

Transportation Access, Residential Location, and Economic Opportunity: Evidence From Two Housing Voucher Experiments

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Abstract

Access to automobiles may be particularly important to housing voucher recipients, who are more likely than residents of public housing to live in suburban neighborhoods where transit service is often limited. Access to high-quality public transit is more likely to benefit low-income households who live in dense central-city neighborhoods in close proximity to employment. In this analysis we draw on survey data from two housing voucher experiments—the Moving to Opportunity for Fair Housing and Welfare-to-Work Voucher programs—to examine the relationship between access to automobiles and public transit and the employment and earnings outcomes of program participants.

Our research underscores the importance of automobiles in achieving desirable outcomes for families who receive subsidized housing. Access to automobiles is associated with improved economic outcomes for all program participants and better facilitates job acquisition, job retention, and earnings than public transit. Our findings suggest the need to better link housing and transportation programs and to pursue a set of policies that increase automobile access among all subsidized housing recipients.

Introduction

In the 1990s and early 2000s, the U.S. Department of Housing and Urban Development (HUD) sponsored two major housing voucher experiments to assess whether low-income families

benefited from living in lower poverty neighborhoods—either through improved neighborhood conditions or better economic and health outcomes. Launched in 1994, the first of these experiments, the Moving to Opportunity (MTO) for Fair Housing program, was designed to move low-income families from high-poverty to lower poverty neighborhoods. In 1999, Congress initiated the Welfare-to-Work Voucher (WtWV) program, another tenant-based housing voucher program. This second experiment aimed to help families who received or were eligible to receive welfare to transition from public assistance into the labor market. Combined, these two programs produced experimental data (with treatment and control groups) for voucher participants in 10 major U.S. metropolitan areas: Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Los Angeles, California; and New York City, New York (from MTO); and Atlanta, Georgia; Augusta, Georgia; Fresno, California; and Houston, Texas (from WtWV).¹

To date, transportation has not been a major focus of the research related to housing vouchers. Yet, evidence is growing that shows transportation—particularly access to automobiles—shapes the residential location choices and the economic outcomes of low-income households. Automobiles and high-quality public transit services can enable participants to better search for housing as well as provide improved access to potential employment, services, and other opportunities within a reasonable travel time.

Transportation was the focus of the research reported in *Driving to Opportunity: Understanding the Links among Transportation Access, Residential Outcomes, and Economic Opportunity for Housing Voucher Recipients* (Pendall et al., 2014) a project funded through HUD's Sustainable Communities Research Grant Program.² The research on voucher users, cars, and neighborhood sustainability is summarized in an article included as part of this symposium (Pendall et al, 2015). In this article, we review the major findings of our research on the role of transportation in influencing the employment outcomes of housing voucher program participants.³ We draw on survey data from the two voucher experiments and supplement those data with information on the characteristics of the neighborhoods in which program participants live, including their access to public transit. We then use statistical models to examine the relationship between transportation measures (access to automobiles and public transit availability) and two outcome measures (employment and earnings) controlling for other potential determinants of these outcomes. As one of our control measures, we include experimental group status: whether participants were in the experimental, control, or—in the MTO experiment—the Section 8 group.

Our findings underscore the role of automobiles in achieving desirable outcomes for all subsidized housing recipients. Access to automobiles is associated with improved economic outcomes for all program participants and facilitates job acquisition, job retention, and earnings better than public transit. Being part of the experimental group of these programs and moving to lower poverty neighborhoods did not improve participants' employment outcomes alone or in combination with

¹ Although Los Angeles also hosted a WtWV demonstration, no followup data were collected in that metropolitan area; therefore, we exclude it from our experimental sample.

² The principal investigators on the larger project (Pendall et al., 2014) were Rolf Pendall (Urban Institute), Casey Dawkins (University of Maryland), and Evelyn Blumenberg (University of California, Los Angeles). See <http://www.urban.org/UploadedPDF/413078-Driving-to-Opportunity.pdf> for the final report and the full list of authors.

³ The full analysis and findings from this research are extensive and appear in multiple articles published in other journals.

transportation. The reason for this null effect may reflect that participants (1) spent relatively little time in lower poverty neighborhoods and (2) had inadequate transit service in these neighborhoods. Most, if not nearly all, MTO households eventually moved back into higher poverty neighborhoods and thus spent a significant amount of time during the course of the experiment in neighborhoods with poverty rates higher than 10 percent, the program's target threshold. For instance, during the 1994-to-2010 period, even households that successfully leased up within the MTO experimental group were exposed to an average degree of poverty of 19 percent, much higher than the 10-percent target. Program households did not necessarily experience less access to transit than the general population. Rather, we suggest that overall transit levels were insufficient to viably support stable economic outcomes among low-income families.

Our analyses point to several implications for future research and data collection efforts, possible improvements in voucher mobility programs, and strategies for coordinating housing and transportation policies in ways that enhance economic opportunity for low-income households. We conclude by proposing the following five strategies—

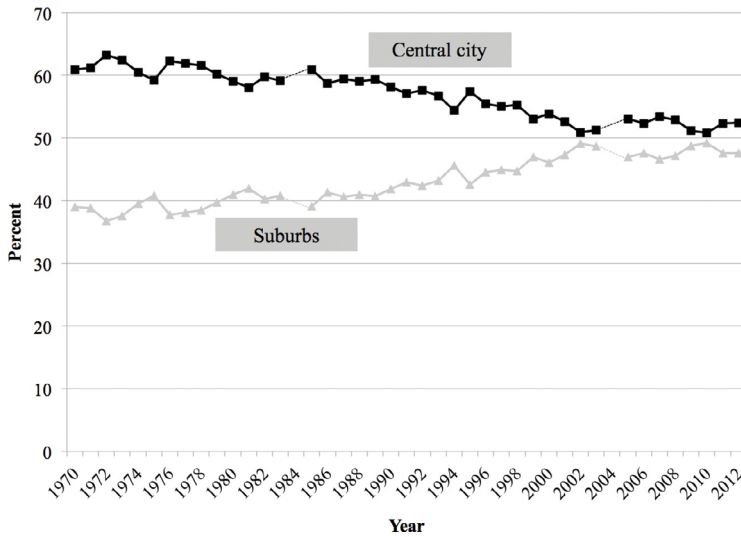
1. Better link housing subsidy and automobile programs.
2. Adopt policies and programs to increase low-income households' access to automobiles.
3. Improve transit in dense urban areas where origins and destinations are reasonably proximate.
4. Strengthen coordination between government transportation and housing programs.
5. Collect better data and conduct additional research on assisted tenants and their access to working automobiles and public transit.

Residential Location, Transportation, and the Poor

In U.S. metropolitan areas, over time, households and employment have dispersed, elevating the importance of automobiles in accessing regional opportunities. Less than two-fifths of the U.S. metropolitan population lives in the central city, defined by the Census Bureau as the principal cities of metropolitan areas (U.S. Census Bureau, 2012). Low-income families, those with incomes that are less than the federally designated poverty line, have also suburbanized (Holliday and Dwyer, 2009; Kneebone and Garr, 2010; U.S. Census Bureau, 2012). As exhibit 1 shows, only a slight majority of the metropolitan poor (52 percent) remain in central-city neighborhoods, motivated by the availability of affordable housing and—for those without automobiles—access to relatively high levels of public transit service (Glaeser, Kahn, and Rappaport, 2008; U.S. Census Bureau, 2012). This pattern will likely continue. As Kneebone and Berube found, between 2000 and 2011, the number of poor families grew twice as fast in the suburbs as in the large cities that anchor them (Kneebone and Berube, 2013). At the same time, employment dispersed. Only 23 percent of employees in the 100 largest metropolitan areas in the United States now work within 3 miles of the central business district. By contrast, 43 percent of workers commute to locations more than 10 miles away from the city center (Kneebone, 2013). Although the dispersal of employment slowed in most metropolitan areas during the recent recession, it did not reverse (Kneebone, 2013).

Exhibit 1

Central City Versus Suburbs, Residential Location of Metropolitan Poor, United States, 1970–2012



Sources: U.S. Census Bureau (various years); Current Population Survey

Proponents of the “spatial mismatch hypothesis” contend that low-income residents have stayed behind in urban areas and are thus now disconnected from suburban employment opportunities. The weight of the evidence suggests that the spatial mismatch contributes to high levels of joblessness, particularly among African-American men (Gobillon, Selod, and Zenou, 2007; Ihlanfeldt and Sjoquist, 1998). Spatial access to opportunities is also a source of concern for low-income families living in the suburbs, where both residents and employment opportunities are dispersed and transit service is limited. Using data for Boston, Shen (2001) found that less-educated jobseekers in the central city have *better* access to jobs than those who live in the suburbs, because job opportunities for less-educated workers remain spatially concentrated in central-city neighborhoods. In Cleveland, Gottlieb and Lentnek (2001) found that residents of a Black suburb had longer commutes than residents of a White suburb. Their results showed that residents in African-American suburban neighborhoods had better access to skill-appropriate employment; however, many had difficulty finding local jobs and, therefore, commuted long distances into the central city. Overall, low-income suburban families tend to live in areas with a below-average number of jobs (Raphael and Stoll, 2010). Finally, suburban residents have less access to public transit. In their analysis of access to public transit in the largest 100 metropolitan areas, Tomer et al. (2011) concluded that, although 94 percent of city residents live in neighborhoods served by transit, only 58 percent of their suburban counterparts do.

A number of scholars, however, assert that rather than facing the classic “spatial mismatch,” low-income, inner-city residents suffer from a modal mismatch, a drastic divergence in the relative advantage between those who have access to automobiles and those who do not (Blumenberg and Ong, 2001; Grengs, 2010; Kawabata, 2003; Ong and Miller, 2005; Shen, 1998; Taylor and Ong, 1995; Wyly, 1998). In nearly all metropolitan areas, individuals lacking reliable access to

automobiles can reach far fewer opportunities within a reasonable travel time compared with those who travel by car (Benenson et al., 2011; Blumenberg and Ong, 2001; Grengs, 2010; Kawabata, 2009; Kawabata and Shen, 2007, 2006; Ong and Miller, 2005; Shen, 2001, 1998). Even in cities considered to have ample transit service, such as Boston and San Francisco, average transit travel times remain much longer than automobile travel times (Kawabata and Shen, 2007; Shen, 2001). Long transit travel times result from walks to and from transit stops, waits at stops and for transfers, slower travel speeds, and frequent vehicle stops along the way.

Because automobiles provide an access advantage, traveling by car greatly improves outcomes for low-income and minority adults. Traveling by automobile makes it easier to search for and commute regularly—and reliably—to jobs and, in so doing, increases employment rates. Employment conversely can provide households with the necessary resources to purchase automobiles; income is one of the strongest correlates of automobile ownership (Blumenberg and Pierce, 2012). Yet, the importance of automobiles to employment persists even in studies that control for the simultaneity of the car ownership and employment decision (Baum, 2009; Cervero, Sandoval, and Landis, 2002; Gurley and Bruce, 2005; Lucas and Nicholson, 2003; Ong, 2002; Raphael and Rice, 2002; Sandoval, Cervero, and Landis, 2011).

Transportation is one of the largest expense categories for American families—in most cases, second only to housing (Lipman, 2006). Yet, over time, automobile ownership has become nearly ubiquitous, even among the poor. Data from the 2010 American Community Survey of the U.S. Census show that nearly 80 percent of adults with household incomes below the poverty line lived in a household with a vehicle, an increase from slightly more than 50 percent in 1960 (Ruggles et al., 2010). Yet, some low-income individuals face barriers to automobile access. As of 2010, more than 6 million poor adults lived in households without automobiles. Many of these adults still travel by car, either via carpooling with others or by borrowing vehicles. For example, in 2010, 30 percent of low-income adults in households without automobiles traveled to work by private vehicle (Ruggles et al., 2010). A slightly higher percentage (35 percent) commuted by public transit, suggesting that proximity to transit services was essential to their mobility. Writing 20 years apart, LeRoy and Sonstelie (1983) and Glaeser, Kahn, and Rappaport (2008) asserted that the presence of public transit largely explains the concentration of low-income households in the central city. In fact, Glaeser, Kahn, and Rappaport (2008: 2) found that “public transportation is two to three times more important than the income elasticity of demand for land in explaining the central location of the poor.”

Despite evidence for the importance of public transit to low-income families, previous studies have, at best, found small, positive effects of transit access on economic outcomes. Some studies showed that public transit access increases the employment rates for residents—particularly those without cars—who live in close proximity to transit stops (Kawabata, 2003; Ong and Houston, 2002; Sanchez, 1999; Yi, 2006). By contrast, in their study of welfare recipients in six major U.S. metropolitan areas, Sanchez, Shen, and Peng (2004) concluded that access to fixed-route transit and employment concentrations showed virtually no association with the employment outcomes of welfare recipients. The few studies that directly compare the relative benefits of cars and public transit found that automobiles better facilitate job acquisition and job retention than does public transit (Cervero, Sandoval, and Landis 2002; Gurley and Bruce, 2005; Sandoval, Cervero, and Landis, 2011).

Transportation and Subsidized Housing Recipients

Existing studies—although few in number—suggest that transportation is essential to the initial use and long-term utility of housing vouchers used outside of public housing projects. Limited access to automobiles and characteristics of the transit system hinder the ability of some voucher households to find suitable units (“lease up”). The lack of an automobile greatly restricts the neighborhoods in which families search for housing (Clampet-Lundquist, 2004; Popkin and Cunningham, 1999). One participant in a Chicago study stated—

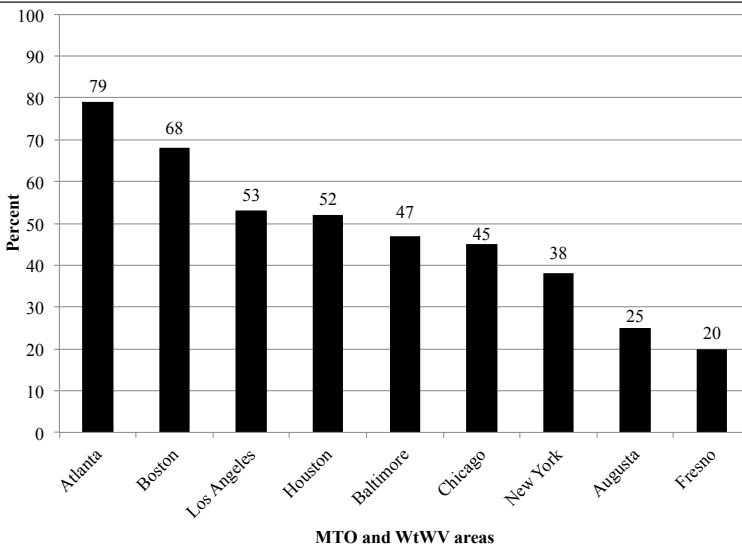
You only have a small percentage that is finding a decent place, either it’s way out in the suburbs someplace, if you don’t have a car, you don’t have access to transportation, that’s not convenient enough for you. (Popkin and Cunningham, 1999: 15)

Searching for housing units can be difficult, made more so by the use of public transit. Some of the transit-related barriers include the cost of transit fares, long travel times, and concern with the safety of transit travel to “unfamiliar locations, particularly in the evening” (Popkin and Cunningham, 1999: 16).

The reliability of transportation can also influence residential stability after the initial move. Like low-income households, housing voucher recipients have suburbanized over time. As of 2008, nearly one-half (49.4 percent) lived in the suburbs (Covington, Freeman and Stoll, 2011). Data assembled in Covington, Freeman and Stoll (2011) showed that 48 percent of housing voucher recipients in the MTO and WtWV metropolitan areas live in the suburbs. Significant disparities exist across metropolitan areas, however. As exhibit 2 shows, in Atlanta, 79 percent of housing

Exhibit 2

Percent of Housing Voucher Recipients Living in the Suburbs, 2008



MTO = Moving to Opportunity. WtWV = Welfare-to-Work Voucher.
Source: Covington et al. (2011)

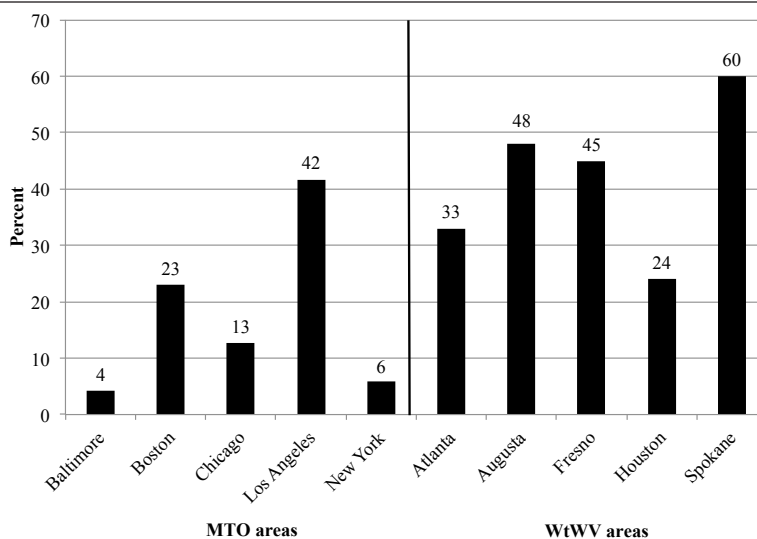
voucher recipients lived in the suburbs compared with Fresno, where only 20 percent lived in the suburbs. In general, housing voucher recipients are more likely than other households to live in low-income suburbs with inferior access to jobs (Covington, Freeman and Stoll, 2011).

Voucher users tend to be more decentralized than project-based housing residents (Turner, 1998) and, therefore, among subsidized housing residents, are more likely to live in neighborhoods with lower levels of transit service. Studies show that MTO participants who moved to lower poverty neighborhoods often found themselves far from bus stops and in neighborhoods where buses ran infrequently; as a consequence, many residents had difficulty reaching jobs by public transit (Briggs, 2005; Turney et al., 2006 ; Turney, Kissane, and Edin, 2012). For example, Turney, Kissane, and Edin (2012) demonstrate that moves to low-poverty neighborhoods increased participants' stress, partly because of their greater distance from public transportation.⁴

When comparing participants from both the WtWV and MTO programs with the general low-income population, we find that the prevalence of car access—at least at the beginning of each of the voucher experiments (baseline)—was low. Automobile access was much higher at baseline for WtWV participants than for MTO participants, however, 40 percent compared with 18 percent. Data from the 1990 census for these 10 metropolitan areas showed that 53 percent of poor adults live in households with automobiles (Ruggles et al., 2010). Exhibit 3 shows these data by voucher program and metropolitan area. At baseline, automobile ownership rates were highest in Spokane and lowest in Baltimore and New York.

Exhibit 3

Automobile Access at Baseline by Area and Voucher Program



MTO = Moving to Opportunity. WtWV = Welfare-to-Work Voucher.

⁴ By contrast, in their study of welfare recipients in Cleveland, Bania, Coulton, and Leete (2003) found that, compared with those living in more traditional project-based public housing, welfare leavers who receive housing vouchers are more likely to be employed closer to their homes, to have shorter estimated commutes, and to be better connected to their first jobs by direct bus routes.

Differences across the two programs are most likely attributable to variation in the socioeconomic status of participants in the two programs and the difference in program timing. WtWV program participants had higher incomes than participants in the MTO program and, therefore, many more had the resources to purchase vehicles. Moreover, in terms of timing, the WtWV program was implemented after the MTO program at the same time when automobile ownership rates were increasing among all low-income families. The WtWV program also was adopted in the immediate aftermath of welfare reform. As part of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, the federal government abolished federal vehicle asset limits that had been set at \$1,500. This change prompted many states to relax their vehicle asset requirements. By 1999, 26 states allowed welfare families to own at least one vehicle without losing their eligibility for benefits (Urban Institute, 2006). Although the evidence is mixed, some studies show that lifting the vehicle asset limitation—at least in some benefit programs—results in higher vehicle ownership (Hurst and Ziliak, 2006; McKernan, Ratcliffe, and Nam, 2008; Sullivan, 2006).

The variation in automobile ownership across metropolitan areas may be due to broader differences in the availability of public transit. Exhibit 4 includes data on transit use and coverage for the 10 metropolitan areas. The MTO program was implemented in Baltimore, Boston, Chicago, Los Angeles, and New York City, relatively transit-rich metropolitan areas. In fact, nearly one-half of all

Exhibit 4

Public Transit in MTO and WtWV Metropolitan Areas

Program Location	PUMS (2000)		Brookings Institution Data		National Transit Database (2012)
	Percent of Commuters Using Transit	Percent of All U.S. Transit Commuters	Transit Coverage ^a (higher is better)	Service Frequency ^b (lower is better)	Percent of All Unlinked Trips
MTO					
Baltimore	6	1	68	7.7	1
Boston	14	4	69	8.9	4
Chicago	12	8	79	7.2	6
Los Angeles	7	4	96	6.2	6
New York	45	29	90	4.5	40
WtWV					
Atlanta	4	1	38	10.2	1
Augusta	1	0	30	27.9	0
Fresno	1	0	72	10.7	0
Houston	4	1	44	7.3	1
Spokane	3	0	NA	NA	0
U.S. total (in thousands)		5,835			10,352,177

MTO = Moving to Opportunity. NA = data not available. PUMS = Public Use Microdata Sample. WtWV = Welfare-to-Work Voucher.

^a Percent of working-age residents near a transit stop.

^b Median wait time for a vehicle in minutes.

Sources: 2000 PUMS (Ruggles et al., 2010); Torner et al. (2011); National Transit Database (Federal Transit Administration, 2012)

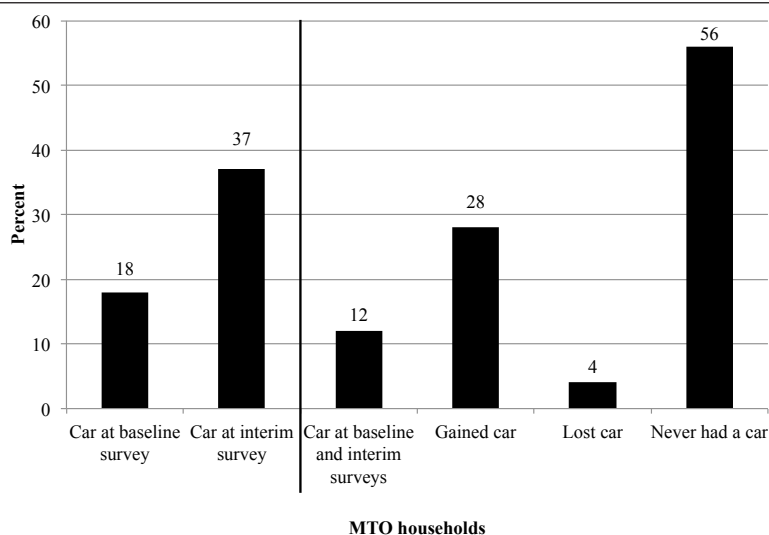
transit commuters in the United States live in these five metropolitan areas, and 29 percent of those live in New York City. The picture is even starker when we include all trips, not just the journey to work; nearly 60 percent of all transit trips occur in the MTO areas. By contrast, only 2.5 percent of all transit commuters and 2.0 percent of all trips are in the WtWV program areas—Atlanta, Augusta, Fresno, Houston, and Spokane.

Longitudinal data from the MTO program enable us to examine transitions in automobile access between the baseline and interim surveys. In other words, we analyze household transitions related to automobile ownership, including (1) having no car at both surveys, (2) gaining a car between the baseline and followup surveys, (3) losing a car between the baseline and followup surveys, and (4) having a car at both surveys. It is unfortunate that in the WtWV followup survey, the automobile question was asked overwhelmingly of respondents who indicated that they were employed but not of respondents who indicated they were unemployed. Because we do not have followup automobile data for all participants, we were unable to capture transitions in automobile access with full confidence.⁵

As indicated in exhibit 5, the MTO data show a rapid increase over time in automobile access. At baseline, 18 percent of MTO households had a car, but this figure increased to 37 percent at the time of the interim survey. Census data for adults in poverty in these 10 metropolitan areas also show increasing automobile ownership rates over time, although the rates are not as dramatic as in the MTO sample. In 1990, 53 percent of poor adults lived in households with cars; this rate increased to 58 percent in 2000 and 65 percent in 2010 (Ruggles et al., 2010).

Exhibit 5

Automobile Transitions, MTO Program



MTO = Moving to Opportunity.

⁵ To further explore this relationship between automobile access and employment, we tested our hypotheses using the limited data on automobile access at the followup survey. The direction of change in vehicle access appears strongly associated with the direction of change in employment in this limited sample.

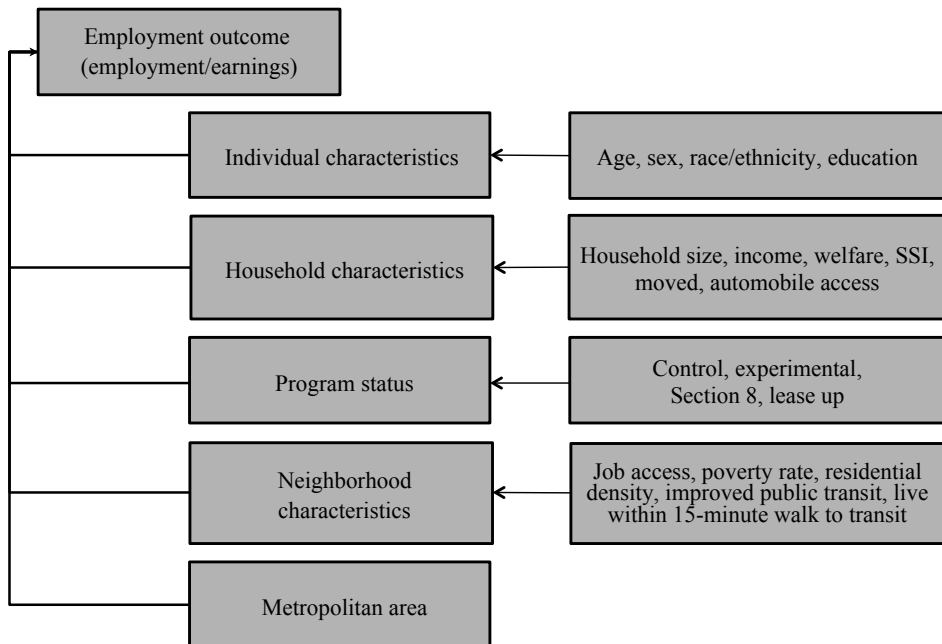
Transportation and Economic Outcomes

In a series of statistical models, we examined the determinants of employment and earnings among program participants. We had two hypotheses. First, we anticipated that access to high-quality transportation—automobiles or public transit—would be positively related to better employment outcomes. Second, as we noted previously, we hypothesized that the relationship between automobile access and employment outcomes would be stronger for participants with vouchers because they would be more likely to live in neighborhoods with less access to public transit. Exhibit 6 presents a basic schematic of expected relationships. Based on the broader literature, we anticipate that the employment outcomes of participants in the voucher experiments will be shaped by five different categories—individual characteristics, household characteristics, program status, neighborhood characteristics, and metropolitan area (geographic location).

Most of the control variables are derived directly from the MTO baseline and interim surveys. For example, in the baseline and interim surveys, households were asked whether they had a functioning car. We use administrative records attached to the interim dataset to determine whether the household had leased up or moved by the interim survey. We supplemented the information on individuals and their households with data on public transit service in the neighborhoods in which program participants lived. A census tract identifier enabled us to match the survey data to census tract-level data on public transit from The Brookings Institution. Between May 2009 and February

Exhibit 6

Determinants of Employment Outcomes



SSI = Supplemental Security Income.

2011, researchers at The Brookings Institution collected data on the routes, schedules, and stops for 371 agencies located in the 100 largest metropolitan areas. They combined these data with employment data to develop a number of different measures of transit access, including the number of jobs available in a 30-minute transit trip from a given census tract.

We briefly summarize our results on employment and earnings in the following sections.

Employment Results

Our research suggests that access to a car makes a big difference in program participants' employment outcomes.⁶ In the MTO sample, gaining a car between the baseline and interim surveys is strongly correlated with finding employment and with remaining employed between the two surveys. Participants who have a car at the time of both surveys are similarly more likely to be employed. Having a car raises the probability of finding a job by a factor of two and of being employed at the time of both surveys by a factor of four. In a similar way, in the WtWV sample, access to an automobile has a significant, positive effect on the likelihood of adults making the transition from unemployment to employment and remaining employed at the time of the two surveys. The model indicates that automobile access is the most important determinant in remaining employed across both waves of the survey.

Transit appears to play less of a role, although it can be important. For MTO participants, improved transit access is not a significant factor in finding employment; however, it appears to be the most important factor associated with being employed at both time points. Moving to a neighborhood with better transit between baseline and interim and living within 15 minutes of a bus stop both raise the probability of having consistent employment by a factor of fourteen. Among WtWV participants, improved transit between baseline and followup surveys is not significantly related to employment outcomes.

As other studies have shown, being part of the experimental group has no discernible effect on participants' ability to find or keep work. Successful lease up (moving to a lower poverty neighborhood) also has no discernible effect on employment outcomes. In addition, we tested the interaction between program status and automobile use, but this variable was not significant. This finding suggests that car access is important to all low-income adults, even those who remain in high-density urban neighborhoods where transit service tends to be highest.

Finally, to test the hypothesis that the quality of transit service matters, we explored whether a relationship—or interaction—was present between our public transit measure and metropolitan area. In other words, might there be a positive effect of public transit on employment outcomes in metropolitan areas that provide more extensive transit service? Indeed, we find some variation by metropolitan area. Relative to program participants in Atlanta, moving to richer transit neighborhoods has a negative effect on employment for participants in the other WtWV metropolitan areas. Although tentative, this finding suggests that public transit may be more effective in connecting low-wage workers to employment opportunities in some metropolitan areas than others. These results should be interpreted with caution as the sample sizes for participants who moved to richer

⁶ These models and analyses for MTO participants are published in Blumenberg and Pierce (2014).

transit neighborhoods in some of the metropolitan areas, particularly Spokane, are quite small. Moreover, relative to Augusta, Fresno, and Spokane but comparable with Atlanta, Houston has a more developed transit network, yet the interaction term indicates transit plays less of a role there.

For both programs, we find no evidence that the experimental housing treatment and use of the treatment (successful lease up) have any effect on employment outcomes. This finding reflects the complex link between housing choice and economic outcomes and the difficulties in implementing the programs. By contrast, the link between private transportation assets and economic outcomes appears robust. Car access is associated with all positive employment outcomes in the WtWV sample, and it is associated with job retention and gain among MTO participants. Having a car at the baseline survey and gaining employment by the time of the followup survey suggests that the automobile likely preceded the job and, therefore, contributed to getting the job. This sequencing may be reversed, however. We cannot completely rule out the possibility that, for some participants, the job preceded the car purchase. Nor can we rule out the possibility that automobile access is associated with other factors that make employment more likely, such as skill or motivation.

Transit outcomes differ across the two programs, perhaps because of the relative size of the metropolitan areas included in each experiment. Transit is not positively related to employment for WtWV participants, but it is associated with job retention (but not transitions to employment) in the MTO sample. Taking the evidence from the two experiments together, the relationship between car access and employment is strongly positive, the relationship between transit and employment is mixed, and the effect of housing vouchers on employment is not borne out.

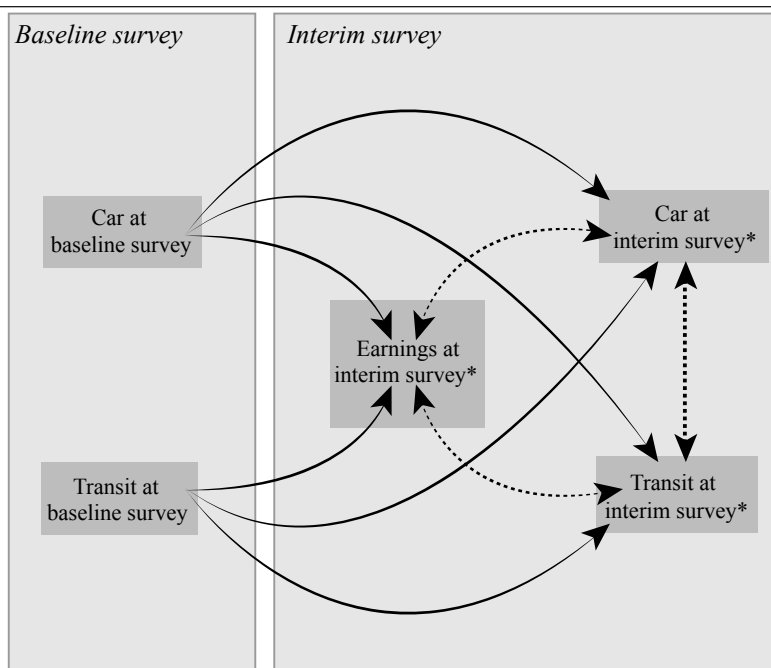
Earnings Results

We also use the longitudinal data from the MTO program to examine the role of transportation in improving earnings outcomes for MTO households. In this research, we analyze the relationship between automobile ownership, residential location in transit-rich neighborhoods, and earnings. Again, similar to our interest in employment models, we are also interested in the effect of program status (being in the experimental group) itself on all three of these outcomes. Because we expect that the relationships among these outcomes are themselves interrelated, we employ structural equation modeling (SEM), which enables us to posit more complex, interrelated pathways of causation than would other modeling approaches.

Exhibit 7 depicts our SEM modeling approach. Our conceptual model rests on the assumption that access to transportation resources—cars and high-quality public transportation—can increase an individual's probability of employment and enhance earnings by expanding the geographic scope of the individual's job search and by improving punctuality and reliability. In the U.S. context, however, the two transportation options we examine—cars and transit—are typically substitute goods for the journey to work. Therefore, we expect that individuals—particularly low-income individuals looking to economize—would make tradeoffs in selecting between the two. We thus expect car ownership and transit richness to be both positively associated with earnings and negatively associated with one another. We further expect car ownership to be more strongly associated with earnings than with transit access, an assumption consistent with previous studies (Cervero, Sandoval, and Landis 2002; Gurley and Bruce, 2005; Sandoval, Cervero, and Landis, 2011).

Exhibit 7

Overview of the Structural Equation Modeling Approach



* Also controlled for randomization group, race/ethnicity, age, sex, and employment at baseline survey. The earnings submodel includes additional controls for years of education and having not moved residences by interim survey.
Note: Dashed lines indicate modeled covariance of error term.

As depicted on the left side of the diagram in exhibit 7, we use characteristics of the individual at the time of the baseline MTO survey (roughly 1994 to 1998), and we also use a series of time-invariant variables, such as race/ethnicity, gender, and randomization group, to predict our three outcomes of interest at the time of the MTO interim survey. These outcomes are (1) automobile ownership, (2) the transit richness of the respondent's home census tract, and (3) the respondent's self-reported earnings. We also relate the three outcome measures to one another in the overall modeling approach. We estimate a parameter for the error covariance of each submodel. This approach assumes that the unobserved variables that help to explain car ownership, choice of residence in a transit-rich neighborhood, and earnings covary in meaningful ways. For instance, those individuals who prefer owning a car also choose to live in a neighborhood with ample parking and lower levels of transit access.

We find that having owned a car at the time of the baseline survey is a strong predictor of owning a car at the interim survey, perhaps reflecting both the likelihood of an individual's retaining a valuable asset such as an automobile and that individual's preferences for automobile ownership. In a similar way, having a job at the time of the baseline survey is a strong predictor of automobile ownership several years later, reflecting the need for employment to cover the financial costs of car ownership.

Only two variables are statistically significant predictors of living in a transit-rich neighborhood. Being a member of the control group for random assignment has a strong positive association with transit richness at the time of the interim survey. The control group in the MTO experiment did not receive Section 8 vouchers and, thus, most participants remained in traditional public housing, which is often located in transit-rich, inner-city areas, or they left housing assistance altogether for one reason or another. The only other significant predictor of transit richness at the time of the interim survey is transit richness at the time of the baseline survey. This relationship may reflect individuals' transit preferences and the "lumpiness" of making the transition to transit's main competitor—the automobile (through vehicle purchases and licensing). It also may be because of the high financial and social costs of moving to a new neighborhood. Regarding this last point, voucher households can experience difficulty moving out of their current neighborhoods because of limited resources, landlord practices, and institutional obstacles associated with the voucher program (DeLuca, Garboden, and Rosenblatt, 2013).

Access to transportation at baseline appears to make a difference in earnings several years later. Both automobile access and living in a transit-rich neighborhood at the time of the baseline survey are statistically significant predictors of higher earnings. The earnings effect for owning a car is considerably greater, however, than the effect of transit richness. Our results suggest that one would have to live in a neighborhood nearly eight standard deviations above the mean regional transit richness to achieve the same estimated effect on earnings as owning a car. When we test whether transit matters more for households without a car, we find no difference; the role of transit is similarly weak for those individuals with and without cars.

Finally, we find that the error terms of our earnings and transit richness models are both correlated with that of the car ownership submodel. This finding suggests that omitted variables that are associated with higher earnings but are difficult to measure (such as perseverance, intelligence, a highly developed social network, or other factors) are also associated with automobile ownership. The model results similarly suggest clear tradeoffs exist between the choice to own a car and the choice to live in a transit-rich neighborhood. Controlling for a host of other factors, those who are more likely to choose one of these transportation options (for instance, buying a car) are considerably less likely to choose the other (for instance, living in a very transit-accessible neighborhood). This relationship likely reflects both attributes of the person (preference for one mode over the other) and also a host of unobserved factors associated with living in a particular neighborhood. For instance, if a person lives in a transit-poor neighborhood to be close to friends and family, that person may be more likely to purchase a car as well.

Why So Little Bang for the Buck? Voucher Programs and Public Transit

Taken together, the findings from all three analyses show that automobile access improves employment outcomes and earnings for low-income households. Furthermore, we find that access to automobiles is more important than assignment to the MTO or WtWV experimental group. The finding of a strong effect of cars on employment outcomes is consistent with the broader literature on automobiles and low-income populations (Baum, 2009; Cervero, Sandoval, and Landis, 2002;

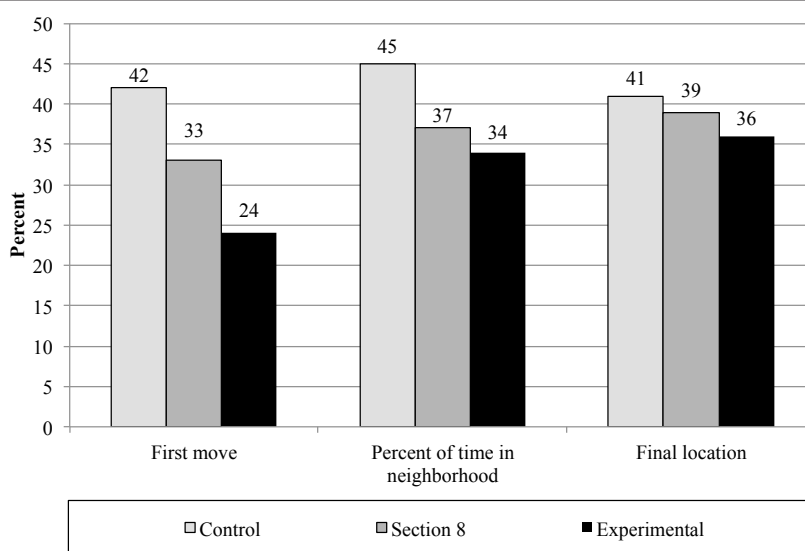
Garasky, Fletcher, and Jensen, 2006; Gurley and Bruce, 2005; Lichtenwalter, Koeske, and Sales, 2006; Lucas and Nicholson, 2003; Ong, 2002; Sandoval et al., 2011). The impacts of public transportation are mixed, likely because of the substantial variability in transit coverage among the metropolitan areas included in the study. Public transit may not effectively connect low-income workers to jobs. It may also be true that public transit—even in the large MTO metropolitan areas—does not provide enough service to adequately connect voucher recipients to employment opportunities.

As a followup on our employment models, we analyze transit access among MTO participants. We use three measures to examine the transit characteristics of the neighborhoods in which MTO program participants live—walk times to transit, service frequency, and the percent of the region’s jobs accessible by public transit in a 30-minute commute. To summarize our findings, we focus on the last measure, because—at least in theory—job access by public transit incorporates both the time it takes to walk to a transit stop or station and how quickly transit users can board a bus or train.

Exhibit 8 shows that residents in the control group are much more likely to live and remain in—what we call—transit-rich neighborhoods. This finding holds true for all three measures—at least up (“first move”), percent of time in transit-rich neighborhood, and at the close of the program (“final location”). Both jobs and transit networks are highly concentrated in central-city neighborhoods, where, as we note previously, public housing tends to be located. In addition, over time—between first move and final location—households in the experimental group are more likely to live in transit-rich neighborhoods. Because our transit data do not change over time and, therefore, do not incorporate changes in levels of transit service, this finding likely reflects the relocation decisions of families in the experimental group.

Exhibit 8

Percent of Region’s Jobs Accessible by Transit in 30 Minutes



Sources: HUD; The Brookings Institution

In a separate paper, we examine the determinants of cumulative poverty exposure. In this analysis, however, we show time spent in low-poverty neighborhoods as the MTO program defined them—census tracts with less than a 10-percent poverty rate. Exhibit 9 shows a distinct effect on the amount of total time spent in low-poverty neighborhoods when we distinguish between program subgroups. In short, those who successfully receive the experimental treatment spend far more time in low-poverty neighborhoods compared both with those who receive the experimental treatment (but did not lease up) and those who receive unrestricted vouchers in the Section 8 group. Unrestricted leasing up (in Section 8 households) does appear to have a mild effect on reducing exposure to poverty. The most clear trend, however, is that households in all subgroups, irrespective of program status or lease up, spend much of their time in higher-poverty neighborhoods.

The data underscore the fact that MTO participants—many who wind up living in transit-rich, central-city neighborhoods—still can reach only a minority of jobs within a 30-minute commute. Additional research ought to examine whether there is a threshold effect with respect to the impact of public transit on employment. If a threshold effect exists, the effect of transit on geographically mobile housing voucher recipients will likely remain limited until transit networks are systematically expanded.

Exhibit 9

Percent of Time Spent in Poor Neighborhoods, 1994–2010

Experimental Lease Up	Experimental No Lease Up	Section 8 Lease Up	Section 8 No Lease Up	Control
52	6	16	9	8

Note: 10-percent poverty rate or more, using 1990 poverty rates.

Conclusion

Our analysis confirms the important role of automobiles in the economic outcomes of low-income households. Yet, despite these findings, relatively few federal programs aim to help low-income families gain access to automobiles; some programs actually act as barriers to gaining such access. Post-welfare reform policymakers turned to transportation as a strategy for rapidly moving welfare recipients and other low-income adults into the labor market. In 1998, Congress passed the Job Access and Reverse Commute program, one component of the Transportation Equity Act of the 21st Century (U.S. Congress, 1998). In addition, other federal agencies—U.S. Departments of Health and Human Services, Housing and Urban Development, and Labor—made resources available to provide transportation for welfare recipients and other low-wage workers. These efforts largely centered on public transit and, in particular, on strengthening transit connections from center cities to suburbs. Policy efforts to coordinate housing and transportation similarly have largely focused on public transit, as demonstrated in the funding history of programs such as the Partnership for Sustainable Communities. Transit investments should take place in dense urban neighborhoods where origins and destinations are reasonably proximate. Without increased

densities—employment and housing located in close proximity to bus stops and station areas—transit investments will not attract significant ridership and, therefore, will require extensive public subsidy (Guerra and Cervero, 2011).

In the absence of building extensive transit networks, which are fiscally impracticable in all but the densest U.S. metropolitan areas, our study suggests that cars present a more viable means of connecting low-income workers to jobs. Low-income households, therefore, would benefit from policies and programs to increase their access to automobiles. These policies and programs might include efforts to ease the remaining vehicle asset limitations associated with participation in some government social benefit programs. For example, most states have lifted or eased vehicle asset limitation rules for welfare recipients. As of 2012, however, 14 states still maintained a vehicle asset limitation; these states include California, New York, and Texas, states with some of the largest numbers of welfare recipients (Urban Institute, 2006). As we mention previously, evidence suggests that this policy change can increase automobile ownership and employment among the poor (Hurst and Ziliak, 2006; Lucas and Nicholson, 2003; Sullivan, 2006).

Policies such as individual development accounts (matched saving accounts) also may help families save for and purchase vehicles (Stegman and Faris, 2005). Efforts to increase automobile access—rather than ownership—could provide many of the benefits of automobiles without the high costs of ownership. These benefits might include the use of car sharing, ride sharing, and automobile leasing programs. For example, many researchers argue that short-term car rental services such as Zipcar and car2go have the potential to address the travel needs of some low-income adults at a lower cost than ownership (National Research Council, 2005; Shaheen, Cohen, and Chung, 2009). Thus far, however, there is little evidence of the effectiveness of these programs in meeting the transportation needs of the poor, who may require car access for 8 or more hours per day, a duration of time not well suited for carsharing.

Automobiles are expensive to own and operate. Therefore, low-income auto owners would benefit from programs to reduce the operating costs of driving. One example might be pay-per-mile automobile insurance. Low-income drivers tend to travel fewer miles than higher income drivers (Blumenberg and Pierce, 2012); therefore, for low-income families, flat auto-insurance rates can translate into much higher premiums per mile traveled. In addition, evidence shows that many low-income families face auto insurance redlining; residents of poor and minority neighborhoods pay higher premiums than do residents in other neighborhoods (Ong and Stoll, 2007). States should adopt regulations to base auto premiums on motorists' driving records rather than on the neighborhood in which they live. For example, in 1988 California voters passed Proposition 103, a broad sweeping initiative to reform property-casualty insurance. After years of legal challenges, new regulations were finally enacted in 2006 to enforce the requirement that insurance premiums be based on driving record and not ZIP Code, marital status, or other factors (Consumer Watchdog, 2007). Other approaches might include low-cost automobile insurance programs (Brobeck and Hunter, 2012) or the course that Detroit Mayor Mike Duggan endorsed—the formation of a city-owned automobile insurance company (City of Detroit, 2014).

Regarding subsidized housing recipients, the provision of transportation-based services was an integral component of the WtWV program, but was less of a focus in the MTO program. HUD

provided guidance to public housing agencies participating in the WtWV program regarding ways in which to tailor services to the transportation needs of households receiving assistance. The HUD website also provides information about how to coordinate housing assistance with the various local transportation programs sponsored by nonprofit organizations, transit agencies, and the business community (<http://www.hud.gov/offices/pih/programs/hcv/wtw/resources/bs10/transportation.cfm> - 1). HUD's role in this effort, however, is primarily advisory, with local public housing agencies playing the lead role in designing such programs. Housing assistance and transportation ought to be coordinated. To play more of a role, HUD should systematically collect data on whether assisted tenants have access to functioning cars. Housing programs can then be shaped to account for the travel needs of assisted households with and without automobiles. Moreover, additional research—such as an experiment in which automobiles or auto assistance are randomly assigned to unemployed housing voucher recipients—can more clearly determine the effects of cars on employment outcomes by ruling out the possibility that employment and the increased income it provides alone enables automobile ownership. Moreover, such a study could help isolate the particular mechanisms by which automobiles contribute to improved employment outcomes, a topic that has received relatively little attention.

Many, if not most, policymakers loathe policies and programs that promote automobile use, thus contributing to traffic congestion, air pollution, sprawl, and high transportation costs. Many good reasons exist for these concerns and for the associated efforts for policymakers to address them. Yet the responsibility for mitigating the negative externalities of automobiles should not be shifted to low-income families—the population group that currently uses cars the least and, as the evidence shows, greatly needs the economic benefits they enable. For low-income households, the evidence clearly shows that the pursuit of “economic sustainability”—in this case measured by employment rates and earnings—may conflict with other dimensions of sustainability and thus will necessitate that policymakers make some difficult policy tradeoffs.

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