RACE, RESIDENTIAL LOCATION AND THE JOURNEY-TO-WORK OF DETROIT'S YOUTHS

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Many urban scholars attribute high rates of joblessnesss among young urban blacks to the lack of spatial access to a decentralizing job market. The friction of distance is an underlying assumption of this literature but has received only little attention. This paper investigates differences of the travel-to-work distance-decay function between young blacks and whites, and between inner-city and suburban residents in the Detroit tri-county area, and accounts for the uneven spatial arrangement of employment. The analysis uses 3,318 individual records from the 1990 PUMS, and aggregate data from the US Census of Population and Housing Summary Tabulations. The results reveal no statistically significant difference between the distance-decay functions of black and white youth. Between central-city and suburban residential locations, however, the differences are significant.

INTRODUCTION

Many urban scholars attribute high rates of joblessness among young inner-city blacks (Adams and Stevenson 1978) to the lack of spatial access to a decentralizing job market (Kain 1968, Kasarda 1987, 1989, Wilson 1987, Ihlanfeldt and Sjoquist 1990, Holzer 1991, Ihlanfeldt 1992, 1994). The focus of this literature has clearly been on employment (Kain 1968, Ellwood 1986, Ihlanfeldt and Sjoquist 1990, Holzer 1991, Ihlanfeldt 1992, McLafferty and Preston 1992, Cooke 1995). Although the friction of distance, the inability and/or unwillingness of young individuals to overcome the cost and time effects of travelling long distances to work, is an underlying assumption of this literature, it has received only little attention.

This paper aims to establish whether the friction of distance has a different impact on black and white youth, and on suburban and inner-city youth. The analysis examines the journey-to-work patterns of employed youth in the Detroit tri-county area; uses data from the 1990 PUMS and the Summary Tabulations of the 1990 US Census of Population and Housing; and accounts for the uneven spatial arrangement of employment in the study area. It is suggested that empirical evidence of racial and residential differences of the distance-decay function improves our understanding of inner-city youth unemployment.

JOURNEY-TO-WORK AND RESIDENTIAL LOCATION

This section reviews selected journey-to-work literature to establish the theoretical context for the paper. The journey-to-work is determined by residential location and work location. The early 'Equilibrium Models' (Wingo 1961, Kain 1962, Alonso 1964, Hecht 1974, Herrin and Kern 1992) assumed that a city's employment is centralized at one point in the CBD. Residential location is then a function of journey-to-work. However, today an increasing number of jobs are available in suburban areas. Hamilton (1982) and White (1988b), therefore, relaxed the assumption of centrality of employment. With economic decentralization (Garreau 1988, Moore and Laramore 1990, Blair and Fichtenbaum 1992), accessibility to jobs may actually improve due to better highway and public transit access

(Matthew 1993) and because decentralizing firms are often attracted by suburban labour markets (Madden 1981, Dubin 1993, England 1993). However, inner-city residents who do not have the opportunity to follow jobs may be forced to commute longer distances.

Whereas Hamilton (1982) and White (1988b) assumed that residential location is determined by job site and the willingness to commute, Simpson (1980) and White (1988a) recognize that place of work may actually adjust to a fixed residential location (also Giulliano and Small 1993, Wachs et al. 1993). This model is much more appropriate for explaining travel behaviour of youth because youth, until they have their own income, are likely to live with their parents and have little or no residential choice vis-a-vis a job site.

Further, youth are constrained in their ability to commute long distances. There are three reasons why youth are expected to have shorter commutes than older groups. First, youth are generally less mobile because fewer of them own automobiles. Second, youth tend to engage in informal job search much more frequently than adults (Holzer 1987). Since this method is ineffective in producing job offers outside one's own neighbourhood (Ihlanfeldt 1992: 59), youth tend to find jobs close to home. Third, workers with low degrees of specialization, such as youth, encounter more potential job vacancies in a certain geographical area than more specialized and older workers (Simpson 1980). Therefore, travel distances for youth tend to be short.

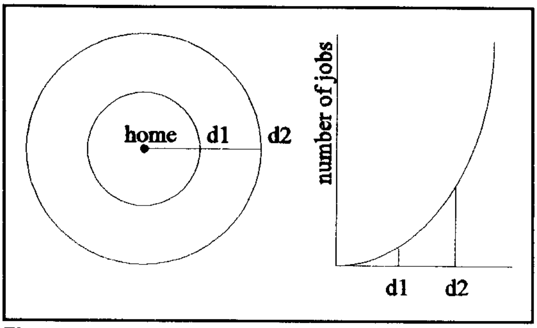

Figure 1: Travel-to-work Distance and Potential Number of Jobs

Previous literature has already examined

Model	Model - F	a	b	n	Chow - F	Description
All Youth	461.508*	.107*	-.727*	77		
by Race						
Blacks	77.789*	.107*	-.938*	34	.061*	Models structurally similar
Whites	244.038*	.107*	-.678*	61		
by Location						
Central City	15.594*	.045*	-.249*	33	1.370	Models structurally different
Suburbs	380.718*	.113*	-.742*	44		

* sig. at .01 confidence level

Note: Numbers of observations (combinations of work-PUMA and residence-PUMA) were different for blacks, whites, central city, and suburbs.

Table 1: Journey-to-work Regression Models for Youth

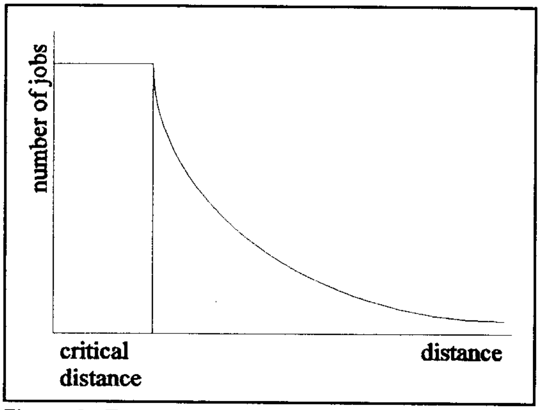

Figure 2: Travel-to-work Distance and Probability of Employment (see Getis 1969)

commuting differences between whites and minority groups and between central-city and suburban residential location. Commuting differentials were attributed to race and/or residential location (Wheeler 1968, Deskins 1972, Danziger and Weinstein 1976, McDonald 1981, Gordon et al. 1989, Kasarda 1989, Zax 1990, Cooke and Shumway 1991, McLafferty and Preston 1991, Holzer 1991, Holzer et al. 1994). Most of these studies (Wheeler 1986, Deskin 1972, Wilson 1979, Gordon et al. 1989, Holzer et al. 1994), however, relied on average travel time as a measure for commuting behaviour. Cooke and Shumway (1991) used a more sophisticated measure and estimated a probability distribution of travel times-to-work. They found that central-city residents have a low frequency of short commutes and a high frequency of long commutes compared to suburban residents. They conclude from these findings that central-city residents are spatially removed from jobs.

Problematic with these studies is the fact that employment accessibility has been directly linked to observed commuting behaviour. It was reasoned that if commuting distance/time was high, accessibility would be low and vice versa. However, it has never been entirely clear whether the observed commuting time/distance was a function of job accessibility or other variables not accounted for in the model, such as family and individual characteristics, attitudes, willingness to commute, and information about job openings. This paper controls for the uneven spatial distribution of employment; it compares commuting behaviour between black and white youth and between residential locations in a situation where everyone has similar spatial access to employment. If the distance-decay function differs among groups, then it must be the result of influences other than employment accessibility.

RESEARCH DESIGN

The analysis is restricted to youth who live with their parents, step-parents or

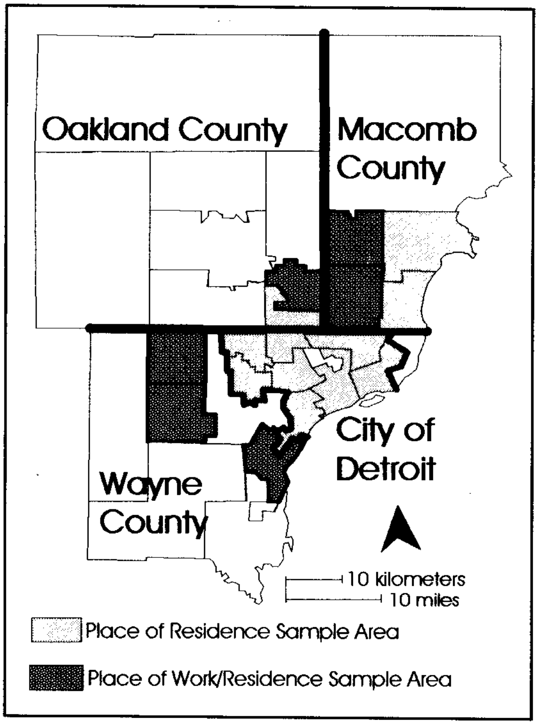

Figure 3: PUMAs in Tri-County Detroit

grandparents. This eliminates the possibility that a residential location was chosen after employment was acquired, assuming that these residences were not chosen according to the children's work place (refer to Ihlanfeldt 1992). On the basis of this assumption, commuting behaviour can be theorized as follows: If a youth has a fixed residential location, and if job opportunities are evenly distributed in space, then employment opportunities increase exponentially with distance from home as a function of increasing area. As Figure 1 shows, when the distance a youth is willing to travel to work increases from d1 to d2, then potential jobs that can be reached increases by a factor of $(d2/d1)^2$. Generally, commuting frequencies of youth should increase with commuting distance.

However, friction of distance counteracts the influence of increasing job opportunities with distance. Friction, in this case, reflects money and time spent on commuting; but also convenience of transportation and knowledge about the accessibility of an area with potential employment. For instance, people tend to be better informed about public transit links to an area that is closer to their home than to an area that is further away. The greater the force of friction, the less willing is a youth to commute a long distance.

It remains unclear whether a youth prefers long commutes to take advantage of the increasing job opportunities with distance from home or short commutes to avoid friction of travel. Getis (1969) studied travel-to-work patterns of the work force of a firm and found a zone surrounding the firm where frequency of residential location is independent of commuting distance. Beyond this isochrone of 'frictionless space' the number of residents who work at the firm declines sharply. When Getis' findings are applied to individuals with fixed residential locations, distance does not affect the distribution of employment within the critical isochrone. Beyond this boundary, however, the friction of distance diminishes the probability of someone working further away from home (Figure 2).

This paper investigates the distance decay of commutes while controlling for the uneven arrangement of employment within the metropolitan area. If jobs are evenly distributed throughout the metropolitan area, then distance-decay functions should not differ between central-city and suburban residents. Similarly, if jobs are evenly accessible for black and white youth, then their commuting behaviour should also be similar. Otherwise, if distance decay functions differ, other influences associated with race and/or residential location are responsible.

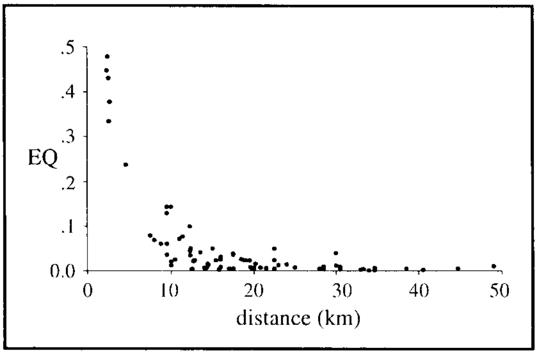

Figure 4: Distance Decay of EQ

The following hypotheses are established:

(a) There is a strong negative relationship between distance and commuting probability associated with the friction of travel.

(b) The distance decay of commutes are similar for blacks and whites if jobs are evenly distributed through space.

(c) The distance decay of commutes are similar for central-city youth and suburban youth if jobs are evenly distributed though space.

DATA

Journey-to-work data were taken from the 1990 5-percent Public-Use Microdata Sample-A (PUMS) for Michigan (US Bureau of the Census 1992). The analysis uses 3,318 individual records of employed youth between the ages of 16 and 25, without mobility or work limitation/prevention status, who are not in the armed forces or hold other military occupations. Only youth who live with their parents, step-parents or their grandparents were included.

The sample is geographically subdivided into so called Public Use Micro Areas (PUMAs) containing at least 100,000 persons. The data specify the PUMA of residence as well as the PUMA of work for every individual record. Commuting distance was measured between PUMA midpoints. If a youth lives and works in the same PUMA, the average distance between PUMA midpoint and PUMA boundary was used. High levels of data aggregation may distort journey-to-work patterns. Therefore, PUMAs covering large geographical areas were omitted to limit errors of the distance measurement. Seventeen PUMAs of residence and six PUMAs of work were selected within Detroit's Tri-County area (Figure 3). Unfortunately, places of work located within the central city of Detroit were not available by PUMA. This, however, should not affect the analysis since it is primarily concerned with the general distance decay function of commutes from a fixed residential location and not with the specific location of employment. There are 102 possible combinations of trips from one of the selected PUMAs of residence to one of the PUMAs of work. There was at least one observed commute in the microdata sample for 77 of these combinations. Information about the spatial distribution of employment throughout the metropolitan area was provided by the Summary Tabulations of the 1990 US Census of Population and Housing (US Bureau of the Census 1990). Census tracts were aggregated to approximate PUMA boundaries.

METHODOLOGY

A quotient is derived to capture the frequency distribution of trips from one PUMA to another, weighted to control for the uneven spatial arrangement of employment. A trip distribution ratio (TD) is computed from the observed distribution of trips between PUMAs to measure the proportional distribution of trips to a PUMA of work relative to the total number of youth residing in the PUMAs of residence. Each PUMA of residence has a unique distribution of trips to PUMAs of work. Hence, a value of TD is computed separately for each combination of PUMA of residence and PUMA of work, provided that there is at least one observed trip. TD is computed as follows:

(1) $$TD_{ij} = w_{ij} / w_{.j}$$

where: TD_{ij} is the trip distribution ratio of work-PUMA i and PUMA of residence j; w_{ij} is the number of youth commuting from j to i; $w_{.j}$ is the total number of working youth who reside in PUMA j.

Next, TD is adjusted to the uneven arrangement of employment. Each PUMA of work is weighted according to its proportion of the total number of jobs in all PUMAs of work. The weight is represented by an employment distribution ratio (ED), computed as follows:

(2) $$ED_i = e_i / \sum e_i$$

where: ED_i is the employment distribution ratio for area i; e_i represents the number of jobs in area i. Each PUMA has *one* distinct value for ED.

The trip distribution ratio is adjusted to the employment distribution ratio to produce an employment quotient (EQ), derived as follows:

(3) $EQ_{ij} = TD_{ij} / ED_i$

where: EQ_{ij} is the employment quotient for the ith PUMA of work and the jth PUMA of residence; TD_{ij} is the probability of a youth commuting from i to j (trip distribution ratio); ED_i represents the proportion of employment within PUMA i (employment distribution ratio).

EQ reflects the impact of friction on commuting probability. If the impact of friction is high, EQ will be low and vice versa. The plotting of EQ against the journey-to-work distance, in Figure 4, allows for examining the relationship between distance and friction.

ANALYSIS

Visual analysis of Figure 4 shows that the relationship between EQ and distance is not linear. However, it becomes clear that there is a strong negative relationship between distance and friction. Commuting probability rapidly declines as distance increases. This result supports Hypothesis (a). The friction of travel outweighs the exponential increase of potential jobs with increasing distance.

A double-log transformation of the distance variable achieved a close fit to the regression line and low error sum of squares. Thus, the following equation could be estimated:

(4) $EQ_i = a + b\ (\log \log D_i) + e_i$

where: EQ_i is the ith observed value of EQ; a is the intercept; b is the slope coefficient; D_i is the ith observed value of distance; e_i is the error term for observation i.

Different models were estimated for blacks and whites, and for central-city and suburban locations (Table 1). F-tests and t-tests examined the overall fit of the estimated equations to the observed values and the significance of the individual coefficients. The F and the t-tests revealed that all equations and their coefficients are significant at a one percent confidence level. Next, a Chow-test (Pindyck and Rubinfeld 1981) was used to compare the model for black youth with that for white youth and the model for central-city residents with that for suburban residents. The Chow-test gives an F-value for assessing whether two models are structurally similar or different. The results, presented in Table 1, show that the models for blacks and whites are not significantly different; black and white youth have, in accordance to hypothesis (b), structurally similar distance-decay functions. Structural differences, however, are significant between central-city and suburban residential locations. The distance decay of EQ is much greater for suburban youth (-.742) than for youth who live in the city of Detroit (-.249). Therefore, hypothesis (c) is rejected. Although the distribution of employment is controlled for, commuting differences remain between inner-city and suburban youth.

DISCUSSION

The results have shown that the impact of friction is independent from race, no matter where a person lives. Interestingly, variations in job search behaviour between black and white youth, as observed by Holzer (1987), do not affect commuting behaviour significantly; nor does the narrower geographical job search of young blacks (Wilson 1987, Kasarda 1989) have a significant impact.

In contrast, the rejection of hypothesis (c) indicates that commuting behaviour differs significantly between central-city and suburban residential location. The models have controlled for the uneven spatial distribution of employment. Uneven employment densities should therefore not impact distance-decay functions. Thus, these variation must be caused by other influences. Yet, the narrow specifications of the models do not allow for identifying the specific causes.

Paradoxically, after controlling for spatial employment distribution, the distance decay function remains steeper for suburban than for inner-city residents. This indicates that the friction of distance is stronger for suburban than for inner-city youth. This contradicts the general understanding that suburban youth are more mobile and have a wider perspective of the labour markets outside their own neighbourhood. Contrary, the results suggest that inner-city youth have less constraints to travel. These relative advantages may be associated with better transit links at inner-city locations. Further, the desire to work may be stronger among central-city youth due to overall lower household incomes. Thus, central-city youth may be willing to commute longer distances.

Nevertheless, considering the dramatic transformation of the distance variable (double log), the impact of friction remains very strong for both suburban and inner-city youth. Hence, once the assumption of even distribution of employment is relaxed, inner-city youth may well be disadvantaged with regard to finding a job, although they are slightly more willing and/or able to commute. It is beyond the scope of this paper to examine the balance between the disadvantage of labour market decentralization and the advantage of reduced friction of travel for inner-city youth.

CONCLUSION

This analysis provides evidence of factors associated with residential location that influence a youth's willingness and/or ability to commute. Generally, inner-city youth are more willing and/or able to overcome long travel distances to work than suburban youth. Furthermore, race is shown to have no effect on this distance-decay function.

Nevertheless, a weakness of this analysis is that it did not investigate the reasons for city-suburb differences in the distance-decay function. Influences may include better access to public transit, attitudes, perceptions of the labour market, or the stronger need to work among inner-city youth. The analysis also fails to establish a relationship between willingness and/or ability to commute and employment probabilities. Generally, inner-city youth may have an advantage over suburban youth due to their ability and/or willingness to commute longer distances. This relative advantage, however, may be more than offset by the uneven spatial arrangement of employment throughout the metropolitan area, which tends to favour suburban youth.

More insight into youth unemployment may be gained by using data of higher geographical resolution or other measures of distance. Future research should expand upon the model presented above to examine the causes of city-suburb variations of distance-decay functions and investigate the implications for youth employment.

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