adjust to the spatial disruption caused by the plant's move, thus distilling the key processes alleged to be at work in the spatial mismatch hypothesis. Also, in order to be certain that the changes documented here can be attributed to the firm's move *per se*, I construct a counterfactual to ask what would have happened if the plant had not moved. Specifically, I contrast the pre- post-move changes in the factory (Spring, 1991-Fall, 1994) with the baseline of changes occurring at the factory in the period immediately *prior* to the factory's announcement of the move (Spring, 1989-Spring, 1991).

The Setting

In the fall of 1989, the management of a food-processing company publicly announced that it was planning to move the company from Milwaukee's Central Business District (CBD) to the area's suburban ring during 1993. In September, 1990, I conducted extensive open-ended interviews with key personnel involved in the decision to move. The president explained that the main motivation for the move was that the company needed to retool its production equipment. The company was under competitive pressure to make this investment. In the president's words: "If we didn't make this move, within five years we would be out of business." The company's top management team had petitioned for and received \$92 million from their parent firm to build a new, state of the art production facility.

The downtown plant was located on a square city block, and occupied a multi-story facility, with numerous buildings that had been constructed and interconnected at various times over the 100 year history of the company. The company management explained that the layout of the current plant was woefully inadequate for the latest production machinery. The vice-president in charge of the move expressed that "[we] really require a 'greenfields' site where we

migrants).

can build the plant around the new equipment.” In this regard, the company is fairly typical in saying that a major advantage of “greenfields” is that the physical plant can be treated as a blank slate (Garreau 1991). The “build-to-suit” advantages of suburban locations were apparently hard to overcome. Milwaukee city officials offered large tax incentives for the company to move to a newly renovated multi-story building in the Central Business District, but the vice-president in charge of the move rejected this site as inappropriate because “we would have had to make a ‘Rube Goldberg’ machine out of our new equipment to fit into that plant. This is the big problem we have right now [in the current plant]. Whenever we replace or upgrade a piece of machinery, we need to run plumbing and electrical lines every which way in order to shoehorn [the new machine] in.” The site they ultimately chose was a 16 acre plot in a northwest suburban area, just over the border of the city limits. The driving distance between the old and new sites is 10.5 miles (16.9 kilometers), and with normal traffic the drive takes 25 minutes.⁴

With these stated motivations for the relocation, the company management appears to be enacting the key mechanisms that Kain’s proposed: metropolitan decentralization of employment reflects firms seeking lower land prices which makes operating out of a suburban location less costly. However, the significance of this move needs to be assessed against the social and economic landscape of the Milwaukee metropolitan area at the time. Like many northeastern and midwestern cities, Milwaukee is a monocentric city where the bulk of the 1980s employment growth occurred in the suburban ring rather than in the central city. The vast majority of the metropolitan area jobs created between 1979 and 1989 were located in the suburbs: More than 90 percent of the area’s 67,000 new jobs were in suburban Milwaukee and Waukesha counties. The city of Milwaukee posted a net employment decline of 3 percent while the suburbs increased employment by over 20 percent during the 1980s (Binkley and White 1991).

Moreover, African-Americans and whites rarely live in the same areas of Milwaukee. Milwaukee is one of only six cities in the nation with segregation indices so extreme as to warrant Massey and Denton’s (1989, 1993) designation of “hypersegregated” in 1980 and 1990. Much of this segregation is due to the virtually total exclusion of minorities from the suburbs during this period. In 1970, less than 1 percent of the area’s black population lived outside the city; in 1980 and 1990, the figure was 2 percent (Wiseman 1991). These patterns of African American segregation have continued through the 1990s. The Milwaukee-Waukesha PMSA was cited in a comprehensive report on racial

⁴ This is slightly longer than Zax’s firm relocation which was about 8 miles (13 kilometers).

segregation using the 2000 census as the “Most Segregated Large Metropolitan Area for Blacks or African Americans in 2000” (Iceland et al. 2002: Table 5-3). My own analyses of the 2000 census show that the black-white index of dissimilarity for Milwaukee is 84.4, behind only Gary, Indiana (87.9) and Detroit (86.7), and ahead of New York (84.3) and Chicago (83.6). Although less extreme, Hispanics also show similar patterns. For 1980, the Hispanic-white index of dissimilarity in the Milwaukee area was 55.0, and has increased over time, to 56.4 in 1990, and 59.5 in 2000 (Iceland et al. 2002: Chap. 6). Concurrently, Hispanics in the Milwaukee area have shown a trend toward increasing concentration in the city over time: The percentage of the area’s Hispanics living in the city climbed from 71 percent in 1970 to 76 percent in 1980 (Massey and Denton 1988) to 79 percent in 1990.

Figure 1 maps the location of the old factory (indicated by a star) and the site of the new plant (shown by a diamond) against the percent black by census block groups for the Milwaukee area in 1990. The area of greatest concentration of the African-American population lies north of the Central Business District. Figure 2 shows a similar map for Hispanics. Although less spatially concentrated, the main Hispanic area is located just south of the city's downtown, near the area of Mexicans’ original settlement in Milwaukee (Trotter 1985). The north-south line that runs near the new plant constitutes the Milwaukee city limit. The suburban areas west of that line show low concentrations of blacks and Hispanics. These maps show that the plant is moving from an area with a high (over 76 percent) concentration of blacks, near the Hispanic neighborhood of Milwaukee. The suburban area to which the plant is moving has less than 25 percent Hispanic population, but areas close to the plant show black concentrations of between 26 and 50 percent.

The historical trends are also important to consider, however. Figure 3 shows the location of the old and new plants in relation to the 1980 census data. At the time of the move, the black neighborhood in Milwaukee had been spreading north and west over time—a continuation of a trend that had been going on from at least the 1960s (Rose 1971, 34)—and the location of the new plant lies precisely in that direction (c.f. Figures 1 and 3). The Hispanic neighborhood has also become larger over time, but the direction of the spread has been south from the downtown (c.f. Figures 2 and 4). Moreover, these trends continued during the decade of the 1990s. Figures 5 and 6 show comparable data from the 2000 census: Milwaukee’s black neighborhood continued to spread northwest in the direction of the new plant, while the Hispanic neighborhood spread south of the central business district.

The geographic location of the new plant near areas where blacks had already been moving has important

implications for this study. First, the choice of the northwest side for the new plant contributes to the “best-case” nature of the study. In light of these trends, housing market segregation will not pose the absolute obstacle that a move deep into the white suburbs around Milwaukee might have. Thus, this study should be seen as a conservative test of the spatial mismatch hypothesis, generating a lower-bound estimate of what moves deeper into the white suburbs are likely to produce. Second, the fact that the company management chose to site the new plant relatively close to the black neighborhood provides important evidence that the company is not seeking to use space as tool for ridding itself of black workers. Indeed, the overall race distribution of the company employees did not change over the course of the relocation (see below).

Even more important, however, the way that the company management made the site decision strongly suggests that they are seeking to keep their current workforce. During the spring of 1989, before it was generally known that the company was moving, the company’s management conducted a study comparing increases in home to work air-line (i.e., “as the crow flies”) distances between the downtown plant and each of three prospective new sites. The locations of the three alternative sites are shown on Figures 1-6 by triangles. The site they ultimately chose, the northwest suburban location, was the one that minimized the commuting increase for their work force as a whole, with each employee equally weighted. Even more impressive, the northwest site was the *worst* of the 3 sites for the company’s president.⁵

Table 1 shows the data based on the internal site location study done in spring of 1989 prior to the firm’s announcement of its move.⁶ The northwest site they chose requires an average increase of 5.8 miles over the roundtrip commute to the downtown location, compared with increases of 13.5 and 12.8 roundtrip air-miles for the south and west sites. Although the company did not look at race differences—the original spreadsheet cut the data only by hourly vs. salaried—Table 1 shows that the northwest site was the closest of the three suburban sites for African Americans by a wide margin: an increase of 9.3 in roundtrip air-line miles, compared with increases of 22.5 and 21.7 roundtrip air-

⁵ Past research on firm movement (Whyte 1988) has noted that there is a high likelihood that firms move near where the CEO lives.

⁶ The company data were originally coded into a spreadsheet by an administrative assistant who would look up each address on a paper map of the region. Using a string, this person measured the distance from each home address to the downtown site, and each of the alternative sites. The data in Table 1 are based on my reanalysis of these data using a computerized geographic information system to geocode the addresses and to calculate the air-line distances. While I found a number of errors in the original spreadsheet, the results of the internal study yield substantive results that are

miles for the south and west suburban sites, respectively. Hispanics, too, would have had slightly longer commutes to the south than the northwest site (increases of 14.7 vs. 13.6 miles), but the west site would have been as challenging for Hispanics as for blacks (an increase of 21.5). Thus, if the goal of the relocation were to get rid of minorities, the firm's management certainly could have done a better job when choosing where to locate. However, the site they did choose—the northwest site—induced a much bigger increase in commuting distance for minorities than for non-Hispanic whites: the increases for whites were 3.6, 10.1, and 8.7 in roundtrip air-miles for the northwest, south and west sites. While the impact of the move would have been much worse for minorities if the company were to have chosen to relocate to either the south or west sites, nevertheless, the site they did choose clearly has the potential to induce strong racial differences in workers' commutes between their homes and work (Identifying cite).

There is other evidence that the firm's leaders are not moving in order to change its work force as well. In my interviews with the vice-president in charge of the move, he clearly stated that the main reason they did not move the plant to low-wage, low-tax areas such as Kentucky or Tennessee—areas that are alleged to be popular with firms seeking to avoid minorities (Cole and Deskins 1988)—was that they did not want to lose their current work force. Moreover, the firm's management made it clear that all were invited to work in the new plant. They were willing to state this goal publicly and allow me, whom many regarded as an academic interloper, watch them go through the move. The company also gave workers a “no-layoff” guarantee through the period of the move,⁷ and actively engaged in an information campaign in which workers were driven out to the new site on company time and given tours of the new plant during construction. These actions would be very self-defeating if the company management were using the occasion of the plant relocation as a tool for getting rid of its minority workforce.

While these features strengthen my sense of the “best case” nature of the study, the fact that the company chose to locate along the axis of the natural path of the growth of the black neighborhood presents a challenge for assessing the causal nature of the plant relocation's effect on workers. The fact that black workers at the company—the workers most constrained by housing market segregation—are likely to have moved toward the northwest *even in the absence of the firm relocation*, complicates the measurement of the impact of the firm's move. My approach to this

identical to those presented here.

⁷ The production workers—accounting for the vast majority of the minority workforce—also received a pledge that their wages in the new plant would be no lower than their wages in the old plant (see Identifying cite).

challenge is to construct a counterfactual for the changes occurring with the company's workforce over the period of the plant move. Wherever possible, I will compare workforce changes occurring during the approximately 40 month period of the plant move between T_1 (spring, 1991) and T_2 (fall, 1994), to changes that happened to workers in the 24 month period immediately prior to the relocation, i.e., T_0 (spring, 1989) to T_1 (spring, 1991).⁸ Changes in the period prior to the move ($T_0 - T_1$) yield insight into what would have happened in the absence of the plant move. In this design, the causal impact of the plant relocation, then, is the difference between the changes occurring over the $T_1 - T_2$ period of the plant relocation, and those that happened in the baseline $T_0 - T_1$ period.

Hypotheses

In this context, the spatial mismatch account of minority labor market difficulties leads to the following predictions about changes along three margins. While all workers' arrangements with respect to jobs, housing location, and commuting are observed at T_1 , the firm's relocation constitutes an exogenous bump to these arrangements. Thus, at T_2 I observe workers' new choices of job, housing, and commuting. The spatial mismatch hypothesis predicts that minorities will respond to the relocation of the firm differently than will whites. Specifically, the high degree of racial segregation of minorities—especially African Americans—limits minorities' choices with respect to where they can live. To the extent that minorities' responses to the firm's move are muted with respect to household moves, they should be more likely than whites to adjust to the bump of the firm relocation along other dimensions.

To the extent that workers use the labor market as the margin of adjustment,

H1: Minorities will be *more* likely than whites to turn over in response to the firm relocation.

Because racial housing segregation limits opportunities for minorities,

H2: Minorities will be *less* likely than whites to use the housing market in response to the firm relocation.

The final way that people can respond to the disruption of the firm relocation is by simply absorbing the new commute. Here, too, minorities' limitations in the use of the housing market will lead minorities to use the commute margin more than whites as the margin of response to the relocation:

⁸ While ideally, I would prefer these time intervals to be the same, the only pre-move data available correspond to when the company conducted its internal site location study, i.e., spring, 1989. Thus, I use the data from spring 1989 for T_0 . The company announced the move in the fall of 1989. I collected T_1 data during the early spring of 1991, and the company broke ground on the suburban plant about a year later in early 1992. However, the plant move occurred in a set of stages, over a period of time. Production in the new plant didn't start until mid 1993, and didn't end at the

H3: Minorities will absorb to the impact of the firm relocation more than whites by commuting farther.

As discussed above, wherever possible I will compare changes along these dimensions occurring during the period of the plant move between T_1 and T_2 to the counterfactual of changes happening in the $T_0 - T_1$ period.

Data

The data come from a number of sources. First, survey data were collected via closed-ended, face-to-face interviews. The first wave (T_1) of data collection was done during the spring of 1991, about one and one half years after the company announced that they were moving from Milwaukee's downtown,⁹ and approximately a year before the groundbreaking for the new location. Respondents were paid \$15.00 for their participation in the T_1 survey. Interviews of approximately one hour in length were successfully completed with 279 (82.8 percent) of the 337 workers employed at the plant. The second wave (T_2) surveyed workers who had been employed at the downtown plant at the time of the first survey, irrespective of whether they were still employed at the company, as well as any new employees working at the new plant during the fall of 1994. In order to ensure a high response rate on the follow up, respondents were paid \$50.00 for their participation in the T_2 survey; 86.1 percent of the 446 current or former employees were successfully interviewed.¹⁰ In both sets of surveys, I asked about the key variables of interest for the study, e.g., current and prospective commuting times, household moves, etc..

As I described above, however, one of the unique features of this setting is the ability to construct a counterfactual based on changes in the company that were occurring prior to the firm relocation. A second source of data then was historical data provided by the company and corresponding to the internal site location study that they performed in the spring of 1989. Although limited in some respects, I have measured a number of the key variables of interest using this source, e.g., who left the company, and who changed household location in the T_0 and T_1 period.

downtown location until the fall of 1993. I collected the T_2 data about one year later during the fall of 1994.

⁹ As I mentioned above, the company announced the move in the fall of 1989. The fact that I did not begin data collection until the spring of 1991 introduces the possibility that workers might have begun reacting to the impending move prior to my data collection. Comparing the distances from the 1989 addresses (collected prior to the announcement of the move) to the old and new plants to the same data for the 1991 show virtually the same results (c.f. Tables 1 and 3). I also asked a series of retrospective survey items that were designed to provide information on presurvey responses to the company's move (these analyses are available from the author). The results presented here are not affected by the fact that my survey was fielded subsequent to the company's announcement of the move.

¹⁰ The breakdown of these workers is as follows: 253 (56.7 percent) were previously employed in the downtown plant, 84 (18.8 percent) had left the company by T_2 , 85 (19.1 percent) were new hires, and 24 (5.4 percent) were transferred from another facility.

From the home addresses provided by employees on the surveys (T₁ and T₂ waves) or the company (T₀ wave), I used a geographic information system to analyze computerized street maps of the metropolitan area, to code air-line and shortest road distances¹¹ between each worker's residence and the old and new plants. The distance data are critical for measuring the degree of spatial disruption induced by the move. From a number of sources (telephone directories, public company and union records, informants in the plant, etc.), I obtained addresses, as well as a limited set of data, including race, sex, and hourly versus salaried status, for the T₀ data and survey non-respondents as well. (These data showed no evidence of non-response bias on these variables.)

Analysis

Although few minorities are found among the ranks of the salaried workforce at the company,¹² the demography of the hourly work force at this company is well suited to addressing issues of minority employment. The data presented in Table 2 show that the firm workforce overall exhibits considerable diversity along racial and ethnic lines. Moreover, the firm's race distribution has been quite stable over the entire period of the study. These data are inconsistent with the notion that the firm is moving to avoid minority workers.

Most important for these purposes is the fact that the firm relocation constitutes a substantial bump to workers' commuting distances and times to the downtown plant in the spring of 1991. In contrast to the data in Table 1 which are based on the internal location study from T₀, the data presented in Table 3 were collected at T₁ prior to the relocation. The last row of Table 3 shows that if no one changed household, the average worker would face an increased roundtrip commute of 4.8 air-line miles (32 percent), 10.2 road miles (54 percent), and 15.7 "door-to-door" minutes (36 percent) over their commutes to the downtown location. This overall pattern masks large racial differences in the size of the spatial disruption induced by the company move, however.

The different racial groups of workers at this company are distributed in a manner that is quite representative

¹¹ The road distances are based on the shortest paths from point to point using street maps. (I explored using the shortest time algorithm as a metric, but it was correlated .991 with road distance.) I cannot be sure that people actually travel routes with the short distances or times as estimated from the geographic information system since available maps do not take into account driving conditions or altered traffic patterns (e.g., due to construction delays). Nor do these data reflect variations in mode of transportation (e.g., bus vs. automobile). Indeed, the correlation between the shortest time measures and respondent's self-reports of commuting time is .728 for commutes to the old plant at T₁. While I will present data on respondents' self-reports of commuting time whenever possible, it is important to note that the road distance measures likely contain some measurement error.

¹² For T₀, T₁, and T₂, respectively, minorities constitute 3.4, 4.9, and 7.2 percent of salaried workers but 51.1, 55.9, and

of Milwaukee's racial geography. African Americans are concentrated in the area just north and west of the downtown, Hispanics are more spread out, but tend to be located around the area south of the downtown, and whites are spread over a much larger area, especially across the suburban areas outside of the city, but are virtually absent from the black neighborhood north of the old plant (see Appendix Maps A1-A3). On average, African Americans have relatively short commutes to the downtown plant (columns 1-3 of Table 3), i.e., roundtrip air-line and road distances of 6.5 and 8.8 miles, and 33 minutes. As I discuss below, a significant minority (17.7 percent) of blacks rely on public transportation or walking to commute to their jobs.¹³ Hispanics, too, are located relatively close to the old plant: roundtrip air-line and road distances of 7 and 10.2 miles, with roundtrip journeys 28 minutes in duration. Whites—many of whom live in the suburbs (see Appendix Map A3)—commute much farther on average to the downtown plant (roundtrip air-line and road distances of 19.3 and 24.2 miles), and spend more time (roundtrip 50 minutes) commuting, almost always (96.4 percent) by automobile.

Against this backdrop, the increase in commuting necessary to get to the new plant from the 1991 addresses is distributed very unevenly by race. Columns 4-6 of Table 3 show that the average increases in the prospective commute are much less for whites than for minorities in absolute terms. In terms of distance, the average increase is 3.0 air-line miles and 8.5 road miles for whites compared with 7.3 and 12.3 for blacks, and 11.2 and 17.0 for Hispanics. When the increase is measured in “door-to-door” minutes, the increase is 7.2 minutes for whites, compared to 32.0 minutes for blacks, and 27.8 minutes for Hispanics. In contrast, the race differences are even starker in terms of percentage increases. The prospective commute distances for African Americans would more than double (increases of 112 and 139 percent for air-line and road miles), and nearly double in commuting time (increase of 99 percent). For Hispanics, the average commuting increase required is even larger: 161 and 166 percent for air-line and road miles, and 100 percent in minutes. The corresponding percentage increases for whites are modest by comparison: 16 and 35 percent for air-line and road miles, and 7.2 minutes.

Of course, the race differences just discussed are average differences. Within each racial group, there are some workers whose homes are located closer to the new plant than the old plant (see Appendix Maps A1-A3), and for them, the plant move constitutes an unanticipated improvement to their commutes. Using road miles as the metric, 26.8

53.6 percent of the hourly workers at the new plant.

percent of whites, but only 15.4 percent of minorities are “winners” in this way ($p < .015$, Likelihood Ratio $X^2 = 5.932$, with 1 d.f.). The race difference is even stronger when using air miles (38.6 percent of whites are winners, compared with only 14.5 percent of minorities; $p < .00001$, LR $X^2 = 22.730$, with 1 d.f.) or minutes (39.0 percent of whites are winners, compared with only 15.5 percent of minorities; $p < .00001$, LR $X^2 = 17.290$, with 1 d.f.).

The analyses to this point have established that the location of the new plant constitutes a substantial disruption to the commuting patterns of the workforce employed at the downtown plant, and that there are important race differences in the degree of the disruption. As such, the current relocation is a good candidate for studying the processes involved in overcoming the spatial barriers induced by the company’s move (for more evidence, see Identifying cite).

Hypothesis 1

Hypothesis 1 states that minorities will be more likely to turn over in response to the firm relocation. During the $T_0 - T_1$ period, minorities are not more likely to turn over than whites: 13.1 percent of whites turned over, compared with 10.6 percent of minorities ($p < .550$, LR $X^2 = 0.357$, with 1 d.f.).¹⁴ Nor are there are significant race differences in the propensity to turn over when blacks and Hispanics are distinguished: 13.1 percent of whites turned over, compared with 11.6 percent of blacks and 4.5 percent of Hispanics ($p < .429$, LR $X^2 = 1.692$, with 2 d.f.). If minorities are using the labor market margin to adjust to the disruption imposed by the firm relocation, then one would expect the turnover rates to rise, and given the large race differences in the impact of the firm move, turnover should be different by race over the period of the relocation.

Turnover rates did go up in the $T_1 - T_2$ period. While 12.3 percent of the overall workforce left the company between $T_0 - T_1$, the turnover rate for the $T_1 - T_2$ period doubled to 25.0 percent. While some part of this higher rate could reflect the longer time span between $T_1 - T_2$ (40 months) than $T_0 - T_1$ (24 months), it is also possible that this reflects workers’ reactions to the relocation. There is no evidence, however, that turnover during the period of the firm move is different by race. During the $T_1 - T_2$ period, minorities are not more likely to turn over than whites: 24.7 percent of whites turned over, compared with 25.6 percent of minorities ($p < .843$, LR $X^2 = 0.039$, with 1 d.f.). Nor are

¹³ This is contrast to 4.1 percent of whites and 4.0 percent of Hispanics.

¹⁴ Terminations include quits, firings, retirements, and deaths. While I am limited in my ability to distinguish quits and firings (see below), I checked whether the results presented here are affected by various changes in the definition of turnover. The results presented here are robust to excluding deaths (only one person died during each period) and retirements.

there are significant race differences in the propensity to turn over when blacks and Hispanics are distinguished: 24.7 percent of whites turned over, compared with 26.4 percent of blacks and 18.5 percent of Hispanics ($p < .694$, LR $X^2 = 0.729$, with 2 d.f.).

Nor does there seem to be any relationship between the degree of spatial disruption imposed by the firm move and turnover. Table 4 shows the average degree of mismatch measured in air-line miles for terminated vs. continuing workers by race. Considering the first two columns, for both time periods there are only small differences in the level of spatial mismatch for terminated vs. continuing employees. None of these comparisons are significant at the 10 percent level. Only for Hispanics do the terminated employees live farther from the new than the old plant. However, there are only a small number of terminating Hispanics for each time period (i.e., 1 and 5), and F tests show that these contrasts are not statistically reliable ($p < .336$ and $p < .321$).

A better test of H1 would distinguish “voluntary” (quits) from “involuntary” (firings) turnover.¹⁵ Unfortunately, the company did not maintain records on the reason for the termination for the $T_0 - T_1$ interval. The surveys, however, do give me some purchase on the distinction between voluntary vs. involuntary terminations over the $T_1 - T_2$ period (last two columns of Table 4). Although limited by the lack of counterfactual evidence with respect to quitting, the contrasts between quitters and non-quitters during this latter period are not suggestive of spatial mismatch driving racial differences in quits. Although none of the contrasts are statistically significant, with the exception of Hispanics, they are also the wrong sign: quitters are *closer* to the new plant than non-quitters. Moreover, minorities are *less* likely to quit than whites between T_1 and T_2 . The black and Hispanic quit rates are 5.7 and 11.1 percent, compared with 12.7 percent for whites over this period.

Hypothesis 2

To the extent that housing market segregation limits minority workers’ housing choices in this setting, the spatial mismatch hypothesis predicts that minorities will use the housing market less than whites as a way of dealing with the spatial disruption introduced by the firm’s relocation. The simplest dimension along which changes might occur is household relocation. Here, I focus on the set of continuing workers (i.e., workers who did not turn over) since they are the population that has elected not to use the labor market as the means of adaptation to the firm relocation.

¹⁵ Although the company had pledged no layoffs in the move, with the consent of the company’s union, they did reserve

However, minorities move households more than whites: during the $T_0 - T_1$ period, 36.9 percent of minorities moved vs. 19.7 percent of whites. Such a pattern of race differences is not surprising, however. As much research has shown, people move households for many reasons (e.g., Rossi 1980), and minorities are more likely than whites to be renters ($T_0 - T_1$: 61.9 vs. 30.0 percent; $T_1 - T_2$: 67.5 vs. 35.0 percent). While household moves increased in the subsequent period, the same pattern of minorities being more mobile than whites emerged in the $T_1 - T_2$ period: 48.9 percent of minorities moved compared with 27.9 percent of whites. Moreover, the pattern of increase in household mobility is *greater* for minorities than whites; i.e., minorities' increase in household mobility between the two time intervals is 12.0 percent (13.3 percent for blacks, and 7.1 percent for Hispanics), compared with 8.2 percent for whites.¹⁶ At first glance, this would seem to be evidence against H2.

The plant relocation does not appear to produce race differences in household moving *per se*, but the locations of the household relocations are affected by the plant move in the ways predicted by H2. As noted earlier, Milwaukee's black neighborhood had been spreading northwest over time, and the company had chosen to locate the new plant in the direction of where the black neighborhood had been spreading. The minorities at this company are no exception to this pattern. Of the 42 minorities who changed address over the period of the relocation, the T_2 address of minority movers is closer to the new plant than the T_1 address in 62.0 percent of the cases. Table 5 shows that the average move for this group yields a T_2 address that is 2.5 air-miles, and 4.9 road miles closer to the new plant. The household relocations of blacks on average bring them 3.9 air-miles and 6.5 road miles closer to the new plant. It is important to note that *all* of these moves were from T_1 addresses located in the city of Milwaukee, and only 2 of the moves resulted in T_2 addresses in suburban areas outside the city.

It is critical to note, however, that these patterns of household movement were apparent during the $T_0 - T_1$ phase as well. Even prior to the announcement of the plant relocation, minorities—particularly blacks—were drifting toward the northwest. Of the 31 minorities who changed address over the period of the relocation, the T_1 address of minority movers is closer to the new plant than the T_0 address in 71.4 percent of the cases. Here, too, *all* of the moves

the right to fire people for cause.

¹⁶ The percent renting barely changed for either race over the two time intervals ($T_0 - T_1$: 29.7 percent for whites and 67.5 percent for minorities; $T_1 - T_2$: 32.1 percent for whites and 67.0 percent for minorities). In further analyses (available upon request), I found that renter vs. owner status does not explain the tendency for minorities to be more mobile than whites.

originate from T_0 addresses located in the city of Milwaukee, and only 1 of the moves resulted in a T_1 address in the suburbs. Considering first the data on air-miles, the average move for minorities results in a T_1 address that is 3.0 air-miles closer to the new plant. The pattern for blacks is even stronger: their household relocations are 3.5 air-miles closer to the new plant. These figures are very similar to those for the T_1 - T_2 period of the firm relocation (2.5 and 3.9 air-miles). I tested whether these differences are likely to be due to chance by means of a bootstrap (see Appendix A).

In 10,000 resamplings of the longitudinal data, the T_0 - T_1 changes in distances from the new plant meet or exceed those observed during the T_1 - T_2 period of the firm relocation 38 and 65 percent of the time. Thus, these differences could easily be due to the random inclusion or exclusion of a few cases. At least with respect to air-miles, then, the pattern of household movement observed for minorities during the period of the plant relocation is the same as that observed for the prior period when the plant was not moving. (I will return to discuss the results for road miles below).

The story for whites is very different, however. Milwaukee's white population had been dispersing from the city and moving to suburban locations at least through the period of the 1980s and 1990s, and here, too, the company employees exhibit the same pattern. Of the 45 white employees who moved during the T_1 - T_2 period, 62.2 percent had T_1 residences in the city, but 60.0 percent had suburban addresses by T_2 . Of the 28 whites whose T_1 address was in the city, 50 percent had T_2 residences in the suburbs (13 of the remaining 17 movers had suburban addresses at both T_1 and T_2). However, white workers were not dispersing from the city aimlessly during this period. As white workers relocated, they tended to move closer to the northwest suburban plant: the average move yielded an address that was 4.85 air-miles and 4.65 road miles closer to new plant (Table 5).

The patterns of household movement were quite different for whites during the T_0 - T_1 phase, however. Whites had been suburbanizing in the period prior to the announcement of the plant move as well. At T_0 , 64.7 percent of the 34 white movers were located in the city; by T_1 , 50.0 percent of these resided in the suburbs. Unlike the subsequent period, these moves were not focused on the new plant. While the average move for whites brought them 4.85 air-miles and 4.65 road miles closer to the new plant between T_1 and T_2 , in the T_0 - T_1 period, the average move was 3.1 air-miles and 7.9 road miles *farther* from the new plant. The bootstrap tests of significance show changes in air and road distances to the new plant as extreme as those observed between T_1 and T_2 occur very rarely in random resamplings of the data (i.e., 3 and 1 percent of the time), and thus, are unlikely to be accounted for by chance. This suggests that while whites

continued to suburbanize in both the period before and after the plant move, they appear to change their suburban destinations over the two time periods. In particular, the household locations observed after the firm move are closer to the new plant than those chosen prior to the firm relocation.

In contrast, the household relocation patterns for minorities showed less reaction to the shock of the firm relocation. As shown above, when measured in air-miles, the pattern of minority household movement is very similar between the T_0 - T_1 and T_1 - T_2 periods: almost total exclusion from the suburbs, with moves concentrated on the northwest side of the city. According to this metric, the plant move had no impact on blacks and minorities at all, but a substantial impact for whites. This pattern supports H2. The data on road miles (bottom panel of Table 5), however, show that the average T_1 - T_2 household move is significantly closer to the new plant than the moves occurring during the T_0 - T_1 period for all three groups, and that these differences are unlikely to be due to chance: whites = $p < .0135$, blacks = $p < .0232$, and all minorities = $p < .0536$.

Further analyses showed that whites' responses to the relocation were substantially greater than those of blacks and all minorities. While this pattern is the same for both air-miles and road-miles (c.f. the top and bottom panels of Table 5), the bootstrap tests show that the race differences in responses to the relocation are less reliable for road-miles. Although the whites' road-mile response is considerably greater than that of blacks and all minorities (12.56 vs. 4.65 and 3.76 road-miles), blacks and all minorities show responses as extreme as those of whites in respectively 12 and 9 percent of the bootstrap resamplings. The weakness of the results for road miles compared with the air-miles could be due to noise in the road miles measure mentioned above. Although less reliable than the results shown with air-miles, these findings are also supportive of H2: blacks' and minorities' housing market responses to the exogenous shock of the firm relocation are less than those of whites.

A key driver of these patterns appears to be race differences in resettlement in suburban locations (for a discussion of blacks' reluctance to move to the suburbs, see Goodman and Streitwieser 1983). While whites are choosing new household locations closer to the new plant from largely suburban locations, blacks and minorities are shading their choice of household relocation toward the new plant, while still remaining within the city limits. Only two minorities (one black, and one Hispanic, 4.8 percent of 42 minority movers) moved outside the city limits during the T_1 - T_2 period; only one minority (one Hispanic, 3.3 percent of 30 minority movers) had moved during the prior T_0 - T_1 period. In contrast, city-suburb moves were much more common for white movers in both periods. The suburbs were

the destination for 50 percent (14 of 28) of white city-dwellers during the T_1 - T_2 period, a significant increase compared with 31.8 percent (7 of 22) of white city-dwellers during T_0 - T_1 ($p < .08$; based on 1,000 bootstrap replications). The fact that suburbanization increased for whites over the period of the firm relocation is also consistent with the predictions of H2.

Hypothesis 3

The third margin along which workers can adjust to the firm relocation is by simply accepting the often longer commute to the new plant. As I showed above in Table 3, the minorities employed at T_1 show longer commutes to the new plant than whites in both absolute and percentage terms at the start of the process. As I posited with respect to H2, if minorities are more constrained than whites in their housing market response, one would expect minorities to be more likely than whites to respond to the firm relocation by commuting farther (H3).

Table 6 shows the roundtrip commuting distances to the old and new plant for workers who absorbed the bump of the firm relocation along the commuting margin. Thus, I remove from the analysis workers using the other margins of adjustment, i.e., those who either left the company (H1) or changed address (H2). For both air and road miles, minorities' commuting distances to the new plant are about double those to the old plant. Although the number of minorities is modest, these increases are substantial enough that they are significantly different from zero using bootstrap methods. Although much smaller in both absolute and relative terms, for whites the increase in commuting distances associated with the move to the new plant is also unlikely to be due to the chance inclusion or exclusion of a few cases. Most important, however, Table 6 also shows that the increases in commuting distances are greater for minorities than for whites. The one exception to this pattern is Hispanics where the increase in the road miles is less than or equal to that of whites in 107 of 1,000 bootstrap replications. Overall, these results are consistent with H3: minorities who do not move household or leave the firm absorb the impact of the firm relocation via longer commuting distances than whites.¹⁷

It is also possible to ask about race differences in increased commuting for individuals choosing to absorb the relocation along *both* the commuting margin and the household relocation. Since this includes people who changed

¹⁷ Note that for the group of workers who do not change households, the counterfactual of how much commuting is to be expected if the factory were not to move is given by the commute to the downtown plant. Therefore, the analyses presented in Table 6 represent the impact of the firm relocation for household stayers.

household locations, not all of the increase in commuting distance occurring in the T_1 - T_2 interval is due to the impact of the firm relocation: it is important to consider the counterfactual of what the increase in commuting would have been for various race groups due to “natural” household mobility if the plant had not moved. I estimate the “natural” increase in commuting due to people moving by comparing the commute to the downtown plant observed at T_0 to the commute to the downtown plant at T_1 . For all race groups, the average “natural” increase in commuting ranges from approximately 0.9 air-miles to 1.5 road-miles (Table 7). While these increases are statistically different from zero for virtually all the measures for the various race groups (air-line miles for Hispanics is the only exception; p value for this group is .054) the increases for minorities are not reliably different from whites’.

In order to estimate the net impact of the firm relocation, I subtracted these race-specific “natural” increases from the increases in commuting observed over the T_1 - T_2 period. Table 8 shows the results with the natural increases in commuting due to housing mobility netted out. The findings here are that all of the increases in air and road miles are greater for the minority groups than for whites. The bootstrap significance tests¹⁸ show that, with the exception of air-miles for whites, the impacts of the firm relocation are reliably different from zero. Most important, the impacts for the various minority groups are reliably greater than the impacts for whites. The only exception to this pattern is road-miles for African Americans where the bootstrap test does not reach a traditional level of significance (i.e., $p < .129$; 128 of 1,000 bootstrap replications show blacks with impacts less than or equal to whites). Otherwise, the data are supportive of H3: Even when considering the population of people using the joint household moving/commuting margin as a response, minorities absorb the impact of the firm relocation by having longer commuting distances than whites.

These results show that the increase in commuting distances for minorities is greater than the counterfactual increase in distances. While it is useful to measure the spatial disruption caused by the firm relocation in distance terms, the analyses just presented ignore differences in the mode of transportation that people use to travel to work.¹⁹ Table 9 shows the roundtrip commuting time and speed (measured in shortest road miles per hour) to the old and new plants for the population of workers who absorbed the bump of the firm relocation along the commuting margin. Therefore, as

¹⁸ Note that in performing the bootstrap tests of significance, I also resampled the “natural” increase estimates based on the T_0 - T_1 period, and subtracted the increase from the bootstrap estimate of the T_1 - T_2 increase for each of the 1,000 bootstrap resamplings.

¹⁹ I collected the information on commuting times and mode in the T_1 and T_2 surveys; unfortunately, I do not have such information available for T_0 , so I cannot present counterfactual data on commuting times. Consequently, I cannot

with the analyses presented in Table 6, I remove workers using the other margins of adjustment, i.e., those who either left the company (H1) or changed address (H2).

The first column shows that minorities at T₁ have roundtrip commutes of about a half hour, while whites typically commute about 50 minutes. The second column shows minorities—particularly African Americans—commute at much slower speeds than do whites (18.79 vs. 31.77 mph for blacks and whites, respectively). As I showed in Table 6 for this population, the distances that whites cover in commuting to their jobs (often from the suburbs) is proportionately much greater than for minorities. Part of this difference surely reflects differences in transportation mode. Although the great majority of all race groups drive alone to work at T₁ (for whites, blacks and Hispanics, the percent driving alone are 82, 72, and 90), riding the bus to work is more common among blacks than whites (8 vs. 1 percent of blacks and whites; none of the Hispanics ride the bus to work). There are also race differences in the percent participating in car pools: blacks are twice as likely to participate in car pools as are whites (28 vs. 14 percent); the corresponding percentage for Hispanics is 10 percent.

When I examine the increases in commuting times and speeds associated with the firm relocation, I find that the increases in commuting time are reliably different from zero for African Americans ($p < .008$ in 1,000 bootstrap replications), but not for Hispanics by themselves ($p < .149$) or whites ($p < .244$). Black workers experience an almost 11 minute increase in their commuting time, compared with 2.5 minutes for whites. While this contrast with whites is unlikely to be due to chance ($p < .025$), it is important to note that in percentage terms the increase in commuting time is considerably smaller than the corresponding increases in air and road distances in Table 6 (36 percent, compared with 91 and 119 percent in Table 6). Here, too, this contrast likely reflects mode changes: *none* of the T₂ workers use the bus to get to and from work at the new plant.²⁰ Thus, the commute to the new plant always involves a car, either by driving alone or carpooling. The column showing race differences in commuting speed is consistent with this change in mode. Although whites have also increased their speed of commuting 7.64 mile per hour ($p < .004$), the increases for minorities are even more substantial (77 and 50 percent for blacks and Hispanics);²¹ the contrasts with whites are

perform analyses of the time and speed measures in parallel fashion to the analyses presented in Tables 7 and 8.

²⁰ The metro area bus service to the new plant is much less convenient than it was to the downtown plant. The bus stopped a half a city block from the downtown plant. In contrast, the closest scheduled bus stop is 0.76 miles from the location of the new plant.

²¹ Since none of the Hispanics were riding the bus, this speed increase reflects a shift from the use of slow city streets

reliably different from zero (p -values of .009 and .038 for blacks and Hispanics). In sum, whether measured in commuting distances, times, or speeds, the results presented here support H3.²²

Discussion

Taken as a whole, the analyses of this case suggest that minorities—especially blacks—adjust to the spatial disruption induced by the firm relocation in two of the three ways predicted by the spatial mismatch hypothesis. Contrary to the findings of Zax's (1989; also Zax and Kain 1991) studies, I found no support for the idea that minorities absorb the spatial shock along the quit margin in this setting. Although these analyses of H1 are limited by the lack of counterfactual data, the data I am able to muster are not encouraging. One conjecture for the divergence of these findings is that in this case the firm was clearly acting in a manner to maximize the retention of their workforce by pledging no layoffs and guaranteeing wages (Identifying cite), whereas the firm in the relocation that Zax and Kain studied might not have been so inviting. The fact is that the data from their firm were obtained as part of the discovery process from a lawsuit alleging that the firm move was discriminatory.

A second possible factor involves the economic conditions surrounding the firm relocations. Although there is nothing said about this in the Zax studies, the wages for the blue-collar jobs in which the vast majority of minorities were working in this company were plummeting in the open labor market during this period. In addition, the timing of the firm move was such that it was executed during a mild recession in the area (Identifying cite). Both these factors would tend to dampen workers' enthusiasm for managing the bump of the increased commute by leaving the company.

Support is stronger for H2, however. Here, the counterfactual data have been extremely valuable for identifying this impact of the move. On the one hand, the fact that the firm was so even-handed in its location choice vis-à-vis their workforce is important evidence that its management was not using space as a tool for the purpose of getting rid of its workforce. But by choosing to move in the direction of the natural growth of Milwaukee's black neighborhood, blacks' household relocations seem at first glance to be unaffected by the firm's move. However, closer examination of the pattern of moves shows that minorities—especially blacks—are less responsive to the firm

for commuting to the downtown the plant, to faster highways for the commute to the new plant.

²² As mentioned above (note 19), I cannot provide counterfactual information on commuting times for the population of people who used the housing market (i.e., analyses parallel to those presented in Table 7). However, I did examine the pattern of commuting times without netting out the counterfactual increases in commuting, and those results are very similar to those in Table 9.

relocation along this margin than are whites. Compared to the period prior to the firm relocation, white household movers changed the destination of their largely suburban moves, while minority movers continued following their prior trajectories. While the firm relocation increased suburbanization for whites, blacks continued their historical trend outward from the city center but did not venture into the suburbs.

The fact that minorities have continued to be absent from the suburbs suggests another important implication. This is best illustrated by the case of one white, computer programmer that I personally interviewed during the T₁ phase of the study. When I asked how long the commute is to the current (downtown) plant, he responded “a half-hour.” When I asked him how long the commute would be to the new suburban plant, he responded “5 minutes.” He explained that by luck the company had chosen to locate the new plant very close to his home. Further, he told me that he could “easily walk to work” [at the new plant]. Thus, he stood to be one of the “winners” in the plant move I described above: he had a much shorter commute to the new than the old plant. However, when I inquired if he was planning to move household, I was told “yes.” When I asked where he was likely to move, he said “about a half-an-hour farther out.”

The significance of this case is that it illustrates that this person was trading off between the commuting and housing relocation margins that I have examined separately in this paper. Handed a windfall on the commuting margin, he was cashing it in on the housing margin with a move to an ex-urban area with lower house and land prices. This was not mere supposition on his part. Checking his T₂ data reveals that he did indeed move to an ex-urban area 30 minutes from the new suburban plant. What is important to realize here is that as a white worker who shows no improvement on the commuting margin, this programmer counts *against* H2 which posits more fluid spatial adjustments for whites than blacks (Table 5). Of course, as discussed above, moves outside the city are extremely rare for minorities, so the same kind of ex-urban commuting/household moving tradeoff is not working for minorities. To the extent that such African Americans are making such tradeoffs in this context, it would have to be within the boundaries of the city.

In this respect, it is instructive to compare the racial composition of the origins and destinations of black and white movers. Table 10 shows that blacks are moving from areas that are largely black (71.8 percent) to areas that are about half black (49.3 percent) using the 1990 data. The last two rows show that whites have exited both the origin and destination areas by 2000, and those 50/50 destination areas have changed to majority black (63.7 percent black) by

2000.²³ In contrast, white movers are moving from areas that are largely white (82.8 percent) to largely suburban areas in which whites are an even higher percentage (86.4 percent). By 2000, both the origin and destination areas have remained largely white, albeit not in percentages as extreme as in 1990 (for a similar result, see Quillian 1999).

These patterns are strikingly faithful to Schelling's (1971, 1972) tipping model of racial residential segregation. In his account, the fact that blacks and whites have different thresholds of what they consider an integrated neighborhood, leads blacks and whites to seek out different kinds of neighborhoods. Blacks look for areas that are 50/50 black/white, while whites seek neighborhoods in which they are the clear majority (Clark 1991; Emerson et al. 2001; Krysan 2002; Krysan and Farley 2002). This was clearly an ongoing dynamic, since in analyses not reported here, I found precisely the same pattern as that shown in Table 10 for the T_0 - T_1 period.²⁴ However, by increasing the household mobility of its workers (from 36.9 to 48.9 percent for minorities and from 19.7 to 27.9 percent for whites), the firm relocation appears to have contributed to the neighborhood succession dynamic, albeit unwittingly.

The final margin of adjustment examined was commuting. The increases in commuting associated with the plant relocation are documented for various measures and populations in Tables 6-9. These results are reliable in support of H3. Among African Americans who chose to absorb the impact of the firm relocation exclusively along this margin (i.e., continuing workers who did not change address), the magnitudes of the increase are largest for the distance measures (road miles 119 percent, 10.97 miles; air-line miles 91 percent, 6.41; see Table 6), but more modest for the commuting time measure (36 percent, 10.79 minutes; Table 9). As indicated by the speed increases in the journey-to-work measure (77 percent, 14.51 miles per hour), non-trivial numbers of blacks changed their commuting mode away from the bus to faster modes of getting to work (driving alone by car or joining carpools). Indeed, for those seeking to absorb the bump of the firm relocation along the commuting margin, there was little choice but to opt for car transportation: the bus service to the new plant was limited at best (see note 20).

Taken together, these results shed fresh light on a longstanding set of policy choices. One set of policy options focuses on creating incentives for employers to locate jobs in the central city. Programs such as "enterprise" or "empowerment" zones, in essence, involve increasing minorities' access to jobs by moving jobs closer to where

²³ A similar but weaker pattern appears for the small number of Hispanic movers: they move from areas that are 39.3 percent white to neighborhoods that are 60.9 percent white in 1990. By 2000, the destination areas are only 36.1 percent white.

minorities live. As I have argued elsewhere (Identifying cite), the forces driving the decentralization of jobs away from central cities are powerful, so that programs designed to move jobs to the center city are swimming against strong currents. The firm studied here is illustrative: even large tax breaks could not overcome the “build to suit” advantages of the suburbs.

The second policy choice is to move minorities closer to where the jobs have migrated, usually the suburban ring around cities. The effectiveness of this policy on employment outcomes would depend on employers being race-neutral (Identifying cite; Fernandez and Su 2004). In this respect, the current firm stands as a kind of existence proof for the idea that suburban firms do not *per se* avoid blacks. As I argued above, this firm was not moving to the suburbs to avoid minorities; if that had been its motive, the company’s management had ample opportunity to do so (see Table 1). Moreover, the results in Table 2 demonstrate that the firm relocation had no effect on the company’s racial composition. To the extent that other suburban employers are behaving like this firm, then easing the housing market frictions for blacks by opening up the suburbs would serve to improve minorities’ labor market success. While advocates of fair housing have long argued for opening up the suburbs, political opposition to doing so has been strong (Downs 1973; Mitchell 2004) and progress has been slow (Farley and Frey 1994).

Another policy direction for dealing with spatial mismatch is what has been dubbed the mobility strategy (Hughes 1991, 1995). If it is difficult to move jobs to people, or people to jobs, then longer commutes will be necessary on a landscape where jobs and minority neighborhoods are diverging. Mobility policies are aimed at supporting workers’ commuting as a way of dealing with increased work trip length. As predicted by the spatial mismatch hypothesis, among those dealing with the disruption by absorbing the increased commute, minorities in this story had to deal absorb with the disruption posed by the relocation of the firm by absorbing the increased commute more than did whites. As reported above, this disruption was biggest in distance terms, but less so in terms of commuting times. This was because minorities needed to shift away from slower modes of commuting to the old plant (walking, bus travel) to travel by car to the new plant.

The fact that the commuting margin adaptations were incomplete for blacks in this setting is consistent with Raphael and Stoll’s (2001) arguments about low levels of car ownership as contributing to minorities’ labor market

²⁴ Indeed, Milwaukee was one of the cities for which Clark (1991) found significant support for the Schelling dynamic.

difficulties (also see O'Regan and Quigley 1999). In this respect, a particularly intriguing policy suggestion for boosting car ownership among minorities is Smeeding's (1993) proposed "car stamps," which like Food Stamps would be a means-tested program designed to help poor people buy domestic cars.²⁵ The findings here point to other possible means of ameliorating commuting challenges. A non-trivial portion of the company's minority workers adapted to their new commuting circumstances collectively in the form of car pools. This suggests that van pool or rideshare programs that increase center-city residents' access to suburban locations can also serve as a way of easing the transportation difficulties that spatial mismatch processes produce. The fact that both public and private transportation van pool programs have appeared in recent years in the Milwaukee metro area suggests that the commuting challenges documented here are unlikely to be limited to the population of those in the company.²⁶

Conclusion

Over its long history, the spatial mismatch hypothesis has attracted a great deal of attention in both scholarly and policy circles. Within sociology, perhaps the most prominent rendering of the issues at stake is Wilson's (1996) book *When Work Disappears*, where spatial mismatch is given a prominent role among labor market obstacles for poor minorities. The results of this study support the idea that such pride of place is warranted. While the mismatch idea has been commonly invoked descriptively when there are spatial gaps in life chance outcomes (Fernandez and Su 2004), in this paper I have sought to uncover the social and economic mechanisms that underlie those disparate outcomes (Reskin 2003). In addition to addressing the large community of policy-oriented scholars who are interested in racial inequality, this work also seeks to contribute to the burgeoning field of economic sociology (Gibbons 2005). As I have argued elsewhere, the success of this latter enterprise depends on our ability to take seriously theories originating in the neighboring discipline of economics (Identifying cite). I would offer the current study as an example of such high road engagement.

Toward these ends, I have framed the analysis of this firm relocation around Kain's theory of spatial mismatch

²⁵ Limiting the aid to the purchase of domestic cars would ensure that there is a non-poor constituency that would benefit from the program, just as it has for Food Stamps. The Food Stamps program (run by the U.S. Department of Agriculture) enjoys broad congressional support from the agricultural Midwest.

²⁶ The county of Milwaukee runs a public service (<http://www.ridemcts.com/fares/index.asp?id=808>), but private providers have also appeared to serve this area (<http://www.carpoolworld.com>). Further, the Annie E. Casey foundation (<http://www.aecf.org/initiatives/fes/jobs/>) has included Milwaukee as one of the sites of their Jobs Initiative which explicitly addresses transportation based solutions for poor populations.

as the labor market spillover effects of racially constrained housing markets. The breadth and depth of the past research in this area is a testament to the challenges of identifying and empirically separating the numerous domain spanning mechanisms at work in the spatial mismatch hypothesis (see National Research Council 2004:Chap. 11). Therefore, a major contribution of this study is that it can distinguish between labor market spillovers due to housing market factors from space-related processes due to other employer behaviors that are emphasized by sociologists and geographers. The results of this study are largely supportive of the idea that spatial features of the housing market can present an obstacle to job accessibility for minorities, especially African Americans.

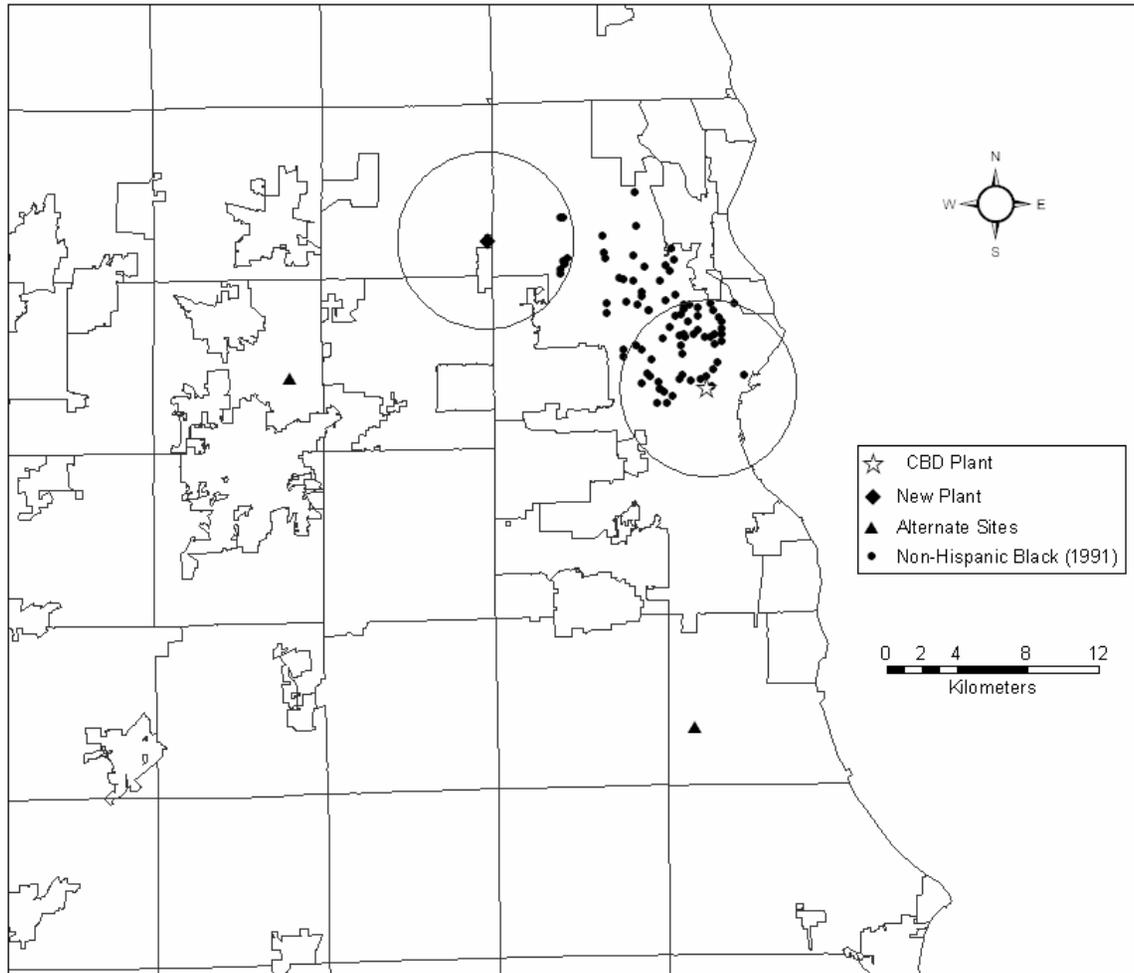
Finally, while the “best case” natural experiment status of this study has allowed for an unbiased test of the spatial mismatch hypothesis, it is important not to stretch these findings beyond their safe limits. More specifically, this case cannot speak to the frequency of spatial mismatch in the open labor market. It might be quite common for employers in the general labor market to use space as a tool in ways that would worsen minorities’ employment difficulties beyond those associated with “pure” housing market based spatial mismatch effects. A glimpse of how these factors might have operated in this context is offered by considering what the outcomes might have been had the firm chosen to site the plant at the south or west suburban locations. A reasonably safe conjecture is that the results of such moves could only exacerbate the race differences documented here. While this study cannot rule out that other space-related processes might also be hindering minorities’ labor market success in other settings, it is important to recognize that the results of this case study do bear out Kain’s original insight: spatially discriminating employers are not needed to produce race differences in job accessibility. Racial segregation of housing alone can generate such outcomes via the spatial mismatch mechanisms examined here.

Appendix A

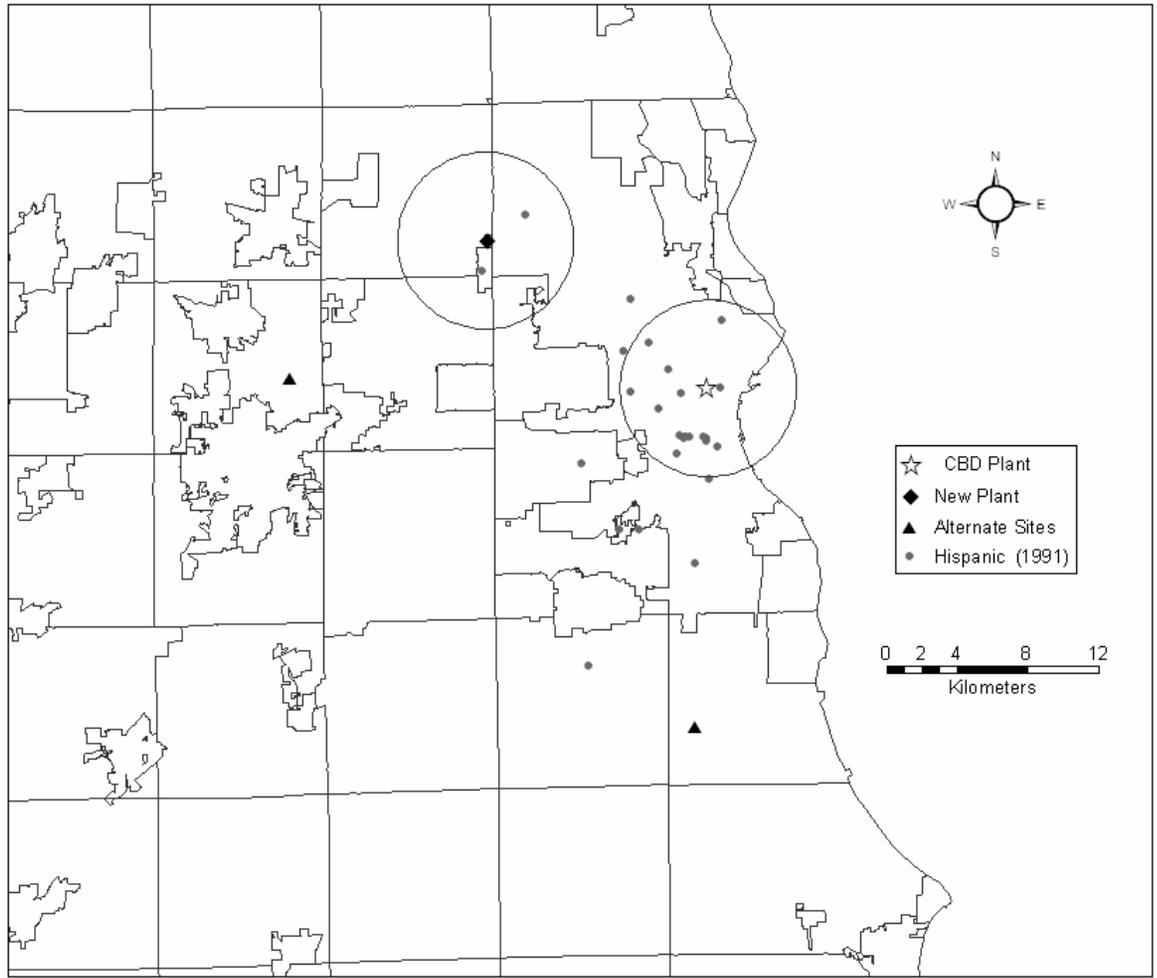
The traditional aim of statistical significance testing is to assess the inferential risks associated with using a probability sample to generalize to the population from which the sample has been drawn. This use of statistical testing, however, is not appropriate for this study. Since I did not employ probability sampling techniques to choose this company or employees for study, statistical tests cannot be used to draw inferences about the population of such firms, and I do not attempt to make such claims here. As is always true in case study research, arguments for generalizing from this study must rest on theoretical grounds (see note 3).

I developed statistical tests in order to assess whether the patterns observed *in these data* can be accounted for by random fluctuations in the measures. As such, I am seeking to convince myself that the patterns observed in this case are robust to chance variations such as those that might be caused by random measurement error or random exclusion of a few cases due to non-response. Bootstrap procedures (Efron and Tibshirani 1986) produce random samples from the observed data (where each case is sampled with replacement), and examine how often these random perturbations produce results that are inconsistent with the pattern observed in the original data. I pose null models of the contrasts of interest, and then use these procedures to determine how common it would be to find results that are consistent with the null model in random resamplings of the data. If the results for the bootstrap replications do not include the pattern associated with the null model very often, then one may conclude that the observed result is robust, and is not sensitive to the random inclusion or exclusion of a few cases.

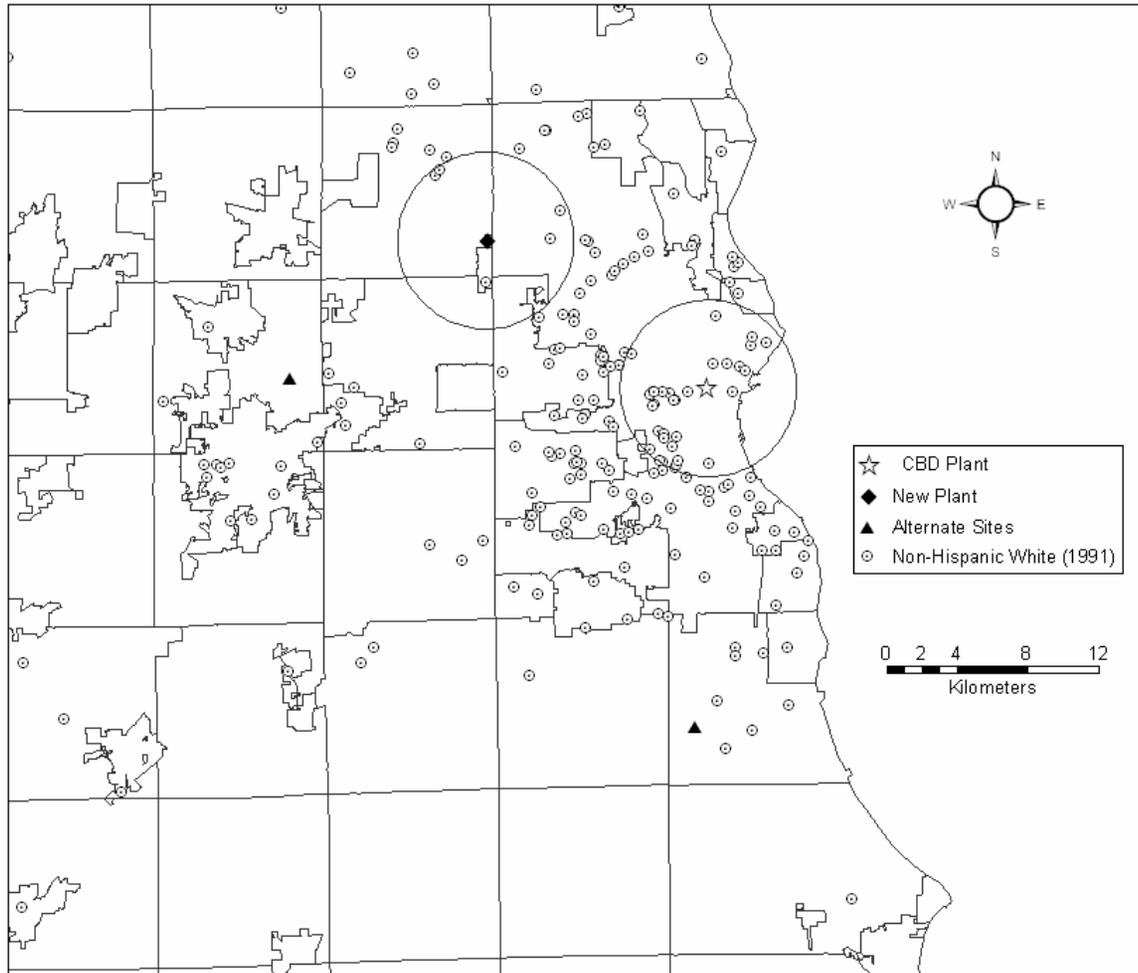
Map A1: Spatial Distribution of African American Workers Employed at Downtown Plant in 1991



Map A2: Spatial Distribution of Hispanic Workers Employed at Downtown Plant in 1991



Map A3: Spatial Distribution of Non-Hispanic White Workers Employed at Downtown Plant in 1991



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Table 1. Roundtrip Air-line Miles^a From Employee's T₀ (1989) Home Address by Race
(Number of cases in parentheses; percent increases in brackets)

	Increase (Absolute and Percent)			
	<u>Downtown Plant</u>	<u>North Site</u>	<u>South Site</u>	<u>West Site</u>
African Americans	5.52 (69)	9.3 [169%]	22.5 [408%]	21.7 [393%]
Hispanics	5.81 (22)	13.6 [234%]	14.7 [253%]	21.5 [370%]
Native Americans	5.25 (3)	10.7 [185%]	18.7 [356%]	20.7 [395%]
All Minorities	5.58 (94)	10.4 [186%]	20.6 [369%]	21.6 [387%]
Non-Hispanic Whites	18.00 (199)	3.6 [20%]	10.1 [56%]	8.7 [48%]
All Workers	14.01 (293)	5.8 [41%]	13.5 [96%]	12.8 [92%]

^a Based on geographic information system analysis of addresses taken from internal plant location study.

Table 2. Race Distribution of Workers Employed at Downtown and Suburban Plants
(Percentages; Number of cases in parentheses)

	T₀ Spring <u>1989</u> ^a	T₁ Spring <u>1991</u> ^a	T₂ Fall <u>1994</u> ^b
African Americans	23.5 (69)	25.8 (87)	24.5 (88)
Hispanics	7.5 (22)	8.0 (27)	6.4 (23)
Native Americans	1.0 (3)	0.9 (3)	1.1 (4)
All Minorities	32.1 (94)	34.7 (117)	32.5 (144)
Non-Hispanic Whites	67.9 (199)	65.3 (220)	68.0 (220)
Total Percent	100 (293)	100 (337)	100 (359)

^a Central business district location.

^b Suburban location; 3 cases are missing on race.

Table 3. Roundtrip Commuting Distances and Times From Employee's T₁ (1991) Home Address to Old and New Plants by Race
(Number of cases in parentheses; percent increases in brackets)

	Downtown Plant			Increase To New Plant (Absolute and Percent)		
	<u>Air-line Miles</u> ^a	<u>Road Miles</u> ^a	<u>"Door-to-Door" Minutes</u> ^b	<u>Air-line Miles</u> ^a	<u>Road Miles</u> ^a	<u>"Door-to-Door" Minutes</u> ^c
African Americans	6.52 (87)	8.79 (87)	33.01 (70)	7.3 [112%] (87)	12.3 [139%] (87)	32.0 [99%] (70)
Hispanics	6.97 (27)	10.20 (27)	27.68 (25)	11.2 [161%] (27)	17.0 [166%] (27)	27.8 [100%] (25)
Native Americans	7.33 (3)	10.20 (3)	60.00 (2)	8.3 [113%] (3)	12.6 [123%] (3)	0.0 [0%] (2)
All Minorities	6.64 (117)	9.15 (117)	32.20 (97)	8.2 [123%] (117)	13.4 [146%] (117)	30.7 [95%] (97)
Non-Hispanic Whites	19.27 (220)	24.19 (220)	50.15 (172)	3.0 [16%] (220)	8.5 [35%] (220)	7.2 [14%] (172)
All Workers	14.89 (337)	18.97 (337)	43.68 (269)	4.8 [32%] (337)	10.2 [54%] (337)	15.7 [36%] (269)

^a Based on geographic information system analysis of addresses.

^b Based on survey items: [1] "Door to door, how long does it usually take to get from home to work at [the downtown plant]?"; [2] "Door to door, how long does it take to get home from [the downtown plant] after work?" Number of cases is based on responding to items for both old and new plants.

^c Based on responses to survey items [1] and [2] for downtown plant, and [3] "How long do you expect the usual commute to the new plant to be?". Roundtrips to the new plant were calculated by doubling responses to 3). Number of cases is based on responding to items for both old and new plants.

Table 4. Average Degree of Mismatch^a for Terminated vs. Continuing Workers by Race and Time (Number of cases in parentheses).

		<u>All Terminations</u>	<u>All Continuing Workers</u>	<u>Quits</u> ^b	<u>Non-Quits</u> ^b
Whites	$T_0 - T_1$	-0.14 (26)	4.14 (173)	--	--
	$T_1 - T_2$	3.71 (54)	2.79 (165)	1.92 (28)	3.18 (191)
African-Americans	$T_0 - T_1$	9.77 (8)	9.25 (61)	--	--
	$T_1 - T_2$	7.25 (23)	7.27 (64)	0.79 (5)	7.66 (82)
Hispanics	$T_0 - T_1$	17.16 (1)	13.46 (22)	--	--
	$T_1 - T_2$	14.72 (5)	10.42 (22)	17.24 (3)	10.5 (24)
All Minorities	$T_0 - T_1$	10.54 (10)	10.34 (84)	--	--
	$T_1 - T_2$	8.32 (30)	8.17 (87)	6.33 (9)	8.36 (108)

^a Spatial mismatch is (Distance_{New Plant} - Distance_{Old Plant}) measured in air-line miles from 1989 address for the $T_0 - T_1$ period, and the 1991 address for the $T_1 - T_2$ period.

^b Quits are people who have terminated employment and identified themselves on the T_2 survey as having quit. For non-respondents, we used the company's record of voluntary termination to identify quits.

Table 5. Average Improvement in Commute Distance to New Plant Between T₀-T₁ and T₁-T₂ and By Race for Household Movers

		Non-Hispanic Whites	Blacks	All Minorities	Blacks vs. Whites Bootstrap Significance^b	All Minorities vs. Whites Bootstrap Significance^b
<u>Air Miles:</u>						
[1]	T ₀ -T ₁ 1989-1991	Mean Air Miles Closer to New Plant	-3.14 (34)	3.46 (21)	3.05 (31)	
[2]	T ₁ -T ₂ 1991-1994	Mean Air Miles Closer to New Plant	4.85 (45)	3.93 (30)	2.50 (42)	
[2] - [1]			7.99	0.47	-0.55	$p < .0473$ $p < .0258$
[2] vs. [1]						
	Bootstrap Significance^a	$p < .0295$	$p < .3812$	$p < .6542$		
<u>Road Miles:</u>						
[3]	T ₀ -T ₁ 1989-1991	Mean Road Miles Closer to New Plant	-7.91 (34)	1.85 (21)	1.14 (31)	
[4]	T ₁ -T ₂ 1991-1994	Mean Road Miles Closer to New Plant	4.65 (45)	6.50 (30)	4.90 (42)	
[4] - [3]			12.56	4.65	3.76	$p < .1201$ $p < .0910$
[4] vs. [3]						
	Bootstrap Significance^a	$p < .0135$	$p < .0232$	$p < .0536$		

^a Proportion of times that the T₁-T₂ figure is less than or equal to the T₀-T₁ figure in 10,000 bootstrap samples drawn from longitudinal data for all 373 people ever employed at the company between 1989 and 1994 (original Ns 245 for whites, and 128 for non-whites).

^b Proportion of times that the black or minority adjustments between the T₁-T₂ and T₀-T₁ periods equal or exceed whites' adjustment in 10,000 bootstrap samples.

Table 6. Roundtrip Commuting Distance From Employee’s Home Address to Old Plant at T₁ and Increased Distance to New Plant at T₂ by Race for Continuing Workers Who Did Not Change Household Location (Number of cases in parentheses; percent increases in brackets)

	Downtown Plant		Increase To New Plant (Absolute and Percent)					
	Air-line Miles ^a	Road Miles ^a	Air-line Miles ^a	Bootstrap Sig. ^b	Bootstrap Sig. vs. Whites ^c	Road Miles ^a	Bootstrap Sig. ^b	Bootstrap Sig. vs. Whites ^c
African Americans	7.01 (33)	9.21 (33)	6.41 [91%] (33)	<i>p</i> < .001	<i>p</i> < .003	10.97 [119%] (33)	<i>p</i> < .001	<i>p</i> < .048
Hispanics	9.66 (10)	13.27 (10)	9.71 [100%] (10)	<i>p</i> < .008	<i>p</i> < .018	13.81 [104%] (10)	<i>p</i> < .011	<i>p</i> < .108
All Minorities	7.62 (43)	10.16 (43)	7.18 [94%] (43)	<i>p</i> < .001	<i>p</i> < .001	11.63 [114%] (43)	<i>p</i> < .001	<i>p</i> < .033
Non-Hispanic Whites	19.53 (118)	24.57 (118)	1.76 [9%] (118)	<i>p</i> < .044	--	7.77 [32%] (118)	<i>p</i> < .001	--

^a Based on geographic information system analysis of addresses.

^b Proportion of times increase in commute is greater than zero in 1,000 bootstrap resamplings.

^c Proportion of times increase in commute is greater for minorities than whites in 1,000 bootstrap resamplings.

Table 7. Roundtrip Commuting Distances From Employee’s Home Address to Old Plant at T₀ and “Natural” Increase (T₀-T₁ Differences) in Roundtrip Commuting Distances to New Plant at T₁ by Race for Continuing Workers (Number of cases in parentheses; percent increases in brackets)

	Downtown Plant		Increase To New Plant (Absolute and Percent)					
	Air-line Miles ^a	Road Miles ^a	Air-line Miles ^a	Bootstrap Sig. ^b	Bootstrap Sig. vs. Whites ^c	Road Miles ^a	Bootstrap Sig. ^b	Bootstrap Sig. vs. Whites ^c
African Americans	5.57 (61)	7.72 (61)	1.13 [20%] (61)	<i>p</i> < .004	<i>p</i> < .998	1.25 [16%] (61)	<i>p</i> < .012	<i>p</i> < .990
Hispanics	5.94 (21)	9.15 (21)	0.89 [15%] (21)	<i>p</i> < .054	<i>p</i> < .948	1.54 [17%] (21)	<i>p</i> < .041	<i>p</i> < .961
All Minorities	5.67 (84)	8.07 (84)	1.04 [18%] (84)	<i>p</i> < .002	<i>p</i> < .999	1.29 [16%] (84)	<i>p</i> < .004	<i>p</i> < .998
Non-Hispanic Whites	17.32 (173)	22.10 (173)	1.30 [7%] (173)	<i>p</i> < .005	--	1.55 [7%] (173)	<i>p</i> < .004	--

^a Based on geographic information system analysis of addresses.

^b Proportion of times increase in commute is greater than zero in 1,000 bootstrap resamplings.

^c Proportion of times increase in commute is greater for minorities than whites in 1,000 bootstrap resamplings.

Table 8. Increase in Roundtrip Commuting Distances from the Old Plant (T₁ Address) to the New Plant (T₂ Address) with “Natural” Commuting Increases (Table 7) Netted Out by Race for Continuing Workers (Number of cases in parentheses; percent increases in brackets)

	Increase To New Plant (Absolute and Percent)					
	<u>Air-line Miles</u> ^a	<u>Bootstrap Sig.</u> ^b	<u>Bootstrap Sig. vs. Whites</u> ^c	<u>Road Miles</u> ^a	<u>Bootstrap Sig.</u> ^b	<u>Bootstrap Sig. vs. Whites</u> ^c
African Americans	4.31 [65%] (64)	<i>p</i> < .001	<i>p</i> < .010	8.02 [90%] (64)	<i>p</i> < .001	<i>p</i> < .129
Hispanics	10.04 [130%] (22)	<i>p</i> < .001	<i>p</i> < .001	14.61 [131%] (22)	<i>p</i> < .001	<i>p</i> < .008
All Minorities	5.92 [86%] (87)	<i>p</i> < .001	<i>p</i> < .002	9.81 [106%] (87)	<i>p</i> < .001	<i>p</i> < .027
Non-Hispanic Whites	0.23 [1%] (165)	<i>p</i> < .597	--	5.60 [23%] (164)	<i>p</i> < .002	--

^a Based on geographic information system analysis of addresses.

^b Proportion of times increase in commute is greater than zero in 1,000 bootstrap resamplings.

^c Proportion of times increase in commute is greater for minorities than whites in 1,000 bootstrap resamplings.

Table 9. Roundtrip Commuting Times and Speed From Employee’s Home Address to Old Plant at T₁ and Increased Commuting Times and Speeds to New Plant at T₂ by Race for Continuing Workers Who Did Not Change Household Location (Number of cases in parentheses; percent increases in brackets)

	Downtown Plant		Increase To New Plant (Absolute and Percent)					
	“Door to Door” Times ^a	MPH Speed ^b	“Door to Door” Times ^a	Bootstrap Sig. ^c	Bootstrap Sig. vs. Whites ^d	MPH Speed ^b	Bootstrap Sig. ^c	Bootstrap Sig. vs. Whites ^d
African Americans	29.80 (25)	18.79 (25)	10.79 [36%] (22)	<i>p</i> < .008	<i>p</i> < .025	14.51 [77%] (22)	<i>p</i> < .001	<i>p</i> < .009
Hispanics	35.10 (10)	25.49 (10)	8.79 [25%] (9)	<i>p</i> < .149	<i>p</i> < .189	12.81 [50%] (9)	<i>p</i> < .002	<i>p</i> < .038
All Minorities	31.31 (35)	20.70 (35)	10.25 [33%] (31)	<i>p</i> < .009	<i>p</i> < .022	14.06 [68%] (43)	<i>p</i> < .002	<i>p</i> < .003
Non-Hispanic Whites	49.31 (84)	31.77 (84)	2.52 [5%] (80)	<i>p</i> < .244	--	7.64 [24%] (80)	<i>p</i> < .004	--

^a Based on survey items: [1] "Door to door, how long does it usually take to get from home to work at [the downtown plant/suburban plant]?"; [2] "Door to door, how long does it take to get home from [the downtown plant/suburban plant] after work?" Number of cases is based on responding to items for both old and new plants.

^b Roundtrip road miles (see Table 6) per hour based on roundtrip “Door to Door” commuting time.

^c Proportion of times increase in commute is greater than zero in 1,000 bootstrap resamplings.

^d Proportion of times increase in commute is greater for minorities than whites in 1,000 bootstrap resamplings.

Table 10. Racial Composition of Neighborhoods for T₁ and T₂ Addresses for Black and White Household Movers Over Time

African Americans (N=30)	Neighborhood Racial Composition ^a		
	<u>Percent Black</u>	<u>Percent White</u>	<u>Percent Hispanic</u>
<u>1990 Census:</u>			
Origin Household (T ₁ Address)	71.8	24.0	3.1
Destination HH (T ₂ Address)	49.3	46.6	2.5
<u>2000 Census:</u>			
Origin Household (T ₁ Address)	79.7	13.4	3.4
Destination HH (T ₂ Address)	63.7	24.6	4.6
Non-Hispanic Whites (N=45)			
<u>1990 Census:</u>			
Origin Household (T ₁ Address)	9.8	82.8	4.8
Destination HH (T ₂ Address)	8.6	86.4	2.3
<u>2000 Census:</u>			
Origin Household (T ₁ Address)	15.3	71.2	8.6
Destination HH (T ₂ Address)	12.9	77.0	5.9

^a Based on Census block group data from the 1990 and 2000 SF3 files.

Figure 1. Percent African American in 1990 census block groups in the Milwaukee Area (radii=5 km.)
Source: U.S. Bureau of the Census STF1A files

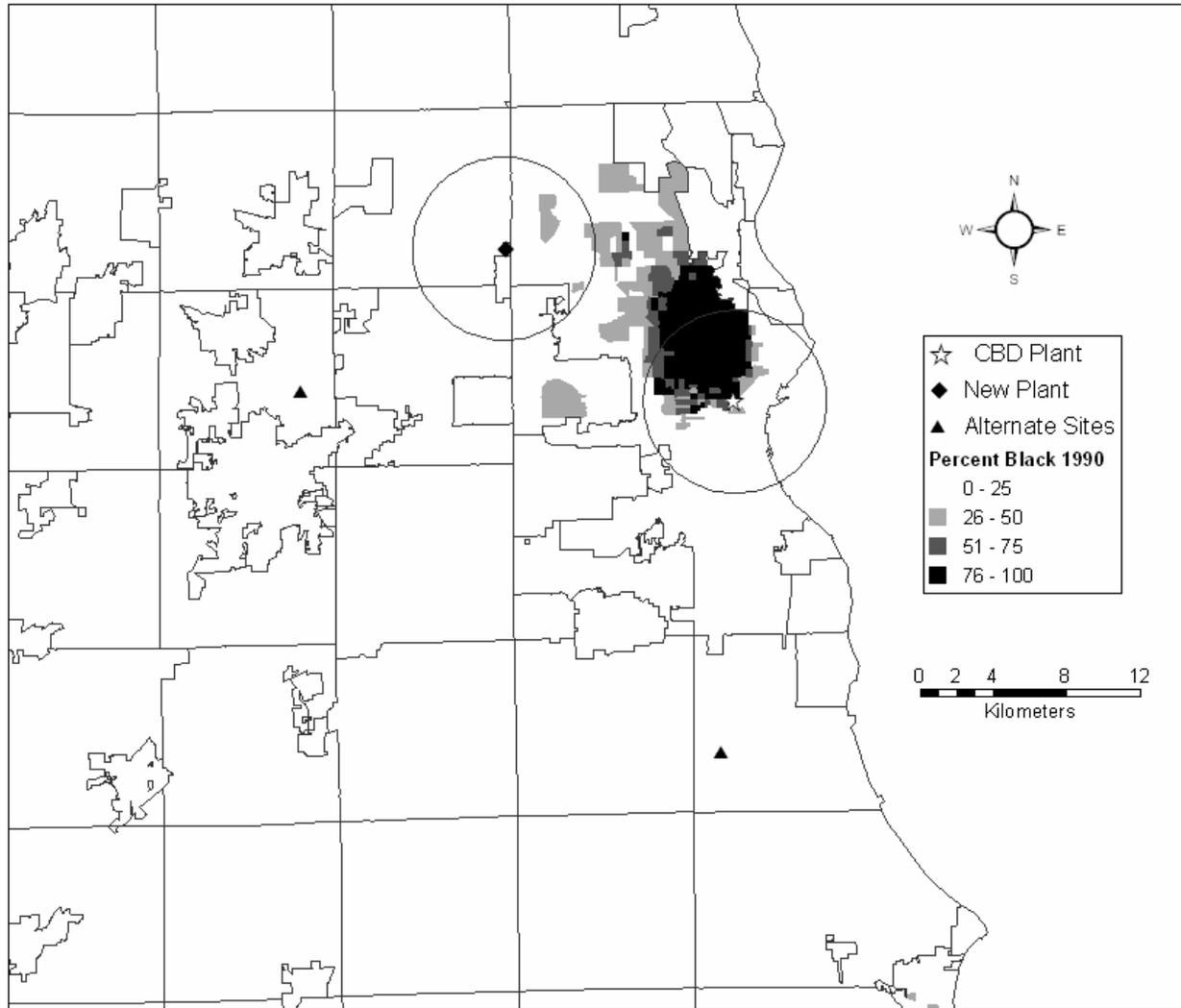


Figure 2. Percent Hispanic in 1990 census block groups in the Milwaukee Area (radii=5 km.) *Source:* U.S. Bureau of the Census STF1A files

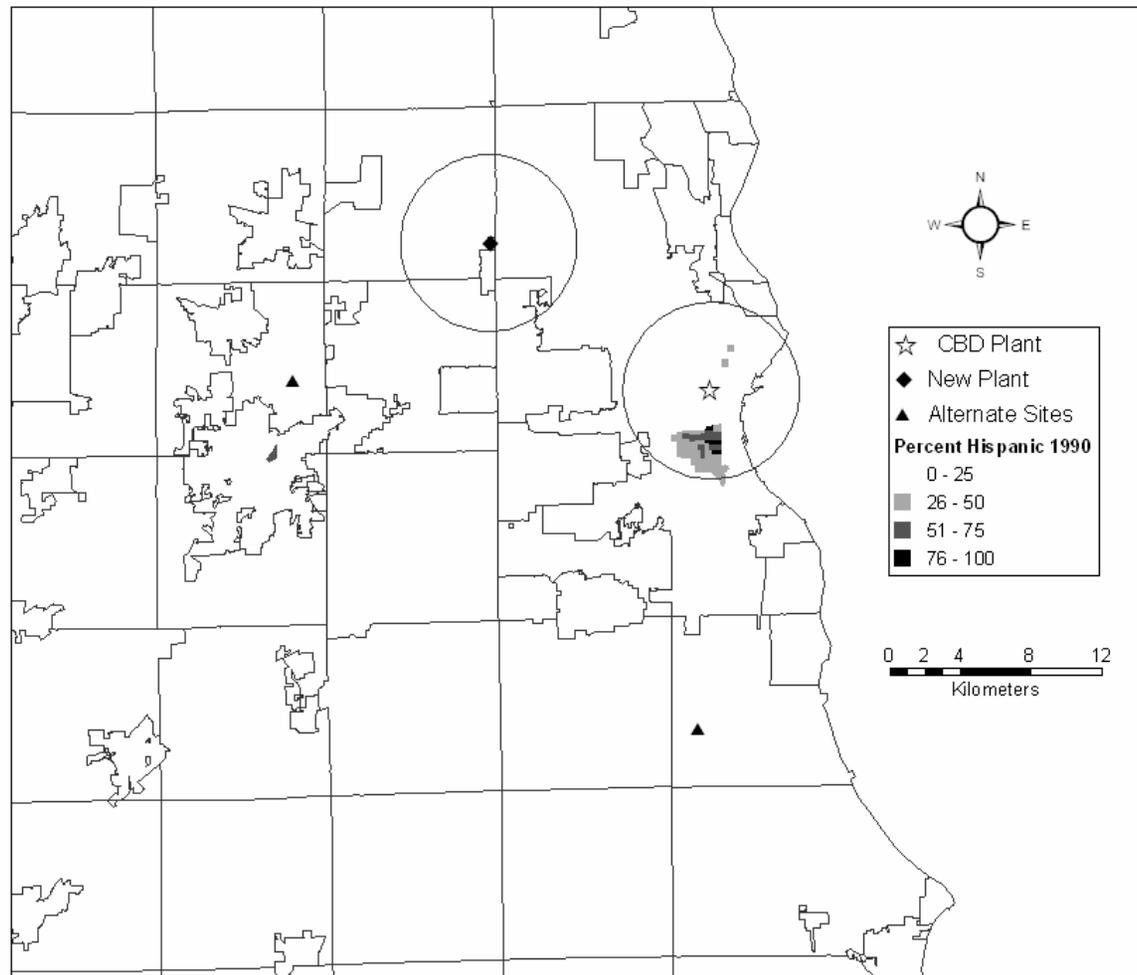


Figure 3. Percent African American in 1980 census block groups in the Milwaukee Area (radii=5 km.)

Source: U.S. Bureau of the Census STF1A files

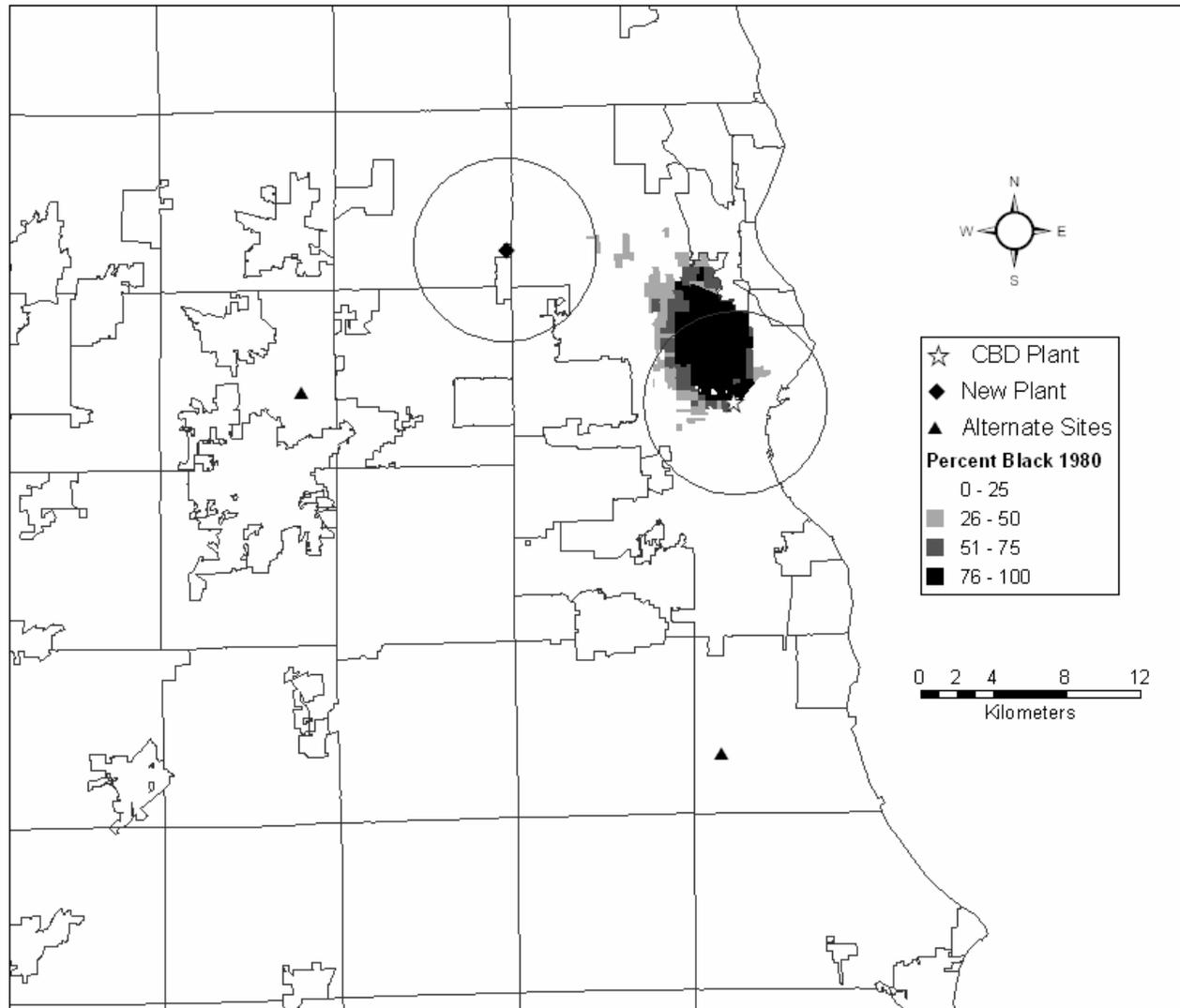


Figure 4. Percent Hispanic in 1980 census block groups in the Milwaukee Area (radii=5 km.)
Source: U.S. Bureau of the Census STF1A files

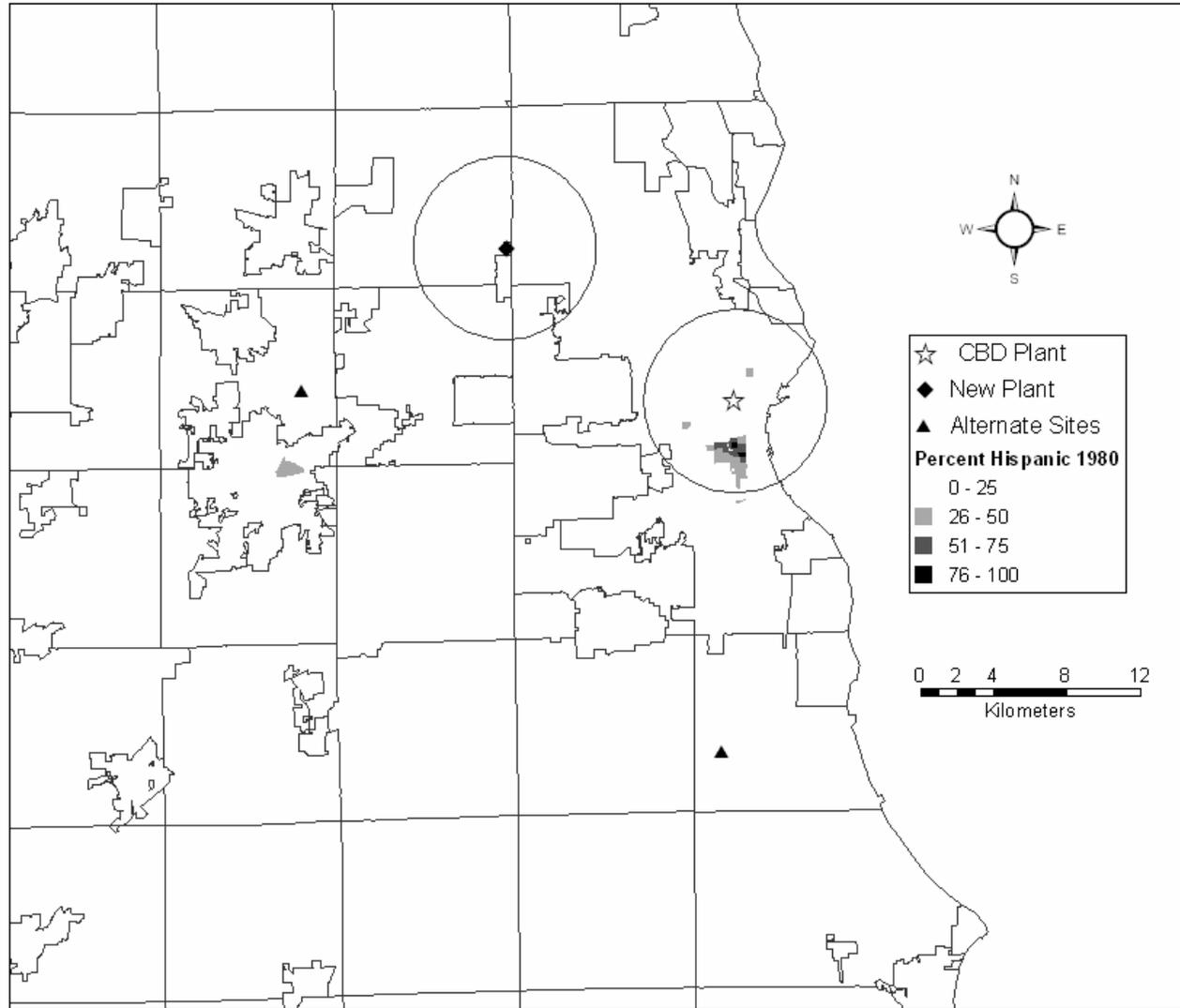


Figure 5. Percent African American in 2000 census block groups in the Milwaukee Area (radii=5 km.) *Source: U.S. Bureau of the Census SF1 files*

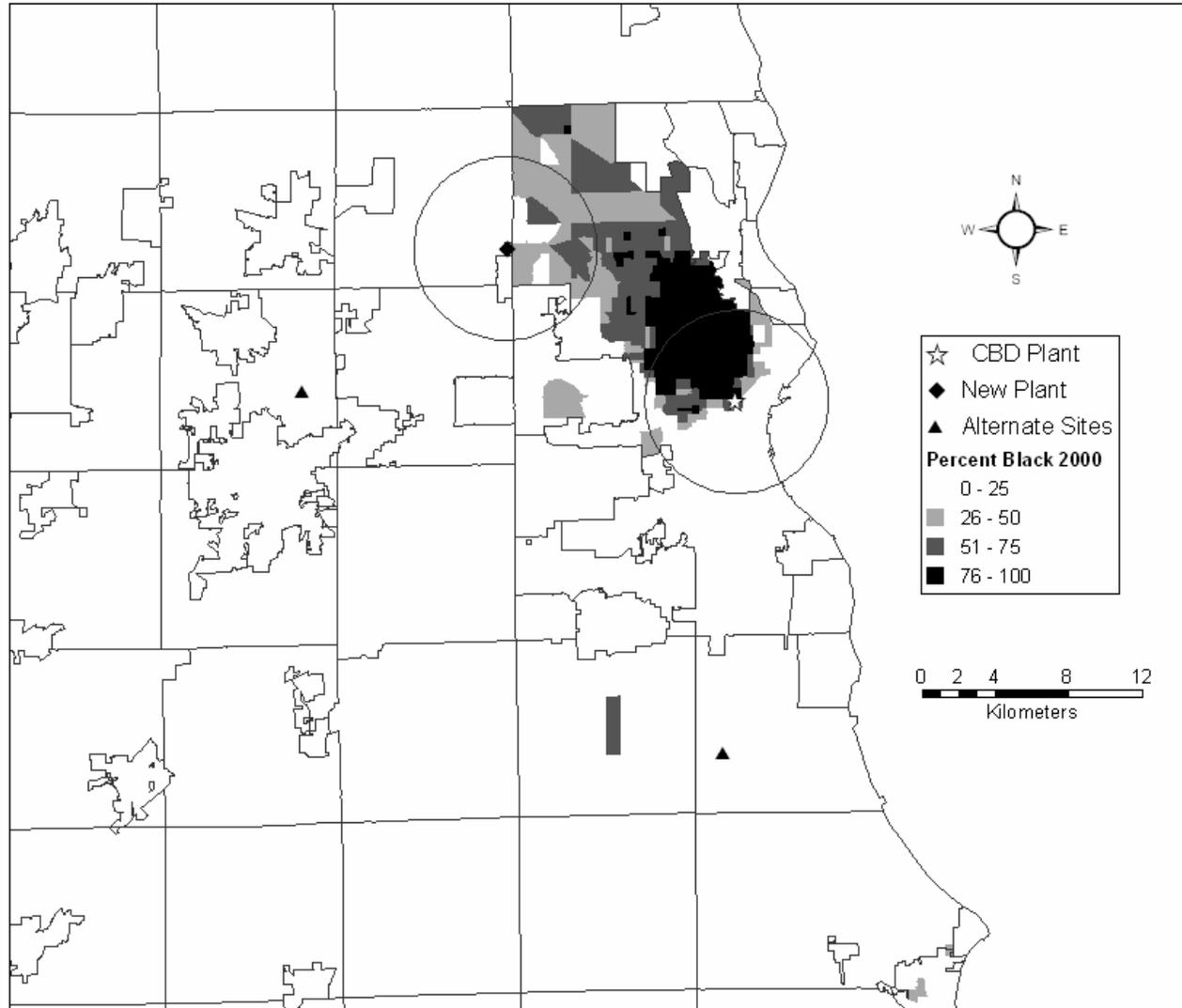


Figure 6. Percent Hispanic in 2000 census block groups in the Milwaukee Area (radii=5 km.) *Source: U.S. Bureau of the Census SF1 files*

