IS POPULATION DECENTRALIZATION LENGTHENING COMMUTING DISTANCES?

Peter A. Morrison, Allan Abrahamse

December 1982

N-1934-NICHD

Prepared for

The National Institute of Child Health and Human Development
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Rand
SANTA MONICA, CA. 90406
This Note is a revision of a paper presented originally at the 1982 Population Association of America meetings in San Diego, April 29-May 1, 1982. The presentation draws on research supported by Center Grant P50-HD12639 from the Center for Population Research, National Institute of Child Health and Human Development, U.S. Department of Health and Human Services.
SUMMARY

This study examines how people's home-to-work commuting distances change when they migrate from metropolitan to nonmetropolitan areas. Findings relate to two contrasting suppositions about how workers are becoming repositioned in relation to their jobs as the U.S. population decentralizes: (1) that when metropolitan residents disperse beyond existing metropolitan boundaries, their jobs and homes become more separated, lengthening the average distance to work (the "sprawl" view); and (2) that nonmetropolitan communities enable workers to live closer to their jobs in these satellite employment centers, thereby shortening the average distance to work (the "nucleation" view).

Our empirical analysis of a small but well-defined sample of intercounty migrants furnishes suggestive evidence that the "nucleation" image fits more closely with the realities of how metropolitan-to-nonmetropolitan migrants typically position themselves in relation to their jobs. We find no indication that such migration is lengthening the aggregate distance that workers commute: Although a minority of such migrants do become long-distance commuters, their numbers are offset by a larger fraction who end up closer to their jobs. On average, then, the nonmetropolitan newcomers do not end up farther from work; moreover, the distribution of their new commuting distances at destination closely resembles that of the residents they have joined.

Inherent limitations of our data make these results tentative and subject to important caveats. The importance of our findings is that they cast doubt on one tenet of the conventional wisdom about the
nation's changing patterns of settlement: The assumption that migration out of metropolitan areas is yielding a more energy-intensive configuration of residences and job locations.
ACKNOWLEDGMENTS

The authors wish to thank Rand colleagues Tom Blaschke, Will Harriss, Jim Kakalik, Kevin F. McCarthy, Larry Painter, Joyce Peterson, and Dan Relles, and Frances E. Kobrin of Brown University's Population Studies and Training Center, all of whom aided in the conceptualization of this study or furnished helpful comments on earlier drafts.
I. INTRODUCTION

Over the last decade, national settlement patterns have changed considerably as people have moved out of large metropolitan centers. The dispersal of population to smaller urban centers and rural areas has generated an assumption that workers who move their households away from the metropolis typically engage in lengthy commutes to their jobs. This possibility raises a variety of social, economic, and political questions. For example, will this outward dispersal induce greater reliance on private automobiles and heighten consumption of energy for commuting? Will it leave commuters more vulnerable to any future fuel-supply "squeeze"?

If, as some assume, many workers who move to nonmetropolitan areas retain metropolitan jobs, then continued outward dispersal may well mean (1) longer-distance commuting to work on average, and (2) greater reliance on private automobiles (since most nonmetropolitan areas lack transportation alternatives to the family car). If, as others claim, workers generally change jobs as well as residences when they leave the metropolitan areas, dispersal may reduce aggregate commuting distances if it promotes clustering nearer to jobs in satellite employment centers. The result will be "nucleation" rather than "sprawl."

No one really knows whether contemporary migration from metropolitan to nonmetropolitan areas typically leaves workers farther from their jobs or closer. To find out, we analyzed data from a national sample of employed heads of families. These data showed the changes in the job-related commuting distances for people who made
particular types of intercounty moves during the 1970s. These moves included migration from one metropolitan county to another, from one nonmetropolitan county to another, from a metropolitan to a nonmetropolitan county, and vice versa.

Although our results have limitations, which we discuss later, they suggest a tentative answer: A small fraction of workers who migrate from metropolitan to nonmetropolitan areas do become long-distance commuters--if they settle in areas adjacent to the metropolis--but their numbers are offset by a larger fraction who end up closer to work. Overall, then, population dispersal is not lengthening the aggregate distance that workers commute. This finding is noteworthy because it casts doubt on at least one tenet of the conventional wisdom about settlement patterns--the assumption that migration out of metropolitan areas yields a more energy-intensive configuration of residences and job locations.

In the next section, we briefly review the findings from previous research about the link between settlement patterns and commuting distances and formulate our specific research questions. Section III describes the data set and our methodology. In Section IV, we present the findings of our study. Section V outlines the implications of those findings.
II. FINDINGS FROM PREVIOUS RESEARCH

Many demographic factors determine personal travel patterns, including where people live, where they work and how they get there, the household units into which they are grouped, and a household's stage in the family life cycle.[1] However, the links between these demographic factors and personal travel patterns are poorly understood, and data for studying them are sparse.[2] In this study, we focus on the distance between where people live and where they work—and how that distance may change when they migrate out, or completely away, from metropolitan areas.

Migration (which we define as a move from one county to another) is transforming U.S. settlement patterns in several ways:[3]

- Net migration flows are causing large metropolitan areas to lose and smaller metropolitan areas (particularly those of less than 500,000 residents) to gain population.
- Decentralization is creating widening zones of growth in nonmetropolitan counties that adjoin metropolitan areas.
- Population is clustering farther out in small, freestanding nonmetropolitan cities and towns beyond commuting range of metropolitan areas.

These changes are repositioning many workers in relation to their jobs. However, as the Introduction noted, opinions differ on how these changes in settlement patterns may affect personal travel patterns, especially commuting distances.[4] Beneath these differences, we can discern two implicit geometric images of settlement whose validity we shall partially test.

One possibility is that when people migrate from metropolitan to nonmetropolitan counties, their distance to work lengthens considerably, either because they retain metropolitan employment links or because jobs and people may be more thinly spread out in many nonmetropolitan settings. This image of "metropolitan sprawl" envisions some of the migrants commuting long distances back to jobs in the metropolitan areas they have left,[5] and long-distance commuting becoming increasingly common in nonmetropolitan areas.[6] Another possibility is that the contemporary pattern of settlement in nonmetropolitan areas outside commuting range of metropolitan centers may result in shorter commuting distances.[7] In this image of "nucleation," settlement patterns are evolving toward a polycentric form, consisting of many autonomous "miniature cities" beyond the fringes of metropolitan areas. This settlement pattern enables people to commute from home to a job nearby.

[5] In 1975, the mean one-way commuting distance of nonmetropolitan residents who worked in metropolitan suburbs was 25 miles, in contrast to the national average commuting distance of 8.5 miles. Source: U.S. Bureau of the Census (1979).
To date there is no conclusive evidence for either the sprawl or nucleation effects (either or both of which could operate). However, Bowles and Beale (1980a) show that more than four-fifths of workers who leave a metropolitan area for a nonmetropolitan one also have severed their former working ties within five years and taken jobs in the nonmetropolitan sector, a finding that would argue more for nucleation.[8] Their studies also show that nonmetropolitan residents travel a shorter median distance to work than their metropolitan counterparts do (4.6 vs. 7.6 miles). However, the distributions around these medians are noticeably different. Figure 1 displays certain of their findings, which indicate that the issue is more complicated than the medians alone might suggest.

Among workers who live outside metropolitan areas, a disproportionate fraction are concentrated in both the short-distance (under 5 miles to work) and long-distance (over 30 miles) categories, relative to workers living inside metropolitan areas. However, the few miles travelled by the many commuters who work close to home in nonmetropolitan areas evidently more than counterbalance the many miles travelled by the few who work far from home. Although this result foreshadows one of our central findings, the data used in the Bowles and Beale studies are inherently limited: They cannot reveal how a given individual's distance from work changes when he migrates, for example, from a metropolitan to nonmetropolitan area. Thus, these data cannot

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[8] Sly (1982) provides related evidence and an insightful discussion of the metropolitan setting. His evidence indicates that the more decentralized U.S. metropolitan areas have lower per-capita consumption of gasoline than the less decentralized ones. The implication here is that dispersal does not compel longer commuting and, therefore, more gasoline consumption.
disclose whether metropolitan out-migration is raising or lowering the medians shown in Fig. 1.

To extend this line of inquiry, we address the following research questions:

1. How do workers' commuting distances change when they migrate from metropolitan to nonmetropolitan counties? In particular, does that change depend on whether or not the latter are adjacent—that is, within commuting distance—to a metropolitan county?

2. Do commuting distances after migration vary by the type of intercounty move made?

3. Do the commuting distances of metropolitan-to-nonmetropolitan migrants differ from those of the nonmigrant residents they have joined?

**Fig. 1** — Distribution of commuting distances for workers living outside and inside metropolitan areas

**SOURCE:** Adapted from Bowles and Beale (1980 a)
III. DATA AND METHODOLOGY

DATA SOURCE

Our analysis is based on data from the University of Michigan Panel Study of Income Dynamics (PSID). The PSID is a longitudinal survey of a national sample of over 5000 U.S. families interviewed annually since 1968. We used data from the 12-year file of the PSID (extending from 1968 through 1979) and restricted our focus to workers who drove to work.\[1\] The PSID has two important advantages for this study: (1) its sample size is sufficient to generate adequate numbers of metropolitan-to-nonmetropolitan migrants; (2) it provides longitudinal coverage, allowing comparisons of individuals' distances to work before and after moves.

From the original sample of 4802, we selected the 3013 family heads in the first wave who were members of an interviewed family in the twelfth wave also. This sample comprises 63 percent of 1968 family heads; it excludes dropouts from the PSID and newly-formed families that "split off" from original families.

\[1\] For further details on sample design, interviewing and follow-up procedures, and response rates, see Institute for Social Research (1972).

Our choice to restrict the sample to drivers was dictated by technical considerations: The survey includes the distance to work for all family heads, regardless of travel mode, for waves 4 through 12. In wave 1, distance was not recorded at all; in waves 2 and 3, it was recorded only for those who drove to work. Thus, limiting the analysis to workers who drove greatly simplified the analysis. However, it probably excludes workers very close to their jobs, who might walk, and those very far from work, who might carpool.

Mode of travel to work is coded differently on different PSID waves but can be recoded consistently to distinguish those employed family heads who (1) drove alone or with a family member, (2) carpooled, (3) took public transportation, or (4) walked.
Based on year-to-year changes in the PSID county-of-residence code, we defined four types of intercounty migration:

- **Metro-metro**: A move from one metropolitan county to another, including both intermetropolitan moves and those intrametropolitan moves that merely cross a single county line.
- **Metro-nonmetro**: A move from a metropolitan to a nonmetropolitan county.
- **Nonmetro-metro**: A move from a nonmetropolitan to a metropolitan county.
- **Nonmetro-nonmetro**: A move from one nonmetropolitan county to another.

We further distinguished moves to nonmetropolitan counties according to whether or not the counties were adjacent to a metropolitan area.

The PSID dataset and our analytical procedures have several important limitations. First, because our sample contains only intercounty moves, we cannot examine potential changes associated with intracounty decentralization—that is, movement outward from urban centers to destinations within the same county. Second, we restricted our analysis to family heads who reported being employed and driving to work before and after a move. This leaves out heads who were temporarily unemployed or who commuted by some other mode.[2] Finally, the PSID is not a representative sample of all U.S. families. Rather, it is highly stratified and initially oversampled families with low incomes. Nevertheless, our sample represents a large, important group--

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stably employed workers who drive—somewhat overrepresenting the lower end of the income scale. We have no reason to suppose that our results would be drastically different if these limitations could be overcome.

**ANALYSIS**

For the analysis reported on here, we constructed two files, one describing actual moves (the "migration file"), the other describing comparable time segments without moves (the "nonmigration file"). For the migration file, we selected only the first identifiable migration of each type for each family head. We limited the file further to moves for which the prior and subsequent survey waves showed the family head driving to work and recorded the distance driven. Under this selection process, one family head could generate as many as four moves (one each of the four types shown below).[3] This procedure yielded a file consisting of 314 migrations:

<table>
<thead>
<tr>
<th>Type of Move</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro-metro</td>
<td>173</td>
</tr>
<tr>
<td>Metro-nonmetro</td>
<td>65</td>
</tr>
<tr>
<td>Nonmetro-metro</td>
<td>38</td>
</tr>
<tr>
<td>Nonmetro-nonmetro</td>
<td>38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>314</td>
</tr>
</tbody>
</table>

We next created the nonmigration file to enable comparisons between migrants' and nonmigrants' commuting distances. For each family head, we selected a pair of successive years (waves) at random and put them in

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[3] As an illustration, a family might have made two moves between metropolitan areas and two moves between nonmetropolitan areas, but only the first move of each type would be included in the migration file—a total of two rather than four moves.
the nonmigration file if they met the following criteria: (1) county of residence was unchanged, (2) the family head drove to work, and (3) distance to work was recorded. The resulting file contained 1077 pairs of consecutive years without migration (one for each family head). For our analysis, this file represents residents who drove to work but remained in a given metropolitan or nonmetropolitan area for two consecutive years:

<table>
<thead>
<tr>
<th>NONMIGRATION FILE</th>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metropolitan</td>
<td>829</td>
</tr>
<tr>
<td></td>
<td>Nonmetropolitan</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1077</td>
</tr>
</tbody>
</table>

For each type in the migration and nonmigration files, we computed the following statistics:

DIST1: Mean commuting distance before the move or nonmove
DIST2: Mean commuting distance after the move or nonmove
AVGINC: Mean of all before-after increases in distance
AVGDEC: Mean of all before-after decreases in distance
%INC: Percentage of cases with before-after increase
%DEC: Percentage of cases with before-after decrease

Appendix Table 1 shows these summary statistics for all migrants by type of move and for nonmigrants by location. In the next section, we highlight the findings relevant to our specific research questions.
IV. FINDINGS

The findings we present here derive from selected comparisons between (1) the commuting distances of metropolitan-to-nonmetropolitan migrants, before and after their moves, (2) commuting distances after migrations of different types, and (3) commuting distances of nonmetropolitan residents and of metropolitan-to-nonmetropolitan migrants joining those residents. These comparisons will test the plausibility of the views that outward migration from metropolitan areas produces "sprawl" or "nucleation" patterns of settlement.

CHANGES IN COMMUTING DISTANCES

How do workers' commuting distances change when they migrate from metropolitan to nonmetropolitan areas? Data on mean commuting distances suggest that they change very little. Within the pairs of pre- and post-migration distances shown in Fig. 2, the differences are modest, and most are not statistically significant.[1] The metropolitan-to-nonmetropolitan migrants end up driving about the same average distance after the move as before, with a faint indication that whatever change occurs may depend on whether or not the nonmetropolitan area chosen is adjacent to a metropolitan area.

[1]Tests of statistical significance were based on rank sum tests. We note only those differences that could be detected with significance of 5 percent or less.
POST-MOVE COMMUTING DISTANCES BY TYPE OF MOVE

Do commuting distances after migration vary by the type of move made? The answer to this question will offer clues to how the common features of destinations shape commuting distances. Fig. 3 shows the mean post-move commuting distances for several types of migrants. Migrants from metropolitan counties evidently end up closest to work (6 miles) when they move to nonmetropolitan counties not adjacent to any
metropolitan area. They end up farthest from work (14 miles) when they move to another metropolitan county (the difference between these two extremes is statistically significant). Nonmetropolitan migrants establish a similar pattern (although the difference is not statistically significant): They wind up commuting 7 to 8 miles after moving to another nonmetropolitan area and 12 miles if they move to a metropolitan area.
COMMUTING DISTANCES OF MIGRANTS AND RESIDENTS

Do the commuting distances of metropolitan-to-nonmetropolitan migrants differ from those of the residents they join?[2] In particular, are these migrants likelier than the residents to be long-distance commuters, suggesting that they have retained their metropolitan-area employment links? Fig. 4 presents the relative commuting distances of residents and metropolitan-to-nonmetropolitan migrants for various types of counties.

The key comparisons reveal no significant difference. Metropolitan migrants to nonmetropolitan counties are no farther from work, on average, than the nonmigrant residents they join—which they should have been if very many of them had actually retained jobs in their former metropolitan locations. As a more definitive test, we compared the distributions of distances to work for (1) the metropolitan migrants to adjacent nonmetropolitan counties and (2) the residents they join. Here again, evidence of long-distance commuting is absent: These distributions (shown in Fig. 5) are not significantly different from each other, and those workers who do commute long distances (in excess of 15 miles) are not disproportionately newcomers.

Thus far, the analysis has involved comparisons of means and distributions of distances to work—and as we have seen, they vary little for migrants and residents. However, when we compare the proportions of cases registering increases or decreases, and the mean

[2] The migrants, of course, become residents, but we use "resident" here to refer to nonmetropolitan family heads in our nonmigrant file, i.e., heads who have lived in the area for two consecutive years.
Fig. 4 — Comparative commuting distance for residents and metropolitan migrants to other counties, by type

distances of those changes, we can find important differences between migrants and residents, as shown in Fig. 6.

Among residents of all nonmetropolitan areas (see third bar from left), changes from year to year display a rough symmetry: there is about a 50-50 chance that residents will change their distance to work, and these changes average (plus or minus) 6 to 7 miles. Some of these changes may reflect year-to-year variations in respondents' reports, but
the rest will be genuine differences resulting from changes in workplace or intracounty changes of residence. In contrast, migrants to all nonmetropolitan areas (see fourth bar from left) show a distinctly asymmetric pattern: They are far likelier to shorten than to lengthen their commuting distance (60 percent vs. 28 percent); but, when they do lengthen it, the increase is a hefty 13 miles—twice that of the residents.
Fig. 6 — Changes in commuting distance for metropolitan migrants and other residents at destination

SOURCE: Panel Study of Income Dynamics data
Because so few migrants end up 13 miles farther from work on average and so many end up 7 miles closer, the effects offset each other. This offsetting effect produced our earlier observations that metropolitan-to-nonmetropolitan migrants travel about the same average distance before and after their move (Fig. 2) and about the same as the residents they join (Fig. 4).

The data in the right-hand panel of Fig. 6 also show an important difference between nonmetropolitan counties that are adjacent or nonadjacent to a metropolitan area. In both types of counties, the incoming migrants are far likelier to shorten than to lengthen their commute. However, the asymmetry of the change in commuting distance—larger increases than decreases—is confined to those migrants settling in adjacent counties. Their average increase is 17 miles (versus 10 miles for the residents) whereas their average decrease is only 8 miles (virtually identical to that of the residents).

According to this analysis, then, metropolitan-to-nonmetropolitan migration typically leads to shorter commuting, consistent with the "nucleation" image. However, a minority of the migration into counties adjacent to metropolitan areas does lead to much longer commuting, consistent with the "sprawl" image.
V. IMPLICATIONS OF FINDINGS

Using a small but well-defined sample of intercounty migrants, we have examined how people's commuting distances change when they migrate from metropolitan to nonmetropolitan areas. We find no indication that such migration is lengthening the aggregate distance that workers commute. Although a minority of such migrants do become long-distance commuters, their numbers are offset by a considerably larger fraction who end up closer to their jobs.

Our findings relate to the two contrasting views of what may be happening in the nation's nonmetropolitan areas. One is that when metropolitan residents disperse into the adjacent nonmetropolitan fringe, their jobs and homes become more separated, lengthening the journey to work. We find evidence of this "sprawl" effect, but it is atypical. Another view is that nonmetropolitan communities enable workers to live closer to their jobs in these satellite employment centers, thereby shortening distances to work. This "nucleation" image fits more closely with the realities of how metropolitan-to-nonmetropolitan migrants typically position themselves in relation to their jobs.

Inherent limitations of our data make these results tentative and subject to important caveats. The importance of our findings is that they cast doubt on one tenet of the conventional wisdom about the nation's changing settlement patterns: The assumption that migration out of metropolitan areas is yielding a more energy-intensive configuration of residences and job locations.
Appendix Table 1
SUMMARY STATISTICS FOR MIGRANTS BY ORIGIN AND DESTINATION, AND FOR NONMIGRANTS BY LOCATION

<table>
<thead>
<tr>
<th></th>
<th>DIST1</th>
<th>DIST2</th>
<th>AVGINC</th>
<th>AVGDEC</th>
<th>%INC</th>
<th>%DEC</th>
</tr>
</thead>
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<td>MIGRANTS</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>N</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>All counties</td>
<td>All counties</td>
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<td>12.1</td>
<td>11.0</td>
<td>10.4</td>
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<tr>
<td></td>
<td>Metro</td>
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<td>12.2</td>
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<td>11.3</td>
<td>11.8</td>
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<tr>
<td></td>
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<td>9.7</td>
<td>8.5</td>
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<td>8.5</td>
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<td></td>
<td>Adjacent nonmetro</td>
<td>56</td>
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<td>6.6</td>
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<td>All nonmetro</td>
<td>All counties</td>
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<td>Adjacent nonmetro</td>
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<tr>
<td></td>
<td>Metro</td>
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<td>8.4</td>
<td>12.3</td>
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<tr>
<td></td>
<td>All nonmetro</td>
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<td>5.9</td>
<td>14.3</td>
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<tr>
<td></td>
<td>Adjacent nonmetro</td>
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<td>23.6</td>
<td>12.3</td>
<td>1.3</td>
<td>23.8</td>
</tr>
<tr>
<td></td>
<td>Nonadjacent nonmetro</td>
<td>14</td>
<td>4.7</td>
<td>7.3</td>
<td>7.9</td>
<td>4.8</td>
</tr>
</tbody>
</table>

NONMIGRANTS

|       | UNCHANGED LOCATION | N   |        |        |      |      |
|-------|---------------------| N   |        |        |      |      |
| All counties | Metro     | 1077 | 10.2  | 10.5  | 6.2  | 5.5  | 29.3 | 27.0 |
|           | All nonmetro | 829  | 10.1  | 10.6  | 6.0  | 5.3  | 31.2 | 26.4 |
|           | Adjacent nonmetro | 248  | 10.5  | 10.3  | 7.0  | 6.0  | 23.0 | 29.0 |
|           | Nonadjacent nonmetro | 135  | 9.7   | 8.9   | 3.8  | 4.2  | 19.3 | 34.8 |

NOTE: N = number of pairs of successive years; DIST1 = mean commuting distance before the move or nonmove; DIST2 = mean commuting distance after the move or nonmove; AVGINC = mean of all before-after increases in distance; AVGDEC = mean of all before-after decreases in distance; %INC = percentage of cases with before-after increase; %DEC = percentage of cases with before-after decrease.

SOURCE: Panel Study of Income Dynamics data.
REFERENCES


