SPATIAL MISMATCH IN U.S. CITIES: FACTS AND THEORIES

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Abstract

The Spatial Mismatch Hypothesis (SMH) argues that low-skilled minorities residing in U.S. inner cities incur poor labor-market outcomes because they are disconnected from suburban job opportunities. We believe the investigation of the SMH has overlooked two major issues: First, spatial mismatch has not been comprehensively documented with relevant stylized facts. Second, despite an abundant empirical literature, theoretical models emerged only recently, which probably explains why the mechanisms of spatial mismatch have long remained unclear and not properly tested. We shed light on these issues by explaining the existence of spatial mismatch with elements of economic theory and by documenting it with a comprehensive set of facts. We also review the mechanisms involved and confront the predictions of theoretical models with the results of earlier empirical studies.

Key words: ghettos, urban unemployment, segregation, discrimination.

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1. Introduction

The research work by two sociologists, Kasarda (1985, 1988, 1989) and Wilson (1987, 1996), have highly contributed to a renewed interest in the so-called "spatial mismatch hypothesis" in the United States. Their studies showed the existence of a black underclass in inner-city ghettos and attributed the endemic problems of that underclass to the sharp decrease in the number of entry-level jobs located in inner cities. However, the idea that a spatial mismatch between residential and work locations may be detrimental to ethnic or racial minorities was first mentioned in a seminal paper by Kain (1968). That paper argued that the spatial disconnection between inner-city ghettos (where minorities resided) and the suburbs (where low-skill jobs had already begun to decentralize) was a major source of unemployment for blacks in US cities. For more than three decades, this assumption inspired numerous empirical works which tried to test the existence of a causal link between spatial mismatch and the bad labor-market outcomes of minorities (see the empirical surveys of Jencks and Mayer, 1990, Holzer, 1991, Kain, 1992, Wheeler, 1993, or Ihlanfeldt and Sjoquist, 1998). What is very unusual is that it is only in the late 1990s ─i.e. following three decades of empirical tests and changes in the structure of US cities─ that theoretical models of spatial mismatch began to emerge. In other words, most of the theoretical corpus associated with spatial mismatch followed the empirical works rather than preceded them. As a consequence, most theoretical models have not yet inspired specific empirical tests that could validate the underlying mechanisms and quantify their importance.

In this rather odd context, *the general objective of the present work is to shed light on spatial mismatch by reviewing the most recent theoretical works and confronting them with a comprehensive set of relevant stylized facts in US cities and empirical results from earlier studies*. This work is certainly useful for the future design of relevant empirical tests that would investigate the different channels according to which distance to jobs can be harmful for ethnic minorities. Distinguishing which mechanisms prevail is indeed crucial for the formulation of targeted and efficient economic policies.

To present our approach in more details, we first need to recall that the causal link between spatial mismatch and the bad labor-market outcomes of minorities, known today as the "Spatial Mismatch Hypothesis" (SMH), can be summarized in the following way:

> *"Serious limitations on black residential choice, combined with the steady dispersal of jobs from central cities, are responsible for the low rates of employment and low earnings of Afro-American workers" (Kain, 1992)*

Four main comments related to this definition are worth stressing here:

First, the SMH refers to two separate issues that should be clearly distinguished: *(i) the reasons why minorities reside far away from jobs* and *(ii) the mechanisms according to which distance to job opportunities may be harmful for minorities*. The standard SMH proposed by Kain and in its subsequent formulations have a clear answer to the first issue since they present job decentralization and the persisting residential location of minorities in inner-cities as the

two historical causes that jointly explain why minorities live far away from job opportunities. The mechanisms leading to adverse labor-market outcomes, however, have not always been clearly identified in empirical studies.

Second, the SMH is only concerned with the way *low-skilled minority workers* ─and notably inner-city black residents─ are affected by distant job locations. This approach not only seems to suggest that it is minority workers who suffer from spatial mismatch because they are those who reside far away from jobs, but also that *since ethnic minorities are poorly qualified*, they can be adversely affected by the distant location of jobs. As a matter of fact, the SMH does not focus on how skilled minority workers may be affected by distance to job opportunities. Nor does it pretend to say anything about the difficulties faced by *low-skilled minority workers who reside in areas where entry-level jobs are supposedly numerous* (as in some suburbs of decentralized American cities).[1]

Third, when it was first introduced, the SMH was more of an intuition than a fully-fledged theory. It is striking that the original formulation of the SMH did not explain how distance to jobs could harm minorities. In this context, given the incomplete formulation of the SMH and its lack of theoretical foundations, it is not surprising that researchers have long had an imprecise understanding of what the SMH clearly meant and implied. That probably explains part of the controversy associated with the nevertheless abundant empirical literature on spatial mismatch.[2]

Lastly, in order to dispel an unfair but frequent objection, it should be said that the SMH does not argue that distance to jobs is the *unique* cause of the difficulties faced by inner-city minorities, but only that it has an adverse and significant impact on the wages and the level of unemployment of unskilled minority workers residing in central cities. In no way does it rule out the possibility of alternative explanations (such as territorial labor-market discrimination for instance or the direct labor-market effects of social segregation).

Keeping in mind these considerations, we believe the investigation of the SMH has overlooked two major issues that we want to address in the present paper:

First, the SMH assumes a specific city structure (minorities residing in city centers and jobs located in the suburbs) and a specific cause for this structure (housing-market discrimination against minorities in the suburbs combined to job decentralization). This may seem a bit restrictive and simple questions naturally arise: What do descriptive statistics exactly tell us about the structure of cities in the US and the changes in this structure? How does economic theory explain job suburbanization? Are there alternative explanations of residential segregation? Basic facts about Metropolitan Statistical Areas (MSAs hereafter) are of particular interest since city structures have continued to change over the past decades and since spatial-mismatch oriented studies usually offer an incomplete characterization of the metropolitan areas studied and often take spatial mismatch for granted.

Second, since it is only recently that economists have started to provide theoretical explanations of spatial mismatch and to model its underlying mechanisms, other questions naturally arise: What is the contribution of these models to the spatial mismatch debate? Are they compatible with previous empirical findings? Are they related to the traditional SMH or do they provide alternative explanations of the bad labor-market outcomes of inner-city Blacks?

With a view to shedding light on those two points, our work is organized as follows. In section two, we provide relevant statistics that depict the specificity of US city structures and recall some elements of theory that help us understand how spatial mismatch came into existence in US cities. In section three, we present the socioeconomic consequences of spatial mismatch, and then analyze the theoretical mechanisms that may account for such consequences. All models presented are confronted with relevant statistics and empirical results extracted from the literature. Section four concludes.

2. The spatial-mismatch urban structure

Over the second half of the twentieth century, dramatic changes have occurred in US Metropolitan Areas. In particular, the concentration of jobs has continuously decreased in central cities and increased in the suburbs. Over the same period, many black households have remained in central cities while whites have continuously decentralized to suburban residential areas. The combination of these two trends is said to have created a situation of spatial mismatch to the extent that African Americans are now located far away from suitable suburban job opportunities. Since the degree of spatial mismatch remains unclear in the empirical literature, we try to provide a more relevant picture of the phenomenon. In particular, we address the two following issues: *(i) What types of jobs have suburbanized and to what extent have they suburbanized? (ii) How central are the residential locations of blacks and how far are they located from suitable job opportunities?* To do that, we have selected a series of relevant figures, including some statistics we calculated from Census 2000, that enables us to assess the extent to which minorities can be said to be disconnected from job opportunities in US cities.[3] Moreover, taking into account urban economic theory, we also explain why all this happened.

In this section, we first present the theory underpinning the suburbanization of population and jobs in US cities (irrespective of race), and provide the corresponding descriptive statistics for the three past decades. We then present the theories that explain the residential concentration of African Americans in central cities and provide the corresponding figures.

2.1 The locations of workers and jobs

2.1.1 Suburbanization of people and jobs in US cities

One of the most striking feature of the American urban landscape has been the massive and continuous suburbanization of both people and jobs in the second half of the twentieth century. Let us first focus on the suburbanization of people in a historic perspective. In the 19th century, US cities were characterized by a small and dense Central Business District located close to an inter-urban transport node (typically a port or a train station). Residences were located nearby or even within this central area. Mieszkowski and Mills (1993) argue that this centrally concentrated structure stemmed from high intra-urban transport costs for both people and goods. In this context, the emergence of new transport means such as tramways, suburban trains, then cars, made it possible for the population to

suburbanize. This is in conformity with the standard urban economic model (see Fujita, 1989) in which people choose their location by trading-off proximity to the city center (facing a high rent) and a higher housing consumption at the city's periphery (where land is cheaper). Indeed, the decrease in intra-urban costs associated with transport innovations enabled people to move to the suburbs so as to consume more housing while keeping their jobs at the city center. The increase in population and wealth also contributed to the spatial expansion of cities and the emergence of rich suburban areas.

This story is confirmed by the descriptive statistics on the changes in cities since World War Two. Whereas on average, more than 57% of MSA residents were located in a central city in 1950, the proportion of central-city residents was already down to 40% in 1980 (Mieszkowski and Mills, 1993). Our own calculations from the census show that suburbanization still goes on, but at a slower pace. Indeed, in the ten largest MSAs, we obtain that the proportion of central city residents has declined from 48% in 1980 to 42% in 2000 (see Table 1).[4] Today, the median resident in a US metropolitan area lives farther than nine miles from the city center (Glaeser and Kahn, 2001).

< Insert Table 1 here >

Between 1950 and 1980, the changes in the distribution of central-city and suburban residents was accounted for by a decrease in the central-city population and an increase in the suburban population. Table 2 indicates the emergence of a new pattern in the 1990s. Indeed, between 1970 and 1990, the average annual rate of net population growth was significantly negative in the city centers of 7 out of the 10 largest MSAs and the population in the central cities of the 10 largest MSAs decreased on average by 0.2 percent each year. This contrasts with the steady population growth in the suburban areas of these MSA's, the average growth rate being 1.5 percent each year.[5] In the 1990s however, the population in central cities grew again in 7 out of the 10 largest MSAs and the average annual growth rate between 1990 and 2000 stood at positive 0.7 percent. Observe though that this figure remains much lower than the average annual growth rate of the suburban population over the same period, at a steady rate of 1.6%. In other words, urban population growth took place and still takes place in the suburbs.

< Insert Table 2 here >

The second striking phenomenon in US cities has been the suburbanization of jobs. It is more or less acknowledged that the driving force beyond this has been the suburbanization of the labor force which has continuously attracted jobs at the periphery of US agglomerations (see Steinnes, 1977, Thurston and Yezer, 1994, White, 1999). As we will now see, other factors which have also been central in the decision of firms to settle in or relocate to the suburbs involve both agglomeration and dispersion forces.

Agglomeration factors are key factors that can account for spatial job concentrations in the suburbs of a metropolitan area. Anas, Arnott and Small (1998) make an exhaustive presentation of such factors and distinguish, in particular, spatial non-homogeneities from externalities. Spatial non-homogeneities can include the existence of a river or natural resource endowments that may attract firms in a particular place, especially when they are a source of comparative advantages. Externalities can also be an agglomeration factor to the extent that the proximity between some agents can improve the input-output linkage by reducing intermediate goods transportation costs, foster innovation through technological spillovers, or even reduce production costs. This means that firms may tend to locate where other firms previously located, triggering a cumulative process of industrial aggregation. The literature usually distinguishes between economies of localization (when firms of a given industry concentrate in a given area)thinspace and economies of urbanization (when firms of different industries conglomerate because of complementarities in the production process).

Dispersion forces can also contribute to the suburbanization of jobs by driving firms away from the city center to its periphery. For instance, the spatial proximity between firms can intensify competition for the local labor force and for local market shares.[6] Land prices, congestion, or crime also constitute significant dispersion forces that shaped the structure of US cities.

In practice, in economic models of location, firms are confronted to both centrifugal and centripetal forces so that their locations results from a trade-off between the advantages and disadvantages of proximity to and distance from the city center. Fujita, Thisse and Zenou (1997) shed light on this issue in a monocentric urban framework (all jobs being located at the city center) by considering a linear city in which workers are uniformly distributed. In this framework, a new firm wishes to settle in the city and chooses its location. Its decision interacts with the wage policy of other firms that are already settled in the city center. Thus, the firm faces a trade-off between proximity to the city center (due to economies of localization) and distance from the city center (so as to increase its market power on the labor force). In much the same way, economies of localization and agglomeration can also play a role in the emergence of secondary employment centers (for a formal model, see Henderson and Mitra, 1996).[7]

Coming to the facts on job suburbanization, we now present some descriptive statistics on the magnitude of the decentralization which occurred over the second half of the twentieth century. Whereas in 1950, central cities gathered nearly 70% of MSA jobs, the figure has gone down to 50% in 1980 (Mills and Lubuele, 1997). We provide figures for the changes between 1980 and 1990, showing that this trend still goes on. In the ten largest MSAs, the proportion of jobs located in central cities has decreased from 57% in 1980 to 51% in 1990 (see Table 3).[8]

If we exclude the case of New York City's center which concentrates about 90% of that metropolitan area's jobs, the average proportion of central-city jobs for the nine remaining MSAs goes down from 50% in 1980 to 44% in 1990. Today, jobs in American cities are very decentralized. To illustrate this point, Glaeser and Kahn (2001) estimate that in 1996, on average, only 16% of jobs were located within a three mile radius from a city's geographical center.[9]

The third and fourth columns of Table 3 show that the decrease in the percentage of jobs located in central cities can be explained by a higher growth rate of jobs in the suburbs than in the central city. In the ten largest MSAs,

between 1980 and 1990, the number of jobs increased on average by 3% each year in the suburbs. It only grew by 0.8% in the central
cities of these selected MSAs.

< Insert Table 3 here >

We also recall some statistics on the emergence of *suburban jobcenters and edge cities*, two important phenomena in US metropolitan areas.

The existence of job subcenters usually involve high rents in their vicinity, where the physical accessibility to jobs is good (White, 1999). Suburban job subcenters are usually defined as areas above a minimal number of jobs and a minimal job density, which means that the identification of job subcenters may be quite arbitrary and dependent on the definition retained. Considering a threshold of 10,000 jobs and a density of 10 employed workers per acre, Giuliano and Small (1991) already identified 29 different employment centers in the sole Los Angeles Metropolitan Area in 1981, thereby proving the polycentricity of that zone. However, as Anas, Arnott, and Small (1998) observe, even taken together, a metropolitan area's job subcenters usually never group more than half the jobs in the city.[11] Furthermore, it should be said that job suburbanization does not only occur with the growth of employment subcenters. In this respect, Glaeser and Kahn (2001) assert that employment suburbanization can be said to remain rather diffuse.

In opposition to the suburban job centers, edge cities can be defined as *real towns* located near transport nodes (for the identification of subcenters and edge cities, see Garreau, 1991, and McMillen and McDonald, 1998). They typically group service industries they export (for example, information technology traded over the internet; see Bogart, 1998). In his famous book Garreau (1991) already identified 123 existing edge cities and 77 emerging ones for the US as a whole. The emergence of edge cities thus appears to be truly characteristic of US cities and has major implications for the location of both jobs and people. In this respect, Garreau asserts that more people now live in so-called edge cities than in traditional cities.

2.1.2 The spatial distribution of industries and skills

Suburbanization has not affected all types of jobs in the same way. What is relevant in the SMH perspective is that entry-level jobs are assumed to be growing in the suburbs but tend to disappear from city centers where low-skilled minorities remain located. One of the theoretical justification for this assumption is that there exists an important pool of consumers for low-skill services in rich residential suburban areas. Another justification is that firms which hire low-skilled workers (especially in the manufacturing industry) consume much land and want to avoid the central locations where land is scarce and expensive. The latter mechanism is central in Smith and Zenou (1997) who investigate the location of jobs in a dual labor-market framework. The authors develop a model in which there are two types of jobs differing by their quality (high or low). The high-quality jobs (primary sector) are assumed to be located in the city center. The low-quality jobs (secondary sector) are offered by a large representative firm that needs to choose its

location in the metropolitan area. As in the models presented in the previous subsection, there are exogenous agglomeration forces that attract the firm towards the city center. To the contrary, land rents decrease with distance and thus play the role of a dispersion force. The location chosen results from the confrontation of these two opposite forces. When the dispersion force is sufficiently strong, the firm (and thus entry-level jobs) locate in the suburbs.[12] The underlying mechanism can be thought in a dynamic setting: firms with low-quality jobs tend to relocate in the suburbs in order to benefit from low rents. As a result, the number of low-quality jobs increases in the suburbs and decreases in the central city. To assess this phenomenon, and assuming that the number of new vacant jobs can be proxied empirically by local job growth (as argued by Ihlandfeldt and Sjoquist, 1998), Table 4 provides some descriptive statistics on the average growth rate of jobs by place and skill between 1980 and 1990. The most striking feature is the decrease in manual jobs in almost all city centers of the ten largest MSAs, the average annual rate of decrease amounting to -1.5%. On the contrary, the number of manual jobs grew on average in the suburbs at the low rate of 0.5%. Concerning professional and services jobs (which, *a priori*, are not the focus of the SMH), both categories grew in the suburbs and city centers, but at a much higher rate in the suburbs.

< Insert Table 4 here >

Now, in order to assess changes in "job accessibility", the growth rates of jobs by location should be compared to that of workers at their place of residence. This is what Table 5 enables us to do by presenting the average annual growth rates of workers by skill and place of residence between 1980 and 1990, for the ten largest MSAs. It can easily be seen that for both professional and services workers, the average annual growth rate was positive in the suburbs but also in central cities, but much higher in the suburbs than in central cities. Concerning manual workers their number decreased in both central cities and suburbs but at a higher rate in central cities (-1.4%) than in the suburbs (-0.2%). Comparing the growth rates of workers by location (Table 5) and those of jobs (Table 4) for professionals and services occupations, it is noticeable that, on average, the annual growth rate of people exceeded that of jobs in central cities, whereas the annual growth rate of jobs exceeded that of people in the suburbs. This is consistent with the idea that job densities have decreased for inner-city residents and increased for suburbanites, at least for these two categories. In a spatial mismatch perspective, the most relevant comparison concerns the growth rates of *manual workers* (i.e. entry-level jobs) and *manual jobs*: both were negative in central cities and of about the same range (-1.4% and -1.5% respectively). In the suburbs, the number of manual jobs increased (with an annual growth rate of 0.5%) whereas the number of manual workers decreased (-0.2%). This is consistent a deterioration in access to jobs for inner-city low-skilled workers.

< Insert Table 5 here >

Table 6 enables a similar comparison by presenting the average annual growth rates of jobs and workers by industry in central cities and in the suburbs between 1980 and 1990. It can be seen that the trade, finance and services

industries exhibit the same patterns as the professional and services occupations for both jobs and workers as in Table 4 and Table 5: a positive growth rate in the central cities and the suburbs, the growth rate being higher in the suburbs. The most interesting figures of Table 6 concern the manufacturing and construction industries (i.e. industries that traditionally hire low-skilled workers): both the number of jobs and workers decreased in central cities and increased in the suburbs. In these industries, the number of suburban jobs grew at a much higher rate than the nevertheless growing number of suburban workers. These figures also seem consistent with the standard assumptions beyond the SMH.

< Insert Table 6 here >

2.1.3. Commuting patterns

In the traditional conception of commuting, rich suburbanites were thought to commute to the CBD where they held jobs. The suburbanization of both jobs and people makes it less clear nowadays. Table 7 shows the commuting flows in the largest MSAs in the US by place of origin and destination in 1990. The striking fact is that, in all MSAs, over 70% of the workers residing in central cities occupy a job in the city center. Suburbanites also tend to work predominantly in the suburbs. In other words, there is little cross-commuting.

< Insert Table 7 here >

In order to complete the analysis of Table 7, it is worth mentioning that commuting patterns and means of transportation used are strongly correlated: whereas 90% of all workers traveling daily from the suburbs use their car, only 60% of all journeys originating from central cities are by car (Mills and Hamilton, 1994). These figures emphasize the crucial importance of owning a car for those who work out of their residential neighborhood but also underline the tendency of many inner-city residents to resort to public transportation when traveling (see Glaeser, Kahn and Rappaport, 2000). It should be said that these geographic contrasts support the existence of distinct local labor markets that separate inner cities from the suburbs.

2.2 The location of Blacks

In the previous subsection, we provided simple figures that illustrated the suburbanization of jobs that low-skilled workers may occupy, notably in the manufacturing and services sectors (see Table 6). The commuting flows suggested that central-city workers are disconnected from suburban jobs (see Table 7). These features are compatible with the SMH which stipulates that inner-city low-skilled minorities have few contacts with better-paid suburban job opportunities.

We will now focus on the second aspect of spatial mismatch in US cities: *the spatial gap between the residential location of ethnic minorities and their job opportunities*. In the context of decentralized American cities, this broadly amounts to showing that blacks are under-represented in the residential suburbs (Kasarda, 1988 and 1989).

2.2.1 The over-representation of blacks in central cities

The main assumption in the SMH is that blacks have remained in the city centers of US cities and statistics strongly support this assertion: contrary to whites, blacks have not massively suburbanized. Whereas in 1950, 56% of all urban whites were located in central cities, they have massively shifted to suburban residential areas, and, in 1990, 66% of all urban whites now live in the suburbs (Mills and Hamilton, 1994). Table 8 compares the recent changes in the centralization of blacks and whites in the ten largest MSAs between 1980 and 2000. It is striking that the proportion of central dwellers among both blacks and whites has decreased constantly over the past two decades, which reflects the continuing suburbanization of both groups. However, at any point in time the percentage of central city dwellers among blacks always remained more than two times that of whites. In 2000, 64% of all urban blacks lived in a central city in comparison with 28% of the white urban population.

< Insert Table 8 here >

Table 9 presents the racial composition by location in the ten largest MSAs between 1980 and 2000. It is striking that, apart from Los-Angeles, the proportion of blacks has constantly increased in the suburbs, although blacks remain much under-represented in peripheral areas. Indeed, in 2000, in the ten largest MSAs, blacks only account for 11% of the suburban population, but for 27% of all central-city residents. The second observation that should be made is that, on average, the concentration of black residents in central areas increased between 1980 and 1990 and has only slightly decreased since then. Proportions of black residents and levels of concentration nevertheless vary across cities. In Detroit for instance, a highly segregated metropolitan area, 70% of inner-city residents are blacks, whereas blacks only account for 6% of the suburban population.

< Insert Table 9 here >

These differences in residential segregation can be measured by the dissimilarity index, also known as the Duncan and Duncan index (1955).[13] According to Cutler, Glaeser and Vidgor (1999), the average black/white dissimilarity index in American cities increased between 1940 and 1970, rising from 72% to 79%, but decreased afterwards, reaching 66% in 1990. This trend is confirmed by other studies which nevertheless present somewhat higher segregation indices (see Farley, 1984; Frey and Farley, 1996; Farley et al., 1993).[14] Table 10 presents dissimilarity indexes at the Census Tract level for the ten largest MSAs in 1990 and 2000, showing that residential segregation kept decreasing over the last decade even though it remained high.

< Insert Table 10 here >

Confronted with such high levels of segregation, a few words should be said on the causes of segregation in US cities. The SMH usually states that the central location of blacks is due to racial discrimination in the suburban housing market. The choice for this very particular reason can be explained by the historical context of the 60s in which the SMH emerged (see for instance the Kerner report, 1968, which investigated the socio-economic causes of riots in black neighborhoods). Today however, economic theory provides a much larger set of explanations for the residential segregation of ethnic minorities, which can be grouped in two general categories.

The first set of explanations, in line with the SMH, revolves around *restrictions imposed on the residential choices of blacks*. As expected, housing market discrimination has been shown to play a central role (see the implementation of Fair Housing Audits in Yinger, 1986): real-estate agents propose blacks to visit fewer houses than they do for their white customers. There are two main justifications for this behavior: sheer racial discrimination (Becker, 1971), and customer discrimination (real-estate agents wanting to avoid blacks to settle in neighborhoods that they think will then become less attractive for their white customers). However, housing market discrimination can be driven by other mechanisms: *statistical discrimination* (Phelps, 1972, Aigner and Cain, 1977) in the context of imperfect information (blacks being perceived, on average, as bearing a higher default risk) and *redlining* (individuals living in minority neighborhoods ─as if circled by a red line─ being discriminated against, see Tootel, 1996). It is also worth mentioning that housing market discrimination not only concerns the screening of housing units, but can also take the form of credit, mortgage, and insurance discrimination (Yinger, 1996, Tootel, 1996, Ladd, 1998), for the same reasons as previously stated. Other restrictions on the residential choice of black families may take the form of institutional regulations on land use such as zoning. In American cities, zoning can impose minimum lot sizes, which prevents low-income minorities from settling in white suburban areas (Squires, 1996). Housing policies may also distort the set of location choices for blacks when housing projects are concentrated in the city center (Kain, 1992).

The second set of explanations, contrary to the SMH, *presents segregation as market-driven*. In the 1970s, economists presented models in which individuals have racial preferences that lead to the spatial separation of ethnic groups (see Schelling, 1969, Rose-Ackerman, 1975, Yinger, 1976, and Courant and Yinger, 1977). In the empirical literature, this corresponds to the white flight phenomenon according to which whites flee racially-mixed neighborhoods when the proportion of minorities reaches a tilting point (see Galster, 1990 and 2000). It has also been shown that minorities may want to live together because of ethnic preferences (see Akerlof 1997, Ihlanfeldt and Scafidi, 2002). Other models stress the existence of negative externalities from the poor towards the rich or from the uneducated towards the educated, which fuels the flight out of those neighborhoods (as in Benabou, 1993). Furthermore, it has been argued that whites and blacks may have different preferences for the provision of public goods and that this may lead to spatial sorting *à la* Tiebout across local communities (Anas, Arnott and Small, 1998). Finally, blacks may have a higher willingness to pay for housing units characterized by some specific attributes that differ from

those valued by whites. Some spatial sorting consistent with the SMH occurs if these units are mainly located in the central city.

2.2.2 The spatial disconnection between the residences of blacks and job locations

As blacks are concentrated in city centers whereas jobs have suburbanized, there exists a spatial disconnection between blacks and jobs. This spatial mismatch has increased on the 1970-1990 period since blacks have suburbanized at a lower pace than jobs. As a consequence, the spatial disparities between black residences and jobs have increased by more than 20% (Martin, 2001). However, these spatial imbalances have declined after 1990. This is true not only when the black residential locations are compared to that of all jobs, but also when they are compared to the location of retail jobs that may better fit low-skilled workers (Raphael and Stoll, 2002).

In this context, commuting patterns shed some light on some particular features of the spatial disconnection between blacks and jobs. First, it is well known that urban blacks have a bad access to automobiles. Whereas 8.7% of white households do not have a car in 1990, this percentage reaches 30.4% for black households (McGuckin, 2000). The distance traveled and the means of transportation used by black and white commuters differ significantly as shown by Table 11 for the year 1995. Whereas 2% of white workers' commutes are by public transit (by bus or by rail), this percentage stands at 12% for black workers. Similarly, black workers resort more to car pooling (20% of their trips) than white workers (14% of their trips) who massively use their private vehicle to commute. It is also striking that whatever the transportation mode considered, the average distance travelled by whites is higher than that of blacks. Excluding the category "other transportation modes", one can calculate that the average commute of a white worker is 11.8 miles, but only 10.5 miles for a black worker. Note that this does not necessarily mean that blacks reside closer to job opportunities than whites: indeed, black workers may experience difficulties finding or accepting distant jobs, resulting in shorter commuting distances than whites (Kain, 1992).[16] Moreover, although travel distances favor blacks over whites, the average travel time to work is higher for blacks than for whites. In 1990, the average time to work for blacks was 24 minutes, but only 20 minutes for whites (Krovi and Barnes, 2000). It is thus not clear whether blacks bear higher commuting costs than whites or not.[17]

< Insert Table 11 here >

Commuting flows (see Table 7) and commuting times suggest that African Americans living in central cities could not benefit from job offers located in the suburbs. This intuition is confirmed by Table 12 (extracted from Stoll, Holzer and Ihlanfeldt, 2000) which presents the distribution of recently filled jobs and people for a pooled sample of MSAs (Atlanta, Boston, Detroit, Los Angeles). Whereas blacks are over-represented in central cities, recently filled jobs are mainly located in the suburbs. This pattern is even more striking for the less-educated and the jobs they may occupy. While 76.3% of black high-school dropouts (low-skilled workers) live in central cities, the suburbs group 79.6% of recently filled low-skill jobs. In contrast, the proportion of white high-school dropouts residing in the suburbs is close to that of the recently-filled low-skill jobs located there.

< Insert Table 12 here >

Finally we

To sum up, this section has shown that US city structures are indeed consistent with what is assumed in the SMH: the suburbanization of low-skill jobs while ethnic minorities remain centrally located.[18] In this context, the SMH stipulates that this city structure has and adverse impact on the social outcomes of ethnic minorities, an assumption that we will now investigate.

3. The consequences of spatial mismatch

3.1 Adverse labor-market outcomes

In this subsection, we present some key figures that illustrate the adverse labor-market outcomes of inner-city blacks by successively looking at the distribution of unemployment, income, and poverty in US cities.

3.1.1 Unemployment

There are stark differences in local employment rates within any given metropolitan area. Strikingly, the unemployment rate is always higher in central cities than in the suburbs. Table 13 presents the city/suburbs contrasts in unemployment in the ten largest MSAs in 1990 and 2000, and shows that intra-urban variations in unemployment rates can be huge. In Detroit for instance, the unemployment rate for the year 2000 reaches 6.6% in the city center, which is more than two times the 2.5% unemployment rate prevailing in the suburbs.

< Insert Table 13 here >

The fact that the unemployment rate is always higher in central cities than in the suburbs is true for the urban population as a whole, but also for each racial group as can be seen in Table 14 which presents the unemployment rates of whites and blacks in the twenty-five largest cities in 1997. The figures show the sharp contrast that opposes white and black workers, and the distressed situation of central cities. Indeed, the unemployment rate of central-city blacks reaches 12.5%, which is 5 points above the unemployment rate of suburban blacks and more than three times the unemployment rate of suburban whites.

< Insert Table 14 here >

3.1.2 Low income

Table 15 presents the income ratio between central cities and suburbs for families, in 1970, 1980, 1990 and 2000, for the ten largest MSAs. All figures are below one at all dates and in all cities, indicating that families residing in city centers have a lower income than families living in the suburbs.[19] It should also be noted that for most metropolitan areas, the discrepancy between central cities and suburban families has continuously widened over the 1970-2000 period.

< Insert Table 15 here >

When one considers ethnicity, there also appears to be stark disparities concerning the distribution of income across places and racial groups in American cities. In 1990 for instance, the average income of a central-city black is close to $8,700, which is almost half the average income of a central-city white. In the suburbs, disparities are also very large although relatively narrower than in central cities. Indeed, in 1990, suburban blacks have an average per-capita income of $11,000, which is one third lower than that of suburban whites but 25% higher than that of central-city blacks (Mills and Lubuele, 1997). Of course, these discrepancies between central city and suburbs can be (at least partly) explained by the spatial sorting of individuals and families, and the disparities across racial groups can be (at least partly) explained by differing levels of inherited human capital or by labor-market discrimination. Nevertheless, theses disparities should also be considered in view of spatial elements such as those put forward in the spatial mismatch literature. In this respect, another important feature of urban labor markets in the US is that wages differ much across location. For instance, Ihlanfeldt (1997) reports that the hourly hiring wage in a fast food restaurant is $4.39 in the northern suburbs of Atlanta, but only $3.84 the city center. In another study on Atlanta, Ihlanfeldt and Young (1994) find that the wage rate increases about 1% per mile when moving outward from the CBD for employees of fast-food restaurants. This suggests that low-skill jobs are remunerated less in city centers (where the poor allegedly live) than in the suburbs (where residents are relatively more wealthy).[20] This can truly affect the income of black workers facing residential restrictions since their income prospects will depend on which jobs are physically accessible for them. It is thus little surprising that Ihlanfeldt and Young (1994) find that blacks usually work in places where the wages are the lowest.

3.1.3 Poverty

Finally, the high unemployment and low incomes of inner-city dwellers are the source of intense poverty in central cities. As can be seen in Table 16, the discrepancy between central cities and suburbs, which was already huge in 1970, widened over the 1970-1990 period. Whereas the average poverty rate in the suburbs of the ten largest MSAs

has remained constant since 1970 (at 7-8%), it increased in city centers from 14% in 1970 to 20% in 1990, and has remained constant since then. Most MSAs more or less exhibit these trends even though in the last decade, some metropolitan areas have experienced an increase in the inner-city poverty incidence (as in Los-Angeles or Philadelphia) whereas others have experienced a reduction in their inner-city poverty rate (as in Detroit for instance).

< Insert Table 16 here >

When one also looks across racial groups, the main pattern is that the poverty rate is always higher in central cities than in the suburbs and is usually three or four times higher for blacks than for whites. Indeed, in central-cities, poverty is sometimes endemic: in 1996, whereas only 30% of the US urban population resided in a central city, central cities grouped more than half the poor families (U.S. Bureau of the Census, 1997) and 72% of the inner-city poor were ethnic minorities (US. Department of Housing and Urban Development, 1999). In 1990, 31.1% of blacks living in central cities were poor whereas the poverty rate of central-city whites only stood at 12% (Mills and Lubuele, 1997).[21]

The poverty of blacks in American cities goes along with a strong residential inertia in poor areas. This is captured over the 1979-1984 period by Bogart (1998) who provides estimates of the average transition probabilities between neighborhoods with different economic profiles for poor families with children (see Table 17 below). Each cell gives the probability for a poor family living in a certain type of neighborhood the current year to be located in another type of neighborhood the next year. It appears that a black household with children living in a low-income neighborhood only has a 9% chance to be living in a better neighborhood the following year, whereas for whites, this probability reaches 20%. Moreover, a black household living in a middle-income neighborhood has a higher probability to be located in a poor neighborhood the following year than a white household in a similar area.

< Insert Table 17 here >

Thus, blacks living in poor areas are less spatially and socially mobile than whites residing in poor areas. This suggests that, for some reason, it is more difficult for blacks than for whites to escape inner-city residences. In this perspective, a recent study has shown that blacks have a lower probability than whites to move from central city to suburbs, but a higher probability to move from suburbs to central city, even after controlling for socioeconomic characteristics (South and Crowder, 1997).

< Insert Table 18 here >

Finally, Table 18 documents the features of spatial mismatch by using the Raphael's and Stoll's (2002) measure of spatial mismatch. The authors measure the spatial imbalance between jobs and residential locations using an index of dissimilarity, which ranges from 0 to 100, with higher values indicating a greater geographic mismatch

between populations and jobs within a given metropolitan area. For instance, a dissimilarity index of 50 for blacks means that 50 percent of all blacks residing in the metropolitan area would have had to relocate to different neighborhoods within the metropolitan area in order to be spatially distributed in perfect proportion with jobs. Table 4 shows that, in the largest metropolitan areas in the US, the access to jobs for blacks is quite bad (especially in Detroit and New York).

To sum up, the main features of urban labor markets in US cities suggest that low-skilled central-city residents, especially blacks, are disconnected from suburban low-skill job opportunities and face low local wages, a high local unemployment rate and have a high exposure to poverty. All these features are consistent with the standard SMH. In this respect, several empirical studies indeed suggest the existence of a causality between distance to jobs and the poor labor-market outcomes of blacks. For instance, Weinberg (2000) shows that the residential centralization of blacks can account for 48 to 52% of the black-white employment differential among 18-30 year olds living in large MAs. According to Weinberg (2002), the effect of job decentralization is also greater for less educated workers.[22]

3.2 The mechanisms leading to unemployment and low incomes

We now turn to the theoretical explanations that underpin the spatial mismatch hypothesis: how can the disconnection between the locations of jobs and the places of residence explain the poor labor-market outcomes of minorities as suggested by the stylized facts presented in the previous section?[23] Our objective here is not to explain why minorities reside far away from jobs (see section 2 of the present paper) but how distance to job opportunities can affect them. In view of the empirical spatial mismatch literature, we can think of (at least) seven different underlying mechanisms that explain how distance to job opportunities could be harmful. *(i)-(iv)* adopt the point of view of minority workers whereas explanations *(v)-(vii)* adopt the perspective of firms:

(i) Workers' job search efficiency may decrease with distance to jobs. In other words, for a given search effort, workers that live far away from jobs have few chances to find a job because, for instance, they get little information on distant job opportunities.

(ii) Workers residing far away from jobs may have few incentives to search intensively. For instance, when housing prices decrease with distance to jobs, distant workers have less incentives to search for a job that would pay for their rent.

(iii) Workers may incur high search costs that cause them to restrict their spatial search horizon at the vicinity of their neighborhood.

(iv) Workers may refuse jobs that involve commutes that are too long because commuting to that job would be too costly in view of the proposed wage.

(v) Employers may refuse to hire or prefer to pay lower wages to distant workers because commuting long distances makes them less productive (they are more tired or more likely to be absent).

(vi) Employers may discriminate against residentially segregated workers because of the stigma or prejudice associated with their residential location (*redlining*). In particular, suburban employers may consider that, on average, inner city residents are less productive or more likely to be criminal (*statistical discrimination*).

(vii) Employers may think that their white local customers are unwilling to have contacts with minority workers, and thus discriminate against minority workers (*customer discrimination*).

It should be noted that these arguments are not directly based on ethnicity at the exception of *(vii)* and possibly *(vi)*. However, in American cities, minorities are disconnected from job opportunities and should thus be sensitive to such economic mechanisms involving distance to jobs. To the best of our knowledge, all these points have been theoretically addressed at the exception of *(vii)*. It should be said that a single model sometimes incorporates several of these points (even though it is not always explicitly stated by the authors)[24] and that some mechanisms are embodied in models that do not adopt a standard spatial mismatch perspective. Indeed, in some models, the spatial disconnection between residences and jobs results from free location choices and thus departs from the historical perspective of the SMH in which housing choices are supposed to be constrained. While assuming free location choice may be a modeling device of the different authors, this may nevertheless have important implications for the relevance of economic policies. Indeed, should difference in labor-market outcomes be addressed if they result from free location choices (and thus from a city structure economists will regard as "efficient")? We do not take part in this debate since the focus of our paper is only to show how labor-market outcomes may be related to distance to jobs as was first pointed out by the SMH. We will now detail the above-mentioned mechanisms by discussing both models and empirical studies. We distinguishing the point of view of workers and that of firms.

3.2.1 Spatial Mismatch: the workers' perspective

Job-search is inefficient far away from jobs *(i)*

The first mechanism revolves around the decrease with distance in the available information on job opportunities. It suggests that a worker who resides far away from job opportunities has less information about jobs than an individual who resides closer to job opportunities. Indeed, several empirical studies suggest that physical distance to jobs reduces available information on the existence and characteristics of job vacancies (see Ihlanfeldt and Sjoquist, 1990, Ihlanfeldt, 1997). One possible reason is that job seekers do not know exactly where to search in distant places they are not accustomed to. Another reason could be that many firms resort to local recruiting methods (such as ads in local newspapers or by posting "wanted" signs) that disadvantage distant workers (see Turner, 1997). In this context, Davies and Huff (1972) show that individuals looking for a job can only search efficiently in a restricted

perimeter centered around their residence, even though there are only low-quality and low-salary jobs in the area. Consequently, being distant to jobs may lead to a high unemployment rate and low incomes, in conformity with the SMH. In this perspective, Rogers (1997) and Immergluk (1998) estimate that, for informational reasons, the workers who reside close to jobs remain unemployed for a shorter period of time.

Furthermore, the harmful effect of distance on job-search efficiency may be stronger for ethnic minorities than for whites. For instance, Stoll and Raphael (2000) show that whites have a better job-search quality than blacks because they search in areas where employment growth is higher. The consequences are important since the authors show that the difference in spatial job search quality between whites and blacks explains nearly 40% of the difference between their employment rates. This is all the more crucial in a spatial mismatch context since the authors show that half of the racial difference in the quality of job search can be explained by racial residential segregation.

The role of spatial frictions in job-search efficiency has not been modeled in the racial perspective of American cities but Wasmer and Zenou (2002) incorporate it in a search-matching model (see Mortensen and Pissarides, 1999, Pissarides, 2000) which formalizes the link between distance to jobs and unemployment. In their paper, the authors consider a linear city in which individuals endogenously sort themselves at a greater or shorter distance from a unique employment center which corresponds to a suburban employment center if one has in mind the configuration of a US city.[25] The main idea defended here is that search efficiency is deteriorated with the distance between a searcher's residence and the prospected center of employment. At the aggregate level, the number of matches between the two sides of the market (workers and firms) depends on the average search efficiency of unemployed workers (given their locations) and on labor-market tightness (the number of vacant jobs per unemployed worker) as in traditional job-search models. In this model, individuals change their residential location whenever they experience a change in their employment status, so that occupied and unemployed workers reside in distinct portions of the city.

The model's contribution lies in the existence of several forces that attract unemployed and occupied workers with different intensities. The first one is the fact that the employed workers travel to the job center more frequently than the unemployed workers so that residing closer to the job center becomes relatively more attractive for employed workers than for unemployed workers. On the contrary, there exists an attraction force towards the job center that only concerns unemployed workers: *the increase in their job-search efficiency associated with proximity to jobs*. The confrontation of these two opposite forces leads to two possible urban configuration in equilibrium. A first equilibrium, the "Integrated-City Equilibrium", has unemployed workers residing close to the employment center whereas employed workers reside further away. In a second equilibrium, the "Spatial-Mismatch Equilibrium", it is the opposite: employed workers reside close to the employment center whereas unemployed workers reside at a distance from job opportunities. Which equilibrium prevails depends on a trade-off between the difference in commuting costs per unit of distance between employed and unemployed workers, and the expected return of being more efficient in search when unemployed workers reside marginally closer to the employment center. The Spatial-Mismatch Equilibrium prevails when the expected return associated with search efficiency is lower than the difference in commuting costs between employed and unemployed workers. In this case, employed workers are willing to pay higher land rents than unemployed workers to live closer to the suburban employment center and bid away unemployed workers at a distance

from jobs (i.e. close to the historic center). In this spatial mismatch configuration, unemployed workers have little chances to find a job.

It should be noted that the so-called "Spatial-Mismatch Equilibrium" does not exactly correspond to the traditional conception of the SMH since agents freely choose their locations. The model contributes to the Spatial Mismatch debate because it generates a city structure similar to that of American cities: unemployed workers live far away from jobs. However, it cannot address the difference in unemployment and location between black and white workers (see Table 14) nor between skilled and unskilled workers (see Table 12). A major result of the model is nevertheless that the overall unemployment rate is higher and the search efficiency is lower when unemployed workers reside at a distance from jobs than in the other equilibrium in which they reside close to jobs.

Distant workers do not have incentives to search intensively for a job *(ii)*

Another mechanism that can explain unemployment patterns in US cities relies on the incentives to search for a job. This may be because, if ethnic minorities pay low rents when they live in the city center (for instance when they live in a housing project), they may feel less pressure to find a well-paid suburban job to finance their housing consumption. However, to our knowledge, no empirical study has investigated how residential location may affect the *effort* dedicated to job search. In fact, the empirical studies that are closest to test this issue, investigate the *differences in job-search efficiency* between black and white job seekers. These studies relate the greater efficiency of whites to the better quality of the places where they search but do not focus on whether this could be due to a higher search effort (see for instance Stoll and Raphael, 2000).

Smith and Zenou (2003) propose a model that focuses on the job-search behavior of workers but not on minorities nor on unskilled workers (contrary to the SMH). The authors consider a search-matching framework with housing in an urban context similar to that of Wasmer and Zenou (2002) except that *search intensity and land consumption are now endogenous*. In their model, when an unemployed worker increases her search intensity, she incurs a loss in utility in the short run because of higher transportation costs (more frequent search trips) and a lower housing consumption (because of a lower net disposable income, housing being a normal good). However, she gains in the long run because searching more intensively increases her chances of obtaining a job and thus her life-time surplus (because she can expect a higher income). In this context, each worker determines her optimal search intensity by equating the short-run losses with the long-run gains. When it comes to choosing their residential location, workers face the following trade-off: locations near the employment center are costly in the short run (high rents), but allow higher search intensities which in turn increase the long-run prospects of reemployment. Conversely, locations far away from the employment center are more desirable in the short run (low rents) but allow only infrequent trips to the employment center and hence reduce the long-run prospects of reemployment. Under some assumptions, the authors show that, in equilibrium, the employed (who bear a higher commuting cost per unit of distance than the unemployed) reside closer to the employment center and outbid the unemployed to further locations. For the unemployed, the endogenous search intensity is a decreasing function of their distance to the employment center.

At first sight, this formalization does not provide other results than those already present in Wasmer and Zenou (2002). However, it contributes to the Spatial Mismatch debate by giving an explanation of (and by modeling) why search intensity decreases with distance to jobs while this was taken as granted in the previous model. It nevertheless gives rise to a somewhat disturbing question: the unemployed optimally choose low amounts of search and low prospects of employment. In US cities, this would imply that inner-city blacks could choose to remain in the inner-city and only sporadically search for a job.

Search costs deter workers from searching far away *(iii)*

When search costs are high, workers may be deterred from searching far away from their residential location and restrict their search horizon to their neighborhood or its close vicinity, even if the neighborhood only offers a few low-quality jobs. Thus, in the American context, living far away from suburban job centers could be very detrimental to inner-city minorities. This has been empirically tested by studies such as Holzer and Reaser (2000) who find that less-educated black workers apply less frequently for jobs in the suburbs than in central cities and attribute this to higher costs of applying. There exist other empirical studies which results are also consistent with high search costs for blacks even though they may also illustrate other spatial mismatch mechanisms. Holzer, Ihlanfeldt, and Sjoquist (1994) find that blacks cover less distance than whites when looking for a job. Simulations in Stoll (1999) show that increasing blacks' access to cars (thus decreasing their search costs) or decreasing their average distance to search areas should lead to a greater geographic job search, and in turn to greater employment and wages.[26]

In a search-matching framework, Ortega (2000) proposes a two-area model that revolves around the above-mentioned mechanism. The Ortega model does not explicitly address the SMH[27] but sheds light on an important mechanism in the Spatial Mismatch debate. Contrary to Wasmer and Zenou (2002) and Smith and Zenou (2003), the Ortega model assumes that jobs are located in two different areas (that we wish to interpret as a city center and its suburbs). The main advantage of this setting is that it enables its author to *model where workers choose to search*. In the model, each one of the two zones has a local labor market and are structurally asymmetric since each market has a specific job destruction rate which we will consider higher in the central-city than in the suburbs.[28] The main assumption in this model concerns *the search costs that differ whether the research is undertaken "at home" or in the other local labor market*. These costs account for traveling costs associated with job search in different areas of the city. These search costs are assumed to be zero in the home area and strictly positive in the host area. According to this simplifying assumption, central-city residents (respectively suburban residents) have higher costs to search in the suburbs (respectively in the city center) than to search in the city center (respectively in the suburbs). The efficiency of job search is endogenously determined in each zone and depends on the local labor-market tightness as in Wasmer and Zenou (2002). In this context, individuals choose where to search for a job by trading off the efficiency and the cost of job search. For central-city residents, when the probability of finding a job is higher in the suburbs than in the central city, individuals face a trade-off between the benefit of a more efficient job search in the suburbs and its higher cost since they reside far away from the suburban job center. The main result of the model is that, under certain conditions, when the cost is too high, city-center residents have no incentive to search for a job in the suburbs, and the unemployment rate in the city-center is higher than in the suburbs. Another interesting result is that the suburban wages

bargained by the central-city residents are lower than those bargained by suburban residents for suburban jobs. This asymmetry results from the high search cost which lowers the bargaining power of individuals at a distance from their place of residence.

As the two previous formalizations, this model was not written in a SMH perspective. However, it yields interesting predictions on the level of wages in the city center and in the suburbs that are consistent with the statistics presented in the previous subsection (see section 3.1.2 in which we argue that the wages for low-skill jobs are higher in the suburbs than in central cities, and the evidence found by Ihlanfeldt and Young, 1994, and Ihlanfeldt, 1997). Nevertheless, this model is not completely satisfactory in the sheer SMH perspective since it does not establish any distinction of skill nor of race among workers.

Commuting costs are too high in view of the wages offered *(iv)*

The empirical literature on the SMH focused for many years on the role of commuting costs as a deterrent for inner-city blacks to hold a distant job. Indeed, commuting costs can deter unemployed workers from accepting suburban jobs (since the potential wages net of commuting costs would be too low). In US cities, this mechanism could significantly contribute to the unemployment of inner-city minorities, as supported by various types of empirical studies.

Indeed, to validate this assumption, some authors have tried to test the effect of transport costs in the acceptance (or refusal) of jobs. In this respect, Zax and Kain (1996) analyze the impact of a firm's relocation from Detroit's central city to a white suburb on workers' mobility and employment. They show that as white employees are confronted with longer commutes, they move to get closer to the firm's new location. On the contrary, few black employees change their place of residence (maybe because they are discriminated against on the housing market in the white suburbs). The resulting increase in black workers' commutes induces many of them to quit their jobs. This study thus tends to validate the spatial mismatch hypothesis by suggesting that blacks residing in city centers have difficulties following jobs that decentralize because of high transportation costs and low residential mobility. Fernandez (1994) obtains similar results by studying the relocation of a food-processing firm from the center of Milwaukee to one of its suburbs. Holzer, Quigley, and Raphael (2003) also come to conclusions that are consistent with this spatial mismatch mechanism by showing that the expansion of the railway system in San Francisco to a predominantly white, high-growth, and low-unemployment suburb increases the relative employment of minority workers near the station. Holzer, Ihlanfeldt, and Sjoquist (1994) find that black and white central-city residents do not offset greater job decentralization with greater distances traveled, either for search or work, which lead them to conclude that "*attempts to eliminate transportation barriers alone will do much to eliminate the effects of spatial mismatch*". Ihlanfeldt and Young (1996) show that in Atlanta, one third of the differences in black employment share between central city and suburban fast-food restaurants is attributable to the fact that suburban firms are less frequently served by public transit.

Other studies, compare the degree of spatial mismatch for blacks and for whites. For instance, Hugues and Madden (1998) test whether black male household heads who are employed full-time year-round are less likely than whites to live and work at their best locations. Using data on Cleveland, Detroit, and Philadelphia, they show that changes in residential locations could indeed improve the economic status of blacks relative to whites by decreasing commuting (and/or the cost of housing).

Another type of studies investigates whether workers are compensated for commuting costs by higher wages, neighborhood amenities or low housing prices. Indeed, if inner-city job seekers, especially blacks, are not compensated enough, they can be reluctant to accept suburban jobs. In this respect, McMillen (1993) shows that blacks do indeed require a premium to work in the suburbs, which suggests that residential segregation limits their choices. Gabriel and Rosenthal (1996) show that blacks have longer commutes than *comparably skilled* white workers, but that only one-third of the estimated difference is offset by neighborhood amenity and housing price differentials. These pessimistic results are confirmed by Petitte and Ross (1999) who also show that both racial commute time differences and the

sources of potential compensation may vary dramatically by metropolitan area, and that in some cases blacks are not fully compensated for their commutes.

Facing these empirical results, however, it is only in the late 1990s that corresponding models provided a theoretical framework for the identified (and empirically validated) mechanism. There are two such models that takes seriously one of the main assumptions of the SMH, namely *the restriction on residential choices*, as well as another important feature of spatial mismatch: *the existence of two spatially distinct local labor markets*. Since the two frameworks are very different even though the mechanisms involved are similar, we will present them successively.

The first model (Coulson, Laing, and Wang, 2001) focuses on the adverse labor-market outcomes of inner-city residents when firms locate in the suburbs. The authors consider two asymmetric zones (a central city or CBD, and a suburb or SBD) which form two separate local labor markets. Whereas workers are assigned to a place of residence (for some in the central city, for others in the suburbs), firms endogenously decide whether to locate in the central city or in the suburbs, the suburbs being more attractive in terms of entry costs. Workers can hold a job in any one of the two zones but incur higher transport costs if they work out of their zone of residence. In each zone, workers are heterogenous with respect to their utility or their capacity to commute out of their zone of residence. This assumption can account for the heterogeneity of locations in each zone. In this context, different individuals anticipate different commuting costs and thus different net wages for potential job offers. The firms' differing entry costs, the heterogeneity of workers in terms of transportation costs, and the frictions in the job-matching process suffice to generate a spatial-mismatch situation. The authors show that there exists an equilibrium in which the SBD residents work in their zone of residence (which is more attractive for firms) whereas some residents of the CBD commute daily to the SBD (reverse commuting). In this equilibrium, the number of job vacancies in the CBD is lower than in the SBD, in particular because the entry-cost differential favors job creation in the SBD. Moreover, in the SBD, the unemployment rate is lower and the gross wage is higher than in the CBD. Whereas the CBD residents who bear low commuting costs find SBD jobs attractive, those with high commuting costs prefer to search in the CBD even if the unemployment rate is higher there. It should finally be noted that this model simultaneously accounts for the two major consequences of spatial mismatch: the low income and the high unemployment rate of city-center residents. However, it does not propose an analysis along the racial line as suggested by the traditional spatial mismatch literature. Nor does it provide a framework flexible enough that would make it possible to compare an unrestricted equilibrium (with free housing choice) with the spatial mismatch equilibrium (with constrained residential choices). These two flaws are circumvented by Brueckner and Zenou (2003) which we now present.

The second model investigates the effects of housing market discrimination on the labor-market outcomes of blacks. The first attempt to model spatial mismatch in a standard urban economics framework was initially proposed by Brueckner and Martin (1997).[29] In accordance with the traditional spatial mismatch hypothesis, the objective was to study the combined effects of job decentralization and housing market discrimination on the wages of minorities. The originality consisted in considering a local labor market at each end of a linear city (a central-city employment center and a suburban employment center). In this framework, the authors presented a comparison "before" and "after" the introduction of spatial mismatch in the model, that is "with" and "without" housing market discrimination assigning

blacks to central-city locations. However, this formalization did not model the effects of spatial mismatch on unemployment rates. Brueckner and Zenou (2003) propose an extension which bridges this gap.

The authors consider a closed linear city with absentee landlords with an employment center at each end of the segment: the Central Business District (CBD) and the Suburban Business District (SBD). They assume that these centers form two separate local labor markets. Labor demand is exogenous and the same in each center so that it limits the number of local available jobs. There are two continua of individuals, blacks and whites, who are uniformly distributed in the city and go to work in one center or the other. Each individual chooses where to search for a job by comparing the expected wages offered in each center net of commuting costs. The authors assume *housing-market discrimination* so that blacks are not authorized to live in the suburbs (close to the SBD). In this context, black workers are skewed towards the CBD and blacks' residences are thus remote from the SBD. For a black worker, working in the SBD involves high commuting costs which deters many of them from accepting SBD jobs even though some of them work in the SBD. As a result, the black CBD labor pool is large relative to the black SBD pool. In a simple version of this model, the wages of both whites and blacks are set at an exogenous level. Black workers are paid at the minimum wage and whites are better paid (which could be justified if they are more skilled). In equilibrium, the combination of fixed wages and fixed local labor demand generates unemployment so as to clear the labor market. As the black labor supply is skewed towards the CBD under housing-market discrimination, the unemployment rate of blacks is higher in the CBD than in the SBD (in conformity with Table 14 in the previous section). The interesting result in line with the SMH is that, without housing market discrimination (implying that labor supply of black is equally shared between the two centers), the unemployment rate of all blacks would lie between the CBD and SBD unemployment rates in the restricted equilibrium.

A limit of the fixed wage setting however is that it does not yield any prediction on the effect of spatial mismatch on wages. This limit is addressed in an extension of the model in which the wages of blacks are endogenously determined to deter shirking. In this efficiency-wage setting, unemployment acts as a worker discipline device which enables employers to pay lower wages when unemployment is higher (see Shapiro and Stiglitz, 1984). In this context, the authors obtain exactly the same result as in the fixed-wage setting concerning the unemployment rates. In addition, they also show that black CBD workers have lower wages than black SBD workers in the spatial mismatch equilibrium (in conformity with the figures we presented in section 2 of the present survey). Moreover, the wage of all blacks in the unrestricted equilibrium would lie between the CBD and SBD wages of blacks in the restricted equilibrium.

3.2.2 Spatial Mismatch: the firms' perspective

Distance may yield bad labor-market outcomes because employers are reluctant to hire workers that live far away from their workplace or in other neighborhoods. There are several justifications to this behavior that we now present:

The productivity of distant workers is too low *(v)*

Employers may consider that distance to jobs deteriorates productivity because of long commuting trips. This can be the case if distant workers are more likely to be late or tired or reluctant to provide high levels of effort than those who reside closer to jobs. This is particularly true in some jobs (e.g. working in a restaurant) which involve long breaks during the day (typically between 2 p.m. and 6 p.m.). The worker who lives nearby can go back home and relax whereas the workers that live further away cannot rest at home, which certainly affects their productivity. As a consequence, firms may decide of a geographical boundary beyond which they will not recruit workers.

This idea has been modeled by Zenou (2002) in the context of a monocentric city where all firms are located in the city center. Each worker chooses whether to shirk or not. When shirking, the worker provides no effort. When not shirking, she provides an effort that contributes to production but decreases her utility. In accordance with the above remarks, the author assumes that the provided effort decreases with distance to the workplace. The worker's contribution to production depends on its effort (and thus on its proximity to the firm). Unemployed workers commute to the CBD to search for a job, but at a less frequent pace than employed workers. The author further assumes that the marginal transportation and effort cost of employed workers is higher than that of unemployed workers. This means that employed workers would loose more in terms of utility than unemployed workers from residing marginally further away from the employment center. Consequently, employed workers always bid away unemployed workers to reside closer to the employment center. As in the Brueckner and Zenou (2003), the wage is determined in an efficiency-wage setting to deter workers from shirking. If a worker is caught shirking, she is automatically fired. The wage is set so as to deter all employed workers from shirking. As employed workers differ in their locations and thus in their productivities, the per-worker profit decreases with distance to jobs. Firms anticipate that remote workers provide lower effort levels and do not recruit workers beyond a certain distance where the per-worker profit is zero. This model is not a formalization of the SMH but yields a realistic city structure (unemployed workers residing far away from jobs) as in other spatial mismatch models that adopt the workers' perspectives.

Territorial discrimination *(vi)*

A segregated spatial-structure in which ethnic minorities are spatially disconnected from jobs can give rise to employer discrimination on the basis of the applicant's residential location (known as redlining, just as if the discriminated neighborhood had been circled by a red line). As far as the labor market in US cities is concerned, suburban employers may discriminate against inner-city residents, for instance because they view them as more likely to be criminal. Even though there exist many empirical studies on redlining in the housing market (see Ladd, 1998) and in spite of much evidence in the popular press, redlining in the labor market has not been systematically studied in US cities. This leaves room for interesting studies that would try to measure the importance of redlining in the US urban labor market.

From a theoretical perspective, Zenou and Boccard (2000) show how redlining can amplify unemployment problems. In their model, the authors consider a linear city in which all jobs are grouped in a single employment center,

which they present as a CBD. There are two continua of black and white workers that can be employed or unemployed. Both groups commute to the employment center, endogenously decide where to locate in the city and the quantity of land they want to consume (land being a normal good). The two groups differ since blacks bear a higher commuting cost per unit of distance than whites and since they are discriminated against by employers (so that it is more difficult for them to get a job). Irrespective of their residential location, blacks are thus more unemployed than whites. Two different urban equilibria can occur depending on a trade-off between transportation costs and land consumption: when the transport cost of blacks is high enough, they bid away all whites from the vicinity of the employment center which thus gathers all unemployed and employed blacks (equilibrium 1). When the transport cost of blacks is sufficiently low, then all black and white unemployed workers locate close to the employment center whereas all black and white employed workers locate at the other end of the city where they can consume more land since they are richer (equilibrium 2). In other words, when the transportation cost of black workers is sufficiently large, a city is segregated by race. When the transportation cost of black workers is sufficiently small, a city is segregated by employment status. In this framework, the authors introduce redlining which they model as an additional labor-market discrimination on all the workers residing in the city center, i.e. close to the employment center since they have assumed it to represent a CBD.[30] In the first equilibrium, blacks are discriminated against both racially and spatially (because of redlining) and thus their unemployment rate is very high. In the second equilibrium, redlining increases the unemployment rate of both blacks and whites since the central city gathers all unemployed workers. In conclusion, an interesting feature of that model is that it shows how redlining can differently affect minorities depending on the city structure and on whom resides out of the "red line".

However, neither of the model's equilibria correspond to the urban structure described in section 2 and 3.1 of the present survey where unemployed minority workers are located far away from the low-skill jobs they may occupy. There are two assumptions made by the authors that explain this problem. First, the authors have assumed that both the employment center and the redlined zone correspond to a central city. Second, they have assumed that blacks have a higher unit transport cost than whites which attracts them towards the employment center. In fact, a more adapted specification that would better fit a spatial mismatch perspective would have been to consider that the employment center is a suburban employment center (whereas redlining occurs in the city center) and that blacks bear a lower unit transportation cost than whites, which would have driven them away from jobs.[31] In this context, the segregated equilibrium would have had all blacks residing in the inner city at a distance from suburban jobs. In any case, neither version of this model would correspond to the standard SMH since there is no constraint on residential choices. The paper nevertheless contributes to the literature to the extent that it is the first model to address the effect of redlining on unemployment.

Customer discrimination *(vii)*

Another type of spatial discrimination consistent with spatial mismatch involves the preferences of customers. "*Customer discrimination*" corresponds to a situation in which an employer discriminates against ethnic minorities to please local customers who do not wish to be in contact with other racial groups. In the context of US cities where segregation and prejudice are high, this means that services firms located in white suburbs are likely to discriminate

against black workers. This mechanism is consistent with the SMH to the extent that both whites and services firms are located in the suburbs whereas ethnic minorities tend to live in city centers.

A series of recent empirical studies have shown that customer discrimination could contribute to the poor labor-market outcome of minority workers. In their study of the wage gradient of fast-food restaurants within Atlanta, Ihlanfeldt and Young (1994) find evidence that consumer prejudice affects the wages paid to black workers. More precisely, they find that as distance from the CBD increases, there exists a negative effect on wages from greater customer discrimination (even though this negative effect is strongly dominated by a positive wage gradient effect).[32] Other studies do not focus on how customer discrimination might affect the wages of minority workers but directly on the hiring of those workers. For instance, Ihlanfeldt and Young (1996) find that the share of fast-food restaurant jobs held by blacks is smaller in the suburbs of Atlanta than in the central city, and that 29 percent of the difference in black employment share between central city and suburban firms is attributable to the city/suburban differences in the race of managers and customers. In a similar perspective, Holzer and Ihlanfeldt (1998) estimate that the racial composition of an establishment's customers has sizeable effects on the race of who gets hired, particularly in jobs that involve direct contact with customers. More recently, Raphael, Stoll and Holzer (2000) show that both suburban black and white employers hire fewer blacks than their central-city counterparts, but are not able to assess whether this is due to spatial frictions or to the discriminatory preferences of suburban employers relative to their central-city counterparts. These results lend credit to the existence of another mechanism that could adversely affect the labor-market outcomes of ethnic minorities but, to the best of our knowledge, no urban theoretical model has been proposed yet.

4. Conclusion

The spatial mismatch hypothesis originally formulated by Kain (1968), supports the view that because black workers reside in segregated zones that are distant and poorly connected to major centers of growth, they are confronted to barriers in finding and keeping well-paid jobs. The objective of our work was to confront the principal stylized facts of US cities and the most recent theoretical contributions to the spatial-mismatch literature, as it had not been done before.

We investigated the structure of American cities with the help of various statistics that are seldom presented together, and tried to explain how this structure emerged using urban economic theory. We also checked as assumed by the Spatial Mismatch Hypothesis (SMH) that inner-cities, which are indeed disconnected from job opportunities, are also characterized by higher unemployment and lower wages than in the suburbs. We used recent theoretical models related to the spatial mismatch literature to shed light on why residing at a distance from jobs can be harmful for ethnic minorities, and discussed how these models and their findings fit in the spatial mismatch debate.

We chose to distinguish two parts in this debate: why minorities live far away from jobs, and how this may lead to adverse labor-market outcomes. Concerning the first part of the debate, an interesting outcome of the present survey is to point out that housing market restrictions (such as discrimination as assumed in the standard Spatial Mismatch Hypothesis) are not the only cause why blacks reside far away from jobs. In other words, disconnection to

jobs can emerge even under free residential choice. This is indeed the case when poor and unskilled minorities are bid away by whites from the suburbs where many low-skill job opportunities are located. Concerning the second part of the debate, the main result of our paper is to identify seven different mechanisms that can lead to adverse labor-market outcomes in a spatial mismatch context. Each mechanism takes the perspective of either workers or firms. Workers who reside far away from job opportunities may experience poor efficiency and high costs in the job-search process. They may also have little incentives to search for a job, for instance because they feel little pressure to find a job since they do not have to pay high house prices. Finally, they may be confronted to high commuting costs that may deter them from accepting distant job offers. Concerning suburban firms, they may be reluctant to hire long-distance commuters because of the negative effect of commuting on productivity. They may also discriminate against ghetto residents to satisfy the prejudice of their local customers.

It should be clear that the different mechanisms put forward in the present survey have strong policy implications and, as a result, should be tested in order to design adequate policies that can alleviate the harmful effects of spatial mismatch for ethnic minority workers.

Notes

1. Observe that some authors prefer the expression *spatial-skill-mismatch* to more accurately depict the spatial disconnection between the residential locations of inner-city minorities and the locations of the *low-skill suburban jobs* they could occupy (see Ong and Blumenberg, 1998, or Immergluck, 1998).

2. The empirical controversy was initiated by Ellwood (1986) for whom race is a much more important factor than job accessibility in explaining the adverse labor market outcomes of minorities. According to that author, "*race, not space, remains the key explanatory variable*". A discussion on this empirical controversy is clearly beyond the scope of the present paper (for more details, see the comprehensive surveys by Jencks and Mayer, 1990; Holzer, 1991; Ihlandfeldt and Sjoquist, 1998). We only want to stress that, in the absence of a clear understanding of the SMH, many empirical studies have focused on either incorrect, partial or irrelevant specifications of the SMH (Kain, 1992, and Ihlanfeldt and Sjoquist, 1998, provide interesting examples).

3. In accordance with the mainstream spatial mismatch literature, we will focus on the black minority. Other communities such as Hispanics are also affected by spatial mismatch (Ihlanfeldt, 1993) but to a lesser extent than African-Americans.

4. All tables are computed from Census data and refer to the 10 largest MSAs, according to the 1999 NECMA number (MSA-PMSA Number for Non-New England Metro Areas).

5. The average growth rate corresponds to the growth rate of the total population in the 10 largest MSAs.

6. See Fujita and Thisse (2002).

7. For a fixed distribution of population, suburbanization can also be driven by the discriminating behavior of some firms which flee minority neighborhoods located in city centers. For instance, using data from a representative sample of employers in Boston, Atlanta, Los Angeles and Detroit, Iceland and Harris (1998) show that the higher the propotion of blacks in a neighborhood, the more likely firms are to express relocation intentions.

8. Job figures by location are not available yet for the year 2000 (see the State of the Cities Data System, http://socds.huduser.org, for an update).

9. Of course, all cities do not have the same degree of job suburbanization and a metropolitan area such as Los Angeles is much more decentralized than New York (see Table 3).

10. Stanback (1991, p.26) also provides job-growth figures by location for the periods 1969-1979 and 1979-1987. The interesting pattern that arises from the comparison of these two periods is that central cities in New-York and Chicago had a negative growth rate in the seventies, but a positive one in the eighties. All suburbs had a positive growth over the two periods.

11. For instance, even though San Francisco has huge suburban centers, they only account for 47% of all the metropolitan area's jobs. In Los Angeles, a city that is very decentralized, suburban centers only group one third of the metropolitan area's jobs and the city center remains the biggest employment center of all, two times bigger than the second biggest center and nearly ten times bigger than South Coast Metro, the biggest edge city in the region (Anas, Arnott and Small, 1998).

12. It should be noted however that this model does not completely match a spatial mismatch configuration since, in the model, low-skilled workers reside close to their workplace and not far away from it.

13. By definition, the dissimilarity index is equal to $\frac{1}{2}\sum_i \left| \frac{Blacks_i}{Blacks} - \frac{Non-blacks_i}{Non-blacks} \right|$.

This index gives the percentage of blacks (or similarly of non-blacks) that should be relocated in order to obtain a homogenous distribution of population in the city. A dissimilarity index of less than 30% is considered to be low. Between 30% and 60%, it is medium. Over 60%, it is considered to be high (Cutler, Glaeser and Vidgor, 1999). This index is sensitive to the size and shape of districts (areas *i* in the formula).

14. One explanation of the decrease in segregation could be linked to the emergence of black suburbanization, in particular, after the seventies.

15. The distinction between restrictions and free locational choices might bear important implications concerning both the justification for economic policy and the policies to be implemented. In any case, there seems to be a need for studies that would further disentangle the causes of residential segregation.

16. In fact, there is a controversy about what can be derived from longer or shorter commutes. DeRango (2001) observes that "*commuting-based tests of the spatial mismatch hypothesis are not just biased but mispecified because spatial mismatch is theoretically consistent with both the null and alternative hypothesis*". This is something the reader should have in mind when considering the "contradictory" findings of recent studies that use commutes to test the spatial mismatch hypothesis.

17. For studies investigating racial differences in commuting times, see Gabriel and Rosenthal (1996), and Petitte and Ross (1999).

18. It should be kept in mind however that these features are trends and that American cities present a wide range of configurations, in particular with respect to their degree of spatial mismatch and job suburbanization (see Pugh, 1998, or Glaeser and Kahn, 2001, for city categorizations).

19. It is well known that in US cities, richer families tend to locate in residential suburban areas (Brueckner, Thisse and Zenou, 1999). What the SMH implies is that distance to jobs may amplify income disparities.

20. Of course this is not true of all jobs and the wage gradient of high- and low-skill jobs are thought to be of opposite signs. As a matter of fact, the high-skill jobs that pay the most are located within the CBD, whereas the low-skill jobs that pay the most are located in the suburbs. In theory, the positive wage gradient of low-skill jobs in US cities could be explained by the decentralization of such jobs combined with the suburban residential exclusion of low-skilled workers. The negative gradient of high-skill jobs could be explained by the CBD sectoral specialization. When one considers all jobs taken together, wages are 10% to 35% higher in city centers than in the suburbs (Stanback, 1991).

21. In the suburbs, poverty rates are lower for both whites and blacks, but, as in central cities, blacks are also more affected by poverty than whites: only 6.6% of suburban whites but 19.5% of suburban blacks are poor (Mills and Lubuele, 1997).

22. Also see Ihlanfeldt and Sjoquist (1991), Raphael (1998), or Stoll (1998).

23. Most of these theories use an urban land-use approach. See Brueckner (1987), Fujita (1989) and Fujita and Thisse (2002) for overviews on urban economics.

24. See in particular Arnott (1998) and Anas (2003). Observe however that these two models address the issue of local wages but do not yield predictions concerning unemployment

25. In view of job decentralization in American cities, the assumption of a monocentric city may seem restrictive to study spatial mismatch. In fact, it is not very restrictive since the main focus of the model is only to shed light on the effects associated with distance to jobs. If need be, one could always imagine without much loss of generality that the employment center represents suburban job opportunities. In this context, the workers that are distant from the (suburban) employment center do reside in the historical city center ─the other end of the line─, as in a standard American city.

26. This is confirmed by Raphael and Stoll (2000).

27. The author interprets the search choice as a migration choice between two countries. We believe that the model also has an application in our context.

28. Some jobs are destroyed at each moment in time, but the exogenous destruction rate is higher in one area than in the other.

29. See also Martin (1997).

30. The authors originally presented this employment center as a CBD but, as we will see, this is not very relevant in a spatial mismatch perspective where minorities reside far away from the job opportunities they could occupy.

31. In practice, it is debatable whether blacks have higher or lower transportation costs than whites. In section 2, our statistics show that blacks travel shorter distance and longer times than whites, which would imply that their transport time cost per unit of distance is higher than whites. On the other hand, blacks resort more to public transport and car pooling than whites, which involve a smaller monetary unit transport cost. %

32. See our note in section 3.1.2 for a theoretical explanation of this positive wage gradient moving out from the CBD.

Figures

Table 1: *Percentage Population in Central Cities, 1970-2000*

	1970	*1980*	*1990*	*2000*
Los Angeles – Long Beach	47	47	47	46
New York	88	86	86	87
Chicago	53	47	43	41
Boston	35	33	32	31
Philadelphia	42	37	34	31
Washington	30	24	20	17
Detroit	39	32	29	26
Houston	68	61	52	49
Atlanta	28	19	13	10
Dallas	60	52	46	42
Ten Largest MSAs	53	48	45	42

(Source: calculated by the authors from census data)

Table 2: *Annual Rates of Population Change, 1970-2000 (%)*

	1970-1990		*1990-2000*	
	Central City	*Suburbs*	*Central City*	*Suburbs*
Los Angeles – Long Beach	1.1	1.2	0.6	0.8
New York	-0.4	0.2	0.9	0.6
Chicago	-0.8	1.1	0.6	1.4
Boston	-0.1	0.7	0.3	0.8
Philadelphia	-1.0	0.7	-0.5	0.8
Washington	-0.7	2.1	-0.0	1.9
Detroit	-1.7	0.5	-0.6	0.8
Houston	1.5	4.9	1.8	2.9
Atlanta	-1.2	3.6	0.6	3.7
Dallas	1.1	4.1	1.7	3.6
Ten Largest MSAs	-0.2	1.5	0.7	1.6

(Source: calculated by the authors from census data)

Table 3: *Percentage Jobs in Central City and Average Annual Growth Rates of Jobs by Workplace, 1980-1990*

	% Job (Central City) 1980	*% Job (Central City) 1990*	*Growth Rate (Central City) 1980-1990*	*Growth Rate (Suburbs) 1980-1990*
Los Angeles – Long Beach	51	51	1.9	2.1
New York	91	89	1.1	3.3
Chicago	50	44	-0.2	2.3
Boston	46	41	0.6	2.4
Philadelphia	41	35	-0.0	2.4
Washington	46	38	1.4	4.5
Detroit	38	28	-2.1	2.5
Houston	78	72	1.0	3.9
Atlanta	35	25	0.9	5.6
Dallas	69	60	1.4	5.6
Ten Largest MSAs	57	51	0.8	3.0

(Source: calculated by the authors from census data)

Table 4: *Average Annual Growth Rates of Jobs by Workplace, 1980-1990 (%)*

	Central City			*Suburbs*		
	Manual[1]	*Prof.*[2]	*Services*[3]	*Manual*[1]	*Prof.*[2]	*Services*[3]
Los Angeles–Long Beach	1.1	2.7	2.6	0.6	3.5	2.2
New York	-0.8	2.6	2.0	0.9	5.0	2.0
Chicago	-2.9	1.4	0.6	-0.1	4.0	1.5
Boston	-3.5	2.8	0.8	-1.6	4.4	1.5
Philadelphia	-3.1	1.9	0.4	-0.6	4.3	1.5
Washington	-0.9	3.0	1.7	2.7	6.1	3.5
Detroit	-4.8	-0.1	-1.7	1.0	3.9	1.3
Houston	-1.4	2.5	3.3	1.7	5.7	5.4
Atlanta	-1.5	2.9	1.2	2.4	7.5	4.9
Dallas	-0.9	3.2	2.4	2.2	7.9	6.2
Ten Largest MSAs	-1.5	2.4	1.6	0.5	4.8	2.4

(Source: calculated by the authors from census data)
[1] Machine operators and other laborers.
[2] Managerial, professional, technicians and related supports.
[3] Protective, private household, and other services.

Table 5: *Average Annual Growth Rates of Workers by Place of Residence, 1980-1990 (%)*

	Central City			*Suburbs*		
	Manual[1]	*Prof.*[2]	*Services*[3]	*Manual*[1]	*Prof.*[2]	*Services*[3]
Los Angeles–Long Beach	1.3	2.6	2.7	0.4	3.6	1.9
New York	-1.1	2.8	2.0	-1.6	2.9	0.6
Chicago	-2.5	2.7	0.4	-0.9	2.9	1.2
Boston	-2.7	4.7	1.1	-2.4	4.6	1.0
Philadelphia	-2.3	3.0	0.9	-1.1	4.1	1.2
Washington	-1.3	3.5	0.5	2.0	6.2	3.8
Detroit	-3.2	0.5	-0.8	-0.7	3.1	0.6
Houston	-2.2	0.6	2.6	1.9	5.7	6.1
Atlanta	-2.4	2.4	-0.7	1.8	6.5	4.8
Dallas	-0.6	3.0	2.9	1.5	6.6	5.3
Ten Largest MSAs	-1.4	2.7	1.5	-0.2	4.4	2.1

(Source: calculated by the authors from census data)
[1] Machine and transport equipment operators, material handlers and laborers.
[2] Professional specialty and technical, executive, managerial, and administrative.
[3] Non-household and private household services.

Table 6: *Average Annual Growth Rates of Jobs and Workers by Place and Industries for the ten largest MSAs, 1980-1990 (%)*

	Manufacture[1]	*Trade*[2]	*Finance*[3]	*Services*[4]
Jobs (Workplace)				
Central City	-1.7	0.7	1.7	2.4
Suburbs	1.2	3.3	5.9	4.1
Workers (Place of Residence)				
Central City	-1.5	1.0	1.7	2.3
Suburbs	0.3	2.6	4.3	3.8

(Source: calculated by the authors from census data)
[1] Manufacturing and Construction.
[2] Wholesale and Retail Trade.
[3] Finance, Insurance and Real Estate.
[4] Personal, Professional, Business and Repair Services.

Table 7: *Flows from Place of Residence to Place of Work (% of all Trips by Place of Origin), 1990*

Flow From…	*Central City*		*Suburb*	
To…	*Central City*	*Suburb*	*Central City*	*Suburb*
Los Angeles	95	5	16	84
New York City	85	15	19	81
Chicago	91	9	27	73
Boston	-	-	-	-
Philadelphia	81	19	12	88
Washington, DC	84	16	27	73
Detroit	78	22	17	83
Houston	97	3	41	59
Atlanta	71	29	29	71
Dallas	92	8	28	72

(Source: calculated by the authors from Rossetti and Eversole, 1993, Table 4-12)

Table 8: *Percentage of Population Living in Central City by Race, 1980-2000*

	Blacks			*Whites*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*
Los Angeles–Long Beach	61	58	56	45	45	46
New York	94	94	93	79	78	77
Chicago	88	81	73	31	27	25
Boston	84	79	74	30	27	24
Philadelphia	77	73	68	27	23	18
Washington	53	40	29	14	12	12
Detroit	89	86	80	17	11	8
Houston	87	77	69	50	38	34
Atlanta	53	35	22	8	6	5
Dallas	84	75	63	43	36	28
Ten Largest MSAs	79	72	64	37	32	28

(Source: calculated by the authors from census data)

Table 9: *Percentage of Blacks by Location, 1980-2000*

	Central City			*Suburbs*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*
Los Angeles–Long Beach	16	13	11	9	8	8
New York	24	26	24	10	11	12
Chicago	37	36	33	5	6	8
Boston	9	10	11	1	1	2
Philadelphia	38	40	43	7	8	9
Washington	56	51	44	16	19	22
Detroit	56	66	70	3	4	6
Houston	27	27	24	6	9	10
Atlanta	66	67	61	14	19	25
Dallas	25	25	23	5	7	9
Ten Largest MSAs	24	28	27	7	9	11

(Source: calculated by the authors from census data)

Table 10: *Dissimilarity Indexes at the Census Tract Level, 1990-2000 (%)*

	1990	2000
Los Angeles	64	57
New York	69	67
Chicago	84	78
Boston	68	63
Philadelphia	75	69
Washington	64	60
Detroit	64	60
Houston	62	57
Atlanta	67	62
Dallas	59	54

(Source: Glaeser and Vidgor, 2001)

Table 11: *Mode Choice and Average Distance for Travel to Work by Race, 1995*

	Private Vehicle	*Car Pooling*	*Transit (bus)*	*Transit (rail)*	*Walk*	*Other*
Mode Choice (% of Trips)						
Black	62	20	8	4	3	3
White	79	14	1	1	2	3
Average distance (in miles)						
Black	10.6	10.9	10.0	14.1	1.2	-
White	11.8	13.2	12.1	17.3	0.7	-

(Source: extracted from McGuckin, 2000, Table 4-8 and Table 4-15)

Table 12: *Distribution of Recently Filled Jobs and People (in %): Pooled Sample of MSAs*

	Central City	*Suburbs*
Distribution of Recently-Filled Jobs		
All Jobs	25.2	74.8
*Low-skill Jobs**	20.4	79.6
Distribution of People		
Whites	13.1	86.9
Blacks	65.3	34.8
White H.S. dropouts	22.2	77.9
Black H.S. dropouts	76.3	23.6

(Source: Stoll, Holzer and Ihlandfeldt, 1999)
* No H.S. diploma, no experience of training, no reading, writing, math

Table 13*: Unemployment Rates, 1990-2000 (%)*

	Central City		*Suburbs*	
	1990	*2000*	*1990*	*2000*
Los Angeles–Long Beach	6.4	5.9	5.3	4.9
New York	7.2	5.7	3.2	3.0
Chicago	7.9	5.5	4.9	3.4
Boston MSA	4.9	2.7	4.6	2.1
Philadelphia	6.2	6.4	4.3	3.1
Washington	4.8	4.3	2.3	2.0
Detroit	13.9	6.1	6.6	2.5
Houston	6.5	5.0	4.3	3.2
Atlanta	6.5	4.7	4.2	2.6
Dallas	6.1	3.8	4.4	2.5
Ten Largest MSAs	7.0	5.4	4.5	3.0

(calculated by the author from the Current Labor Force Survey)

Table 14: *Unemployment in the Twenty-Five Largest Cities, 1997 (%)*

	Central City	*Suburbs*
Whites	5.5	3.7
Blacks	12.5	7.6
*Total Population**	7.3	4.0

(Source: Brueckner amd Zenou, 2003)
* Including Hispanic origin.

Table 15: *Family Income Ratios between city center and suburbs, 1970-2000*

	1970	*1980*	*1990*	*2000*
Los Angeles–Long Beach	0.93	0.87	0.82	0.79
New York	0.73	0.64	0.63	0.58
Chicago	0.76	0.67	0.64	0.64
Boston	0.82	0.75	0.72	0.66
Philadelphia	0.79	0.67	0.62	0.54
Washington	0.80	0.75	0.73	0.73
Detroit	0.78	0.65	0.53	0.54
Houston	0.93	0.79	0.70	0.67
Atlanta	0.79	0.61	0.58	0.61
Dallas	0.98	0.84	0.76	0.67
Ten Largest MSAs	0.82	0.72	0.69	0.64

(Source: calculated by the authors from census data)

Table 16: *Poverty Rates by Place of Residence, 1970-2000*

	Central City				*Suburbs*			
	1970	*1980*	*1990*	*2000*	*1970*	*1980*	*1990*	*2000*
Los Angeles–Long Beach	13	16	18	22	9	11	12	15
New York	15	20	19	21	6	7	6	9
Chicago	14	19	20	18	4	4	4	5
Boston	12	15	15	16	6	6	5	5
Philadelphia	15	21	21	24	6	6	5	6
Washington	14	16	14	16	6	6	5	6
Detroit	14	20	30	25	5	5	6	6
Houston	14	13	21	19	11	7	9	9
Atlanta	20	28	27	24	10	9	8	8
Dallas	12	13	17	17	10	7	8	7
Ten Largest MSAs	14	18	20	20	7	7	7	8

(Source: calculated by the authors from census data)

Table 17: *Transition Matrix for Poor Families with Children, 1979-1984 (en %)*

	Tract Type Next Year			
Tract Type in Current Year	*Low Income*	*Middle Income*	*High Income*	*Non Metropolitan*
White Household				
Low Income	73	20	0	7
Middle Income	3	87	9	1
High Income	0	14	78	8
Non Metropolitan	0	1	1	98
Black Household				
Low Income	91	8	1	0
Middle Income	8	88	3	1
High Income	5	23	72	0
Non Metropolitan	3	1	0	96

(Source: Bogart, 1998, p. 298)

Table 18: *American MSAs with the worse spatial mismatch for blacks in 2000*

	Blacks			*Whites*			
	% Pop	**SM**	*% Un*	*% Pop*	**SM**	*% Un*	**Total** *Population*
Atlanta, GA MSA	29	54	8.98	63	40	3.09	4,112,198
Baltimore, MD, PMSA	27	52	11.69	67	37	3.05	2,552,994
Chicago, IL PMSA	19	69	17.27	66	34	4.18	8,272,768
Cleveland-Lorain-Elyria, OH, PMSA	19	62	14.09	77	31	4.17	2,250,871
Detroit, MI, PMSA	23	71	14.89	71	36	4.27	4,441,551
Houston, TX, PMSA	17	57	10.85	61	40	4.46	4,117,646
Los Angeles-Long Beach, CA, PMSA	10	62	15.57	49	37	6.64	9,519,338
Miami, FL, PMSA	20	65	13.44	66	36	6.23	2,253,362
New York, NY, PMSA	25	70	14.63	49	44	5.61	9,314,235
Newark, NJ, PMSA	22	65	13.90	66	34	3.96	2,032,989
Oakland, CA, PMSA	13	55	12.08	55	37	3.95	2,392,557
Philadelphia, PA-NJ, PMSA	20	64	13.93	72	34	4.47	5,100,931
Saint Louis, MO-IL, MSA	18	63	14.21	78	38	4.11	2,603,607
Washington, DC-MD-VA-WV, PMSA	26	56	8.64	60	42	2.63	4,923,153

Source: Raphael and Stoll (2002) and Census (2000), calculations from Selod and Zenou (2004).
% Pop: Percentage of (black or white) individuals in the population in the MSA or PMSA.
SM: Measure of the Spatial Mismatch (for black or white) between people and jobs using the Raphael's and Stoll's (2002) dissimilarity index.
% Un: Percentage of (black or white) male unemployed in the MSA or PMSA.

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