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Abstract

Using an unusually rich panel of data on welfare recipients in Alameda County, California, this paper examines the importance of transportation policy variables in explaining the ability of some individuals to find gainful employment. A multinomial logit model is estimated that predicts the probability someone found a job as a function of car ownership, transit service quality, regional job accessibility by different transportation modes, human-capital factors, and various control variables. The results show that car ownership, along with educational attainment, significantly increased the odds that someone switched from welfare to work, while variables related to transit service quality were largely insignificant predictors. Nor was regional accessibility very important in explaining employment outcomes, a finding that sheds doubts about the spatial mismatch hypothesis. In terms of transit policy, what appeared to be most important in stimulating employment was the concentration of housing near bus and rail routes, a finding which lends support to transit-oriented development. However, improved automobility had far stronger effects on employment outcomes than improvements in transit mobility, at least in the case of Alameda County.

Transportation as a Stimulus to Welfare-to-Work:
Private Versus Public Mobility

Transportation has been called the "to" component of "welfare-to-work" – the vehicle for connecting unemployed, under-privileged residents from the inner city to suburban job opportunities. However, not all sides agree that transportation, or more generally, accessibility, is critical in moving people off of welfare rolls and into gainful employment. And to the degree that transportation "matters", there is considerable disagreement as to which is more important – private mobility (i.e., ownership of and access to a car) or public mobility (i.e., availability of good public transportation services). The purpose of this article is to throw light on both of these questions – does transportation matter, and if so, are fiscal resources best devoted to expanding private or public mobility?

The debate over transportation's importance in reducing inner-city poverty and welfare dependence first surfaced in the wake of urban riots and mass demonstrations of the mid-1960s. At the behest of the Johnson Administration, the McCone Commission identified inadequate public transportation as a contributor to high rates of unemployment among central-city blacks. Ever since the potential role of public transportation in alleviating urban poverty has been embroiled in controversy. Some contend reverse-commute services are absolutely essential, while critics dismiss public transit as a serious mobility option in surburbia, for the poor and non-poor alike (Blackley, 1990; Hughes, 1991; Orski, 1998).

Recent welfare reform, instituted through the Clinton Administration's *Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA)*, fully embraces the view that access to suburban jobs, and in particular, improved public transportation services, are crucial toward reducing inner-city joblessness. Federal programs like *Access to Jobs* under the recent Transportation Equity Act (TEA-21) and U.S. Housing and Urban Development's *Bridges to Work* provide hundreds of millions of dollars for expanding transit connections from inner-city areas to suburban jobs.

01 Transportation's Role in Welfare-to-Work

Transportation's role in welfare-to-work transitions shows up in two key policy debates: (1) the spatial mismatch hypothesis; and (2) the value of public transit versus private automobile ownership. Both debates are briefly reviewed in this section.

The spatial mismatch hypothesis, first advanced by Kain (1968, 1993) and since studied by dozens of researchers, holds that a root cause of joblessness and inter-generational poverty has been the increasing physical isolation, or inaccessibility, of inner-city residents from suburban employment opportunities. Evidence, however, is inconsistent. Some researchers have concluded, based on statistical evidence, that improved accessibility is absolutely essential in moving the poor off of welfare rolls (Jencks and Meyer, 1990; Holzer, 1991;; Holzer *et al*., 1994). A study of poverty in Los Angeles by Ihlanfeldt and Squoquist (1991) found that accessibility to jobs explained between 30 and 40 percent of the difference in employment rates among black and white teenagers. Recent work by Rosenbloom (1995) and Blumenberg and Ong (1998) further stress the importance of job accessibility, showing that neighborhoods with higher levels of accessibility to low-wage firms average lower rates of welfare dependence. Other researchers, however, argue just as strongly that accessibility is fairly inconsequential factor in moving the poor off of welfare rolls, and that spatial mismatch is a smokescreen to more deeply rooted racial divisions (Ellwood, 1986; Leonard, 1987; Zax, 1990). In an influential study of black households in Chicago, Ellwood (1986) found comparably high unemployment rates among blacks with similar education levels regardless whether they resided on the southside, away from job opportunities, or west of the city nearly the booming Interstate 88 employment corridor. He concluded the chief reasons for chronic unemployment among blacks is "race, not space".

The debate over the efficacy of private versus public mobility has been just as divided, though research has focused mainly on the value of public transit services, with less attention given to the importance of automobile ownership. A study by Thompson (1997) found a modest statistical relationship between transit access to jobs and employment participation in Dade County, Florida using 1990 census data. Similarly, Sanchez (1999) used block-level data from the 1990 census to examine differences in rates of labor-force participation among residents of

Atlanta and Portland, Oregon who lived within a quarter-mile walking distance of a transit stop versus those who did not. He found those residing near bus and rail stops had higher rates of employment, controlling for other factors like education level, although the relationship did not hold for non-whites.

While inner-city residents generally receive more intensive transit services than those in the suburbs, this does not necessarily translate into good connectivity to suburban jobs. In the United States, suburban transit services are notoriously poor, a product of low densities, abundant and free parking, circuitous road designs, and high automobile ownership rates (Cervero, 1994). Many bus routes serving in-city employment opportunities. Evidence, however, is inconsistent. Some researchers have concluded, based on statistical evidence, that improved accessibility is absolutely essential in moving the poor off of welfare rolls (Jencks and Meyer, 1990; Holzer, 1991; Holzer *et al*., 1994). A study of poverty in Los Angeles by Ihlanfeldt and Squoquist (1991) found that accessibility to jobs explained between 30 and 40 percent of the difference in employment rates among black and white teenagers. Recent work by Rosenbloom (1995) and Blumenberg and Ong (1998) further stress the importance of job accessibility, showing that neighborhoods with higher levels of accessibility to low-wage firms average lower rates of welfare dependence. Other researchers, however, argue just as strongly that accessibility is fairly inconsequential factor in moving the poor off of welfare rolls, and that spatial mismatch is a smokescreen to more deeply rooted racial divisions (Ellwood, 1986; Leonard, 1987; Zax, 1990). In an influential study of black households in Chicago, Ellwood (1986) found comparably high unemployment rates among blacks with similar education levels regardless whether they resided on the southside, away from job opportunities, or west of the city nearly the booming Interstate 88 employment corridor. He concluded the chief reasons for chronic unemployment among blacks is "race, not space".

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Because of the paucity of good suburban transit services in the United States, some analysts have argued that public funds might be better spent on providing loans to inner-city residents for buying cars versus expanding public transportation services (Taylor and Ong, 1995; Orski, 1998; Waller, 1999). When specialized reverse-commute services have been introduced in the past, transit ridership often fell within a few month's time as participants bought cars once they found steady, well-paying jobs (Rosenbloom, 1992). In the suburbs, some have noted, low-skilled workers need access to cars for the same reasons high-salaried workers do -- in order to drop their kids off at day care centers en route to work, the desire to reduce time spent commuting in order to free up more time for home life, the availability of free parking but not free transit passes, and so on. It is for such reasons that some areas of the United States have shifted their focus to enhancing private mobility for the poor. In Fairfax County, Virginia,

former welfare recipients are eligible for loans that can be used to purchase and insure second-hand cars. The states of Maryland and Texas offer sizable tax deductions to firms and individuals who donate vehicles for welfare recipients. Even these initiatives have not evaded controversy. The retention of older vehicles, environmentalists point out, exacerbates air quality problems. Others warn that the cost of insuring a car in high-crime, central-city settings can be prohibitively expensive. Some also worry that those depending on the private car to reach jobs will not be able to cover mounting maintenance expenses and costly repair bills that accompany owning older vehicles.

Like several earlier studies, our study aims to clarify the importance of transportation in explaining job participation rates, however we feel our approaches improves upon these previous studies in several important ways. One, earlier studies (Thomson, 1997; Blumenberg and Ong, 1998; Sanchez, 1999) relied on zonal-level census data in drawing causal inferences, and thus unavoidably suffer from aggregation biases to some degree. Our work studies relationships at a more appropriate "ecological unit" -- specifically, individuals whom at one time received welfare assistance. Second, past studies have used data from a single time point (e.g., 1990 census data), relying on cross-sectional differences to infer causal relationships. Our work examines change in employment status over two time points, providing a longitudinal context for examining welfare-to-work transitions. Third, we develop multiple measures of transit accessibility at different grains of analysis (e.g., both the neighborhood and regional scales) that, we believe, offer robust indicators of transit service availability and proximity.

Following a brief discussion of methodology and data sources, this article presents a multinomial logit model that explains why individuals have been able to move off of welfare and into some level of formal employment in Alameda County, California. Based on the empirical findings, we suggest ways in which transportation policies might better achieve the objectives of welfare-to-work initiatives. In particular, we weigh in on the debate over whether improving private versus public mobility offers the most promise in stimulating employment among America's inner-city poor.

02 Research Methodology

Our research was designed to study the relative influence of transit versus highway accessibility and car ownership in explaining the ability of some individuals to switch from welfare recipient to active employment. The research relied on an unusually rich panel of data on characteristics of welfare recipients in Alameda County, California during the first half of the 1990s. All data were tied to records maintained for a random sample of individuals who at one time were receiving public assistance. Changes in welfare status were associated with various predictor variables, like job-accessibility and neighborhood-scale measures of bus service intensity, that were address matched to each person's specific location of residence using Geographic Information Systems (GIS) techniques. Multinomial logit estimation allowed the incremental influence of transportation, human capital, and various control variables on the probability of obtaining a job to be measured.

Sampling Frame and Person-Level Data

As part of the California Work Pays Demonstration Project (CWPDP), data were obtained from a random sample of 466 individuals residing in Alameda County, California who in 1992/1993 received Aid for Families with Dependent Children (AFDC). A second wave of survey data was compiled for the same individuals in 1994/1995, some of whom by this time had found jobs and were no longer receiving AFDC assistance. The availability of street address information, tied to anonymous records, allowed us to pinpoint the residential locations of those sampled. In turn, we were able to measure levels of job-accessibility via transit and highway networks for the residential location of each individual in the panel.

Only survey respondents who lived in older, generally low-income parts of western Alameda County were included in our analyses. These individuals made up 97 percent of the Alameda County residents who were surveyed in both waves of the CWPDP and for whom complete data were available. We concentrated on this sub-population because it represents individuals who, theory holds, suffer the most from spatial mismatch and for whom reverse-commute transit services are targeted. Indeed, Alameda County is well-suited for studying the potential value of reverse-commute and specialized transportation services because the

preponderance of job growth has occurred in its eastern suburbs while pockets of poverty and unemployment have remained intact in its western core cities (e.g., Oakland, San Leandro, Union City). Between 1981 and 1990, 70 percent of the 182,000 new jobs that were created in the East Bay occurred in zip codes east of the hills of Alameda and Contra Costa Counties (U.S. Department of Commerce, 1990). Much of this job growth occurred in edge cities and high-tech job-enclaves like Pleasanton, Livermore, San Ramon, Walnut Creek, and Concord (Cervero and Landis, 1997; Cervero and Wu, 1997).

Regional Job-Accessibility Measures

An important metric for studying the importance of transportation adopted in this study is regional job accessibility. For each person in the panel sample, cumulative-opportunities measures of regional job-accessibility were calculated using the following gravity-based form:

$$A_{ik} = \Sigma_j E_j \exp(-v T_{ijk})$$

where: A_{ik} = Accessibility indicator of person residing in location i by mode k;

E_j = Employment (non-professional, non-executive, and non-managerial occupational classes) in destination zone j (where j = 1 to 1382 census tracts in the nine-county San Francisco Bay Area) in 1990; occupational classes were determined from Part II of the Census Transportation Planning Package (CTPP) for the Bay Area, and conversion tables provided by the Metropolitan Transportation Commission (MTC) were used to translate employment totals by traffic analysis zones (TAZs) into census tract equivalents.

T_{ijk} = Travel time (in minutes) from residential location i to census-tract of employment j by transportation network (i.e., transit or highway) of mode k, based on the 1993 regional travel-time matrices maintained by MTC;

v = Empirically derived coefficient for work-trip impedances based on best–fitting results from a gravity model that explained home-based work-trip interchanges for the San Francisco-Oakland-San Jose Consolidated Statistical Area in 1990; set at -.014

k = Mode of transportation and associated travel network: regional transit

network versus regional highway network.

Stratifying accessibility indices by mode allowed employment opportunities to be gauged for each place of residence i over the corresponding regional transit network versus highway network. Accessibility via highways was based on peak-period travel times for drive-alone trips since journeys to work tend to occur during the peak, predominantly by solo-commuting. Also, the measurement of accessibility via transit was further refined according to mode used to reach transit stops – i.e., walk-and-ride or park-and-ride. Transit accessibility indicators were also based on travel times during peak periods (when transit services are generally the most intensive).

One further refinement made in estimating job accessibility was limiting employment counts to non-professional, non-executive, and non-managerial positions -- i.e., the kinds of jobs for which AFDC recipients from wave one (1992/1993) would most likely qualify for. This provided a proxy of the availability of low-skilled, low-to-moderate salary jobs in each of the Bay Area's 1382 census tracts.

Neighborhood-Scale Measures of Transit Service Intensity and Proximity

As a complement to the regional-scale indicators of accessibility, several measures of transit service intensity were computed. These indicators reflected the quality of transit services from a more fine-grained, neighborhood perspective.

The best proxy available for transit service intensity was the number of AC (Alameda-Contra Costa County) Transit bus routes situated within a half-mile buffer of each panel member's place of residence.[1] A second measure of service quality used was the number of bus routes within a half-mile of each person's residence that fed directly into a Bay Area Rapid Transit (BART) rail station. This provided a refined index of local bus connectivity to the region's major mainline transit service.

Model Structure

A discrete-change model was used to predict change in employment status among panel members over the two time points. Models took the form of multinomial logit equations that weighed the importance of transportation, human-capital, and various control variables in explaining differences in outcomes.[2] The resulting model predicted the probabilities that each survey respondent belonged to each of three possible discrete-change categories between the 1992/93 and 1994/95 periods: (1) remained unemployed (i.e., no job in either time period); (2) secured employment but remained on AFDC; and (3) secured employment and got off AFDC. These three categories roughly correspond to ordinal outcomes that range from the least to the most favorable. The second category reflects situations where individuals found jobs, albeit most likely low-paying ones. Besides low-wage employment, category two likely also represents part-time and contingency work – i.e., unstable employment situations which kept working parents with children dependent on public assistance. Of course, the explicit aim of recent welfare reforms, like TANF, is to move recipients into the third category -- gainful employment without direct public assistance. And federal programs like *Access to Jobs* and *Bridges to Work* assume that improved transportation services and accessibility increase the likelihood of needy Americans falling into this third category.

The model we used to test the hypothesis that transportation services and accessibility "matter" took the following form:

$$p_{io} = \frac{\exp(T_{io}, C_{io}, I_{io})}{\Sigma_j \exp(T_{ij}, C_{ij,} I_{io})} \quad \text{for } j = 1, 2, 3$$

where: p_{io} = probability person i belongs to discrete-change category o;

T_i = vector of transportation "policy" variables of person i, including variables measuring vehicle ownership, accessibility to regional jobs via highway and via transit networks, and neighborhood-scale transit service quality.

C_i = vector of control variables, including race, marital status, and various human-capital characteristics of person i (e.g., educational level, use of child-care services).

I_o = vector of interaction effects between transportation and human-capital variables (e.g., the combination of owning a car and having a child who

attends day care).

Generalized least squares estimated the size, direction, and probability of coefficients for both policy and control variables. Weights were used to normalize the sample so that it matched the actual proportions of AFDC recipient in Alameda county according to their socio-demographic characteristics.

We postulate that the transportation policy variables (represented by vector T_i) provide significant incremental explanatory power in estimating the likelihood each panel respondent belongs to any one of the three discrete-change categories, although to varying degrees. The degree to which transit versus automobile accessibility and service-level factors increase the probability of respondents falling into the third category (i.e., employment without AFDC), we believe, offers normative insights into how transportation resources should be allocated in assisting America's inner-city poor transition from welfare to work.

Caveats

Several caveats about the underlying sample used in our analysis are in order. First, although the 466 panel members were randomly selected, they constituted less than one percent of all Alameda County AFDC cases in wave one (1992/1993). And of the 466 survey respondents, only 66 found jobs in wave two (1994/1995); four hundred did not. We are unable to say whether this low percentage was due to a weak statewide economy, to specific characteristics of Alameda County and its economy, or to provisions of the AFDC program as administered in Alameda County. In that joblessness rates remained comparable in other California counties over this same period, the experiences of these sampled welfare recipients from Alameda County are thought to be representative of patterns in the state as a whole. Last, we note that our observations pre-date PRWORA, and that the chief difference between TANF (which replaced AFDC) and AFDC is the presence of work incentives — or more precisely, disincentives for not finding a job. Whether the relationships we have uncovered between finding a job and various transportation policy variables still hold in today's post-AFDC era, we can only speculate. Because transportation variables should be independent of new work

requirements found in TANF, we suspect they do.

3. Descriptive Statistics

Table 1 presents various descriptive statistics for the entire sample, and for each of the three discrete change possibilities: (1) those who remained unemployed (i.e., no job in either wave 1 or wave 2); (2) those who found a job between wave 1 and wave 2 but remained on AFDC; and (3) those who found a job and got off AFDC . Of the total sample of 466 AFDC recipients, 400 were jobless in both the first sampling wave (1991-1992) and the second (1994-95). Twenty-seven AFDC recipients who were jobless in 1991-92 (6 percent of the sample), found jobs by 1994-95, but still received AFDC. Thirty-nine AFDC recipients who were jobless in 1991-92 (8 percent of the total sample) in 1991-92 found jobs by 1994-95 and no longer received AFDC.

Women minorities made up the bulk of the sample. Among all survey respondents, 99 percent were women, 34 percent were African American, and 39 percent identified their race as "Other." Respondents tended to be at the middle stages of their life cycle, entering what is traditionally considered to be their peak earning years (late 30s to 40s). Around half the respondents were married. Compared to the entire sample, those who found jobs tended to be slightly younger and unmarried. They also averaged fewer children. Solely on the basis of the subsample distributions — and not controlling for any other characteristics — white and Black AFDC recipients were more likely to have found a job than Hispanic and Asian recipients.

Regarding human-capital variables, while the sample as a whole completed an average of 9.5 years of schooling, those who found jobs averaged two additional years of education. This bodes favorably for the variable MAX-EDUC as a significant predictor of employment outcomes. Moreover, two-thirds of the two sub-samples who found jobs spoke English, compared to 54 percent for the full sample. Also, those who found jobs were less likely to have had health problem than those who did not. In Alameda County, physical disabilities appeared to be significant impediments to finding work among welfare recipients. Although the survey did not allow us to ascertain the direction of causality, those who found jobs were also more likely to

have had a child in day care. Neither the average age of the housing stock nor neighborhood racial concentrations varied much across the subsamples.

As shown in Map 1, a disproportionate share of the entire sample lived in central

Oakland, where both bus and rail transit services are fairly good. Within a half mile of AFDC recipients there were, on average,11.6 AC Transit bus lines and 4.2 bus lines that connected directly to BART stations. AC Transit availability varied significantly among the sub-samples, but access to BART-oriented buses did not.

Table 1 also shows that nearly one in five of the surveyed individuals gained ownership of a car between the first and second wave; by 1994/95, 38 percent of the entire sample owned private automobiles. Moreover, car ownership was significantly higher among those who found a job. This hints at the variable CAR-OWN+ being a significant contributor to welfare recipients being able to find work. Less promising are the variables related to job accessibility. Those who found jobs and got off AFDC averaged only slightly higher levels of regional job accessibility than the sample as a whole.

Mapping job accessibility indices revealed a fair amount of variation depending on whether accessibility was measured using travel time impedances on the highway network versus the transit network. A comparison of Maps 2 and 3 shows that census tracts with high accessibility via highways are generally different than those with high accessibility by transit.[3] This variation suggests certain measures of job accessibility likely perform better than others in predicting the likelihood of former welfare recipients finding employment. That is, our data base appears potentially robust in gauging the relative importance of highway versus transit accessibility in explaining employment outcomes.

4. Multinomial Logit Results

The logit results in Table 2 offer clear insights into the value of different transportation policy variables in explaining the probability of the surveyed welfare recipients securing employment. The strongest predictor, among transportation variables, of the ability to obtain a job and get off of welfare was car ownership, expressed in three ways – whether the person owned a car in the first wave of 1994/95 (CAR-OWN); whether the person went from not owning a car in wave one (1992/93) to owning one in the second wave of 1994/95 (CAR-

OWN+); and whether the person owned a car in wave one but did not own one in wave two

Map 1. Census Tracts of Residence of Panel Sample of Alameda County AFDC Recipients

Map 2. Job Accessibility Levels via Highway Network

for Alameda County Census Tracts of Residence of Panel Sample

Map 3. Job Accessibility Levels via Transit Network for Alameda County Census Tracts of Residence of Panel Sample

Table 2. Multinomial Logit Results: Equations for Predicting Probabilities of Two Discrete-Change Outcomes

	Equation 1: Got Job/Got Off Welfare			Equation 2: Got Job/Stayed On Welfare		
VARIABLES	**Coeff.**	**Std. Error**	**Prob.**	**Coeff.**	**Std. Error**	**Prob.**
Transportation Variables:						
Transportation Mode Availability:						
CAR-OWN (wave 1)	1.93682	0.91561	0.0344	-4.0118	2.1767	0.0653
CAR-OWN+ (from no to yes)	2.57542	0.89802	0.0041	-0.5766	1.1705	0.6203
CAR-OWN- (from yes to no)	-3.86787	1.95522	0.0479	4.2109	2.3060	0.0678
BUS ROUTE-1/4 MILE	-0.02308	0.03461	0.5074	0.0384	0.0320	0.2305
BART-BUS ROUTES	0.00165	0.07780	0.9833	-0.12853	0.1286	0.3177
Regional Job Accessibility:[a]						
ACCESS-HIGHWAY	-0.00006	0.00003	0.0839	-0.00013	0.00004	0.0026
ACCESS-PARKRIDE	-0.00003	0.00001	0.0059	-0.00001	0.00001	0.7793
ACCESS-WALKRIDE	0.00003	0.00001	0.0020	0.00001	0.00001	0.1359
Human Capital Variables:						
MAX-EDUC	0.2138	0.0975	0.0283	0.5369	0.2485	0.0308
HEALTH RATING	-0.1786	0.2429	0.4622	0.1207	0.2741	0.6597
HEALTH-PROB	-1.5206	0.5669	0.0073	-0.9330	0.7230	0.1969
ENGLISH	-3.3558	0.8698	0.0001	0.0093	1.2621	0.9868
DAYCARE	1.0086	0.4040	0.0125	2.3298	0.6419	0.0003
DAYCARE*CAR-OWN (*interaction effect*)	0.7993	0.6285	0.1859	0.9873	1.1156	0.3762
Control Variables:						
Socio-Demographic Characteristics:						
AGE	0.0444	0.0291	0.1264	-0.0392	0.0457	0.3907
CHILDREN	-0.5322	0.1955	0.0065	-0.0080	0.2408	0.9734
DISABLED CHILD	-0.6737	0.4970	0.1753	-2.7722	0.9693	0.0042
RES-LENGTH	0.0811	0.0316	0.0103	0.0037	0.0423	0.9306
MALE	4.3245	1.1947	0.0003	-5.1332	b	b
MARRIED	0.0492	0.5405	0.9274	0.8290	0.7724	0.2831
ASIAN	-1.9702	1.5206	0.1951	-10.9250	b	b
OTHER-RACE	-4.4264	1.2328	0.0003	-0.7377	1.2321	0.5493
Neighborhood Characeristics:						
YR-BUILT	0.0429	0.0195	0.0279	-0.0007	0.0006	0.2178
PCT-BLACK (Tract)	1.3809	0.5365	0.0101	-1.6565	0.8263	0.0450
PCT-WHITE (Tract)	2.4250	1.1264	0.0313	-7.2501	1.1264	0.0313
INTERCEPT	-83.8546	37.6823	0.0261	-1.8903	4.8421	0.6962

SUMMARY STATISTICS:

Chi-Square = 367.26, Prob.= .000, ρ^2 = .544.

Percentage of cases correctly predicted: Total = 77.3%; Got Job/Off Welfare = 61.5%; Got Job/Stayed on Welfare = 21.2%; No Job/Stayed on Welfare = 82.3%.

Notes:

a See formula 1.

b Parameters are considered infinite under Generalized Least Squares estimation.

c Based on concordance between actual and predicted group membership, where predicted membership involved assigning case to category with the highest predicted probability using Models 1 and 2.Predicted probability for suppressed group (no job and remained on welfare) equals one minus the combined probabilities from Models 1 and 2.

(CAR-OWN-).[4] The table suggests owning a car in 1991/92 increased the odds of finding a job; more importantly, however, a change in status from non-car ownership in wave one to car-ownership in wave two increased the probability of employment even more (e.g., CAR-OWN+ = 1). Indeed, the model shows that, controlling for other factors, the odds ratio of getting a job

(and staying off AFDC) to not getting a job jumped by a factor of 13 when an individual's status switched from not owning to owning a car to owning one [i.e., exp(2.575) = 13 times increase in the odds ratio of working and getting off AFDC relative to not working and staying on AFDC]. Further corroborating the importance of gaining car-ownership is the coefficient on the variable CAR-OWN- : changing from owning a car to being car-less decreased the odds of finding a job. These results lend considerable credence to the argument that assisting the inner-city poor purchase a car can stimulate stimulating employment. We note that gaining ownership of a car was negatively associated with individuals working but remaining on AFDC. We interpret this to mean that those in this category earned sufficient wages to become independent of public assistance, but were not able to afford (or because of the eligibility requirements of public assistance, were discouraged from owning) a car because of their low incomes. Thus, the directionality likely worked in the opposite direction for this category: getting a low-paying job and remaining on AFDC precluded most surveyed individuals from purchasing a car.

All other transportation variables shown in Table 2 were weaker predictors and in some instances, the signs of coefficients were opposite from what was expected. Notably, regional accessibility to low-to-moderate skilled jobs via the highway network was negatively associated with individuals obtaining jobs, controlling for other factors. This somewhat counter-intuitive result, we believe, reflects the fact that those living near core cities and who remained dependent on welfare were still closer to more low-skilled jobs than those who lived farther from core cities. Together, these results suggest that once an inner-city resident obtained a car, it did not matter whether he or she was close or far away from regional job opportunities; either way, the odds of finding a job substantially increased.

Table 2 also shows that job accessibility via transit was more important than via highways in stimulating employment when individuals were in a position to walk-and-ride. Thus, controlling for car ownership, being within a walkable distance of a bus stop or rail station mattered. If someone did not own a car, one can interpret, having plentiful jobs that were reachable via transit and being able to walk to transit lines did incrementally increase the odds of securing employment, at the .001 probability level. This finding, we feel, argues in favor of transit-oriented development as a strategy for increasing inner-city employment. In recent years,

interest in transit villages has gained considerable momentum in the East Bay. Oakland's widely publicized Fruitvale transit village, which recently received funding assistance through the Liveable Communities Initiative of TEA-21, specifically aims to attract jobs and build affordable housing near the neighborhood BART station (Bernick and Cervero, 1997). Our findings lend credibility to such initiatives.

While job accessibility via transit for walk-and-ride access was highly significant in stimulating employment, park-and-ride access had the opposite effect. This could reflect the reality that once individuals owned cars, they were less likely to drive to stations and take transit to work. Because the quality of transit services to suburban destinations is fairly poor in the East Bay, this result was not surprising. Indeed, car ownership can spawn entrepreneurship among inner-city residents. Several studies provide accounts of how inner-city residents with cars sometimes supplement their earnings by operating informally as jitneys, connecting their neighbors to jobs when heading to work themselves (Davis and Johnson, 1984; Cervero, 1997).

Among the neighborhood-scale measures of transit service quality, only the service intensity variable was significant, and only for predicting the probability of someone finding work yet remaining on AFDC. This could reflect situations where low wage-earning individuals who still require public assistance (and who cannot afford a car) are dependent on transit, and having more routes nearby marginally increases the odds of finding work. According to equation 2, having plentiful bus routes that connect to regional rail services actually worked against someone finding a job while remaining on welfare. We believe this finding reflects the fact that lower income neighborhoods with high levels of welfare dependence tend to be concentrated near downtown Oakland and other East Bay core cities where feeder connections to BART are the best.

Many of the human-capital and control variables shown in Table 2 have coefficients that match *a priori* expectations. As anticipated, education attainment substantially increased the likelihood that AFDC recipients found work. The odds of getting a job and staying off of AFDC were also higher for unmarried males in good physical health who had few dependents. For those with children, the use of day care services significantly increased the odds of finding a job and getting off of welfare. Also notable was the significant interaction effects between owning a

car and having a child who attended day care. This combination significantly increased the probability of getting a job and leaving welfare. Thus, while owning a car or having a child in day care, by themselves, improved outcomes, the two in combination did so even more. Evidently, owning a car was of even greater importance to working moms and dads, formerly on AFDC, who also had to drop off and pick up their kids. The trend toward chained trip-making is likely working in favor of car ownership as much for former welfare recipients from the inner city as for well-off suburban workers. This finding lends further credence to private mobility as a means of stimulating employment among needy individuals living in core areas.

5. Sensitivity Analysis

To further convey the importance of private mobility, a sensitivity analysis was carried out. Using Equation 1 of the multinomial logit model, probabilities were computed for "typical" individuals from the sample under a range of situations for two of the most important predictor variables: the attainment of car ownership over the 1992/93 to 1994/95 period (CAR-OWN+) and educational level (MAX-EDUC). Mean (and in the case of dummy variables, modal) values were used for all the other predictor variables in Equation 1. CAR-OWN+ was perturbed between values of 0 and 1 and MAX-EDUC was varied over its actual range, 0 to 17 years. The resulting probabilities reflect the sensitivity of finding a job and getting off AFDC to changes in these two variables. Statistically, this amounts to an Analysis of Covariance (ANCOVA), wherein MAX-EDUC represents the control covariate and CAR-OWN represents the policy variable of interest.

Figure 1 presents the results of the sensitivity analysis. Most evident from this graph is the fact that, in the typical situation (e.g., no disabilities, spoke English, etc.), once a person completed 8 or more years of education, he or she was almost certain to find a job and get off AFDC, whether or not a car was owned. This graph clearly shows human-capital factors like

Figure 1. Sensitivity Analysis Results of Probability Estimates for Someone Finding a Job and Getting Off AFDC

schooling have a strong bearing on employment outcomes. However, the graph also reveals that for those with only primary levels of education, gaining ownership of a car can appreciably increase the odds of finding a job and staying off welfare, all else being equal. In general, the likelihood of finding a job for those with only two to five years of education who were otherwise similar was about 50 percent higher if they owned a car versus if they did not. This is a huge differential, and suggests that car ownership helps the neediest and least employable individuals the most in finding work.

06 Conclusions

Our research results allow us to take fairly clear positions on the two key policy debates that were raised at the beginning of this paper: the spatial mismatch hypothesis and the efficacy of promoting transit versus automobility in stimulating welfare-to-work transitions. With respect to spatial mismatch, our work suggests that once other factors, including education and car ownership, are controlled for, regional accessibility has a fairly modest bearing on employment outcomes. That is, we did not find spatial proximity, as expressed by our measures of regional accessibility, to be particularly important in explaining employment outcomes. This is consistent with other recent findings on spatial mismatch in the San Francisco Bay Area [O'Regan and Quigley, 1998; Cervero, et al., 1999]. And with regard to transportation policy, our results suggest that private mobility is more important than public mobility in getting inner-city residents completely off of welfare and into gainful employment. At least in the case of Alameda County during the first half of the 1990s, car ownership significantly increased the odds of former welfare recipients securing a job and relinquishing public assistance. Once individuals had access to a car, the odds markedly increased that they found a job, regardless whether they lived close to or far from employment opportunities. The only job accessibility indicator that was significant and in the direction that was expected was for those who were able to walk-and-ride to transit. This, we believe, lends credence to the proposition that transit-oriented development improves the economic well-being of inner-city neighborhoods. Notably, our model suggests that those who were within walking distance of bus and rail stops were better

able to reach job opportunities in East Bay suburbs that are well-served by transit, like Walnut Creek and Concord.

We acknowledge that a limitation of our research findings is that they pertain to a single county in northern California for a particular period of time. Still, we believe our results are instructive given that Alameda County's inner-city neighborhoods continued to experience high welfare dependence at the same time its suburbs prospered throughout the 1990s. Nonetheless, similar analyses need to be extended to other places in order to more broadly generalize findings, something we hope to do. We also recognize that variables related to transit accessibility and service quality might have been more significant predictors had the quality of reverse-commute services been far better than what existed in Alameda County in the 1990s. A growing market of city-to-suburb commuters could, over time, generate enough new revenues to substantially upgrade the quality of reverse-commute transit services, which in turn would likely attract more commuters to transit. The best way to test this proposition, however, is to mount and carefully evaluate reverse-commute demonstration programs. The Federal Transit Administration's recently initiated Bus Rapid Transit demonstration is a step in the right direction. However, so are initiatives by states like Maryland, Virginia, Texas, and Florida that provide loans, and other incentives that enable welfare recipients to acquire cars. Frankly, there is no "one-size-fits-all" transportation solution to the welfare-to-work challenge. Specialized transit services and private mobility both have roles to play, as do adult training, child-care services, and other human-capital investments. However, when making resource allocation choices within the transportation arena, our findings lend credibility to the often-heard contention that enhancing private mobility is every bit as important to stimulating employment as is enhancing transit mobility, if not more so.

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Notes

1. Calculations were carried out as follows. First, the geo-coded point file of welfare recipients was combined with a geo-coded point file of bus stops provided by AC Transit. Next, using the "point-distance" function in the Arc/Info GIS package, all stops within a half mile of each welfare recipient were tabulated. This table was then linked to another table that specified which routes serve each stop location. From this the number of routes within a half-mile straight-line distance of each residence was determined.

2. Ordered probit models were also estimated but gave less interpretable results. This probably represented the fact that the three outcome categories are not strictly ordinal in nature – that is, compared to the worst-case result of staying on welfare in wave 2, finding a job and getting off welfare is probably a proportionately much larger improvement than finding a job but remaining on welfare.

3. Maps 2 and 3 plot accessibility indices only for the census tracts of residence for AFDC recipients included in our data base. Job accessibility indices were ordinalized into low, medium, and high categories by dividing the distribution of accessibility indices into equally into one-third groupings. Map 2 shows accessibility indices over the highway network via drive-alone automobile. Ordinal categories corresponded to accessibility index values as follows: low – 38,244 to 59,837; medium – 59,838 to 68,146; and high – 68,147 to 87,502. Map 3 shows accessibility indices over the BART (rapid rail) transit network based on walk-and-ride station access. Ordinal categories corresponded to accessibility index as follow: low – 23,423 to 42,355; medium – 42,356 to 61,233; high – 61,234 to 75,433.

4. The suppressed category represents those who did not own a car in wave two (CAR-OWN = 0) and their status did not change from wave one (CAR-OWN+ = 0 and CAR-OWN- = 0). Thus, model coefficients can be interpreted relative to this suppressed category.