

6-1-2009

Public Versus Private Mobility for the Poor: Transit Improvements Versus Increased Car Ownership in the Sacramento Region, MTI Research Report 08-02

Robert A. Johnston
San Jose State University

Shengyi Gao

Follow this and additional works at: https://scholarworks.sjsu.edu/mti_publications



Part of the [Transportation Commons](#)

Recommended Citation

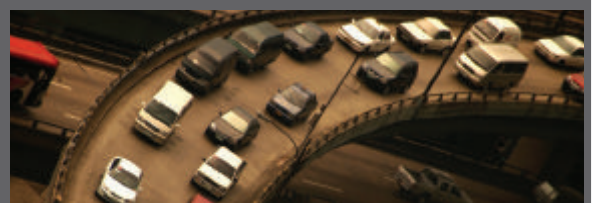
Robert A. Johnston and Shengyi Gao. "Public Versus Private Mobility for the Poor: Transit Improvements Versus Increased Car Ownership in the Sacramento Region, MTI Research Report 08-02" *Mineta Transportation Institute Publications* (2009).

This Report is brought to you for free and open access by SJSU ScholarWorks. It has been accepted for inclusion in Mineta Transportation Institute Publications by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.

Public Versus Private Mobility for the Poor: Transit Improvements Versus Increased Car Ownership in the Sacramento Region



MTI Report 08-02



MINETA TRANSPORTATION INSTITUTE

The Norman Y. Mineta International Institute for Surface Transportation Policy Studies (MTI) was established by Congress as part of the Intermodal Surface Transportation Efficiency Act of 1991. Reauthorized in 1998, MTI was selected by the U.S. Department of Transportation through a competitive process in 2002 as a national “Center of Excellence.” The Institute is funded by Congress through the United States Department of Transportation’s Research and Innovative Technology Administration, the California Legislature through the Department of Transportation (Caltrans), and by private grants and donations.

The Institute receives oversight from an internationally respected Board of Trustees whose members represent all major surface transportation modes. MTI’s focus on policy and management resulted from a Board assessment of the industry’s unmet needs and led directly to the choice of the San José State University College of Business as the Institute’s home. The Board provides policy direction, assists with needs assessment, and connects the Institute and its programs with the international transportation community.

MTI’s transportation policy work is centered on three primary responsibilities:

Research

MTI works to provide policy-oriented research for all levels of government and the private sector to foster the development of optimum surface transportation systems. Research areas include: transportation security; planning and policy development; interrelationships among transportation, land use, and the environment; transportation finance; and collaborative labor-management relations. Certified Research Associates conduct the research. Certification requires an advanced degree, generally a Ph.D., a record of academic publications, and professional references. Research projects culminate in a peer-reviewed publication, available both in hardcopy and on TransWeb, the MTI website (<http://transweb.sjsu.edu>).

Education

The educational goal of the Institute is to provide graduate-level education to students seeking a career in the development and operation of surface transportation programs. MTI, through San José State University, offers an AACSB-accredited Master of Science in Transportation Management and a graduate Certificate in Transportation Management that serve to prepare the nation’s transportation managers for the 21st century. The master’s degree is the highest conferred by the California State University system. With the active assistance of the California Department

of Transportation, MTI delivers its classes over a state-of-the-art videoconference network throughout the state of California and via webcasting beyond, allowing working transportation professionals to pursue an advanced degree regardless of their location. To meet the needs of employers seeking a diverse workforce, MTI’s education program promotes enrollment to under-represented groups.

Information and Technology Transfer

MTI promotes the availability of completed research to professional organizations and journals and works to integrate the research findings into the graduate education program. In addition to publishing the studies, the Institute also sponsors symposia to disseminate research results to transportation professionals and encourages Research Associates to present their findings at conferences. The World in Motion, MTI’s quarterly newsletter, covers innovation in the Institute’s research and education programs. MTI’s extensive collection of transportation-related publications is integrated into San José State University’s world-class Martin Luther King, Jr. Library.

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the information presented herein. This document is disseminated under the sponsorship of the U.S. Department of Transportation, University Transportation Centers Program and the California Department of Transportation, in the interest of information exchange. This report does not necessarily reflect the official views or policies of the U.S. government, State of California, or the Mineta Transportation Institute, who assume no liability for the contents or use thereof. This report does not constitute a standard specification, design standard, or regulation.

MTI REPORT 08-02

**PUBLIC VERSUS PRIVATE MOBILITY FOR THE
POOR: TRANSIT IMPROVEMENTS VERSUS
INCREASED CAR OWNERSHIP IN THE
SACRAMENTO REGION**

June 2009

Robert A. Johnston

Shengyi Gao

a publication of the
Mineta Transportation Institute
College of Business
San José State University
San José, CA 95192-0219
Created by Congress in 1991

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. CA-MTI-09-2403	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Public Versus Private Mobility for the Poor: Transit Improvements Versus Increased Car Ownership in the Sacramento Area		5. Report Date June 2009	
		6. Performing Organization Code	
7. Authors Robert A. Johnston and Shengyi Gao		8. Performing Organization Report No. MTI Report 08-02	
9. Performing Organization Name and Address Mineta Transportation Institute College of Business San José State University San José, CA 95192-0219		10. Work Unit No.	
		11. Contract or Grant No. DTRT07-G-0054	
12. Sponsoring Agency Name and Address California Department of Transportation Sacramento, CA 95815 U.S. Department of Transportation Research and Innovative Technology Administration 1200 New Jersey Avenue SE, Rm. E33 Washington, DC 20590-0001		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
<p>16. Abstract</p> <p>Whether to aid welfare recipients in overcoming transportation barriers with increased car ownership or better transit became an issue after the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 was signed into law. Empirical studies pointed out that welfare recipients owning a car had a high probability of moving from welfare to work. In this study, the authors examined the impacts of car ownership promotion versus transit improvements on job accessibility, work trips, and traveler's economic welfare by running a travel demand model adopted by the Sacramento Area Council of Governments (SACOG). In the car scenario, the zero-car households who were assigned a car had higher job accessibility and larger traveler benefits than in the Base Case scenario. The other households had lower traveler benefits, compared to the Base Case, due to slight increases in congestion. In the transit scenario, all households had gains in traveler benefits and the households without a car gained more than those with a car. The households without a car gained more in traveler benefits in the transit scenario than in the car scenario. The total gain in traveler benefits was higher in the transit scenario. In both scenarios, the changes in total travel time, congestion, and vehicle miles traveled (VMT) were small, but mode shares changed substantially.</p>			
17. Keywords Car ownership; Journey to work; Transportation policy; Travel behavior; Work trips	18. Distribution Statement No restriction. This document is available to the public through the National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 34	22. Price \$15.00

Copyright © 2009
by Mineta Transportation Institute

All rights reserved

Library of Congress Catalog Card Number: 2009922856

To order this publication, please contact the following:

Mineta Transportation Institute

College of Business

San José State University

San José, CA 95192-0219

Tel (408) 924-7560

Fax (408) 924-7565

E-mail: mti@mti.sjsu.edu

<http://transweb.sjsu.edu>

ACKNOWLEDGMENTS

The authors thank the Mineta Transportation Institute at San José State University for funding this work, and especially thank Research Director Trixie Johnson for her patience with our many difficulties and long delays in executing this research. We also thank Kenneth Vaughn, Citilabs, Inc., Allen X. Nie, TJKM Transportation Consultants, and John Gibb, DKS Associates, for their technical support for exporting logsums from SacMet04. Additionally, many thanks to Gordon Garry, director of research and modeling, and Bruce Griesenbeck, principal transportation analyst, at the Sacramento Council of Governments (SACOG) for sharing the model and data with us.

The authors would also like to thank ITT & Special Projects Director Donna Maurillo, Research Support Manager Meg Fitts, Publication Assistant Sahil Rahimi. Editing and publication services were provided by Catherine Frazier and Cris Gutierrez.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
INTRODUCTION	3
LITERATURE REVIEW	5
ANALYSIS	9
Modeling Method	9
RESULTS	13
Changes in Job Access by Transit	13
Changes in Travel	14
Changes in Traveler Benefit	16
CONCLUSION	19
ENDNOTES	21
ABBREVIATIONS AND ACRONYMS	25
BIBLIOGRAPHY	27
ABOUT THE AUTHORS	29
PEER REVIEW	31

LIST OF FIGURES

1. Spatial distributions of retail jobs and low- and very-low income households	10
2. Spatial distribution of access to retail jobs in the Base Case scenario	14
3. Spatial distribution of access to retail jobs in the Transit scenario	15

LIST OF TABLES

1. Household classification by income and workers (in 1990 dollars)	10
2. Household classification by workers and cars for home-based work trips	11
3. Headways of transit in the Base Case and Transit scenarios	12
4. Home-based work person trips (a.m. 3-hour peak), year 2013	16
5. CV measures by IWclass of policy scenarios (unit: dollars per trip in 1990 dollars, year 2013)	17
6. CV measures by IWclass and CWclass of policy scenarios (unit: dollars per trip in 1990 dollars), year 2013	17

EXECUTIVE SUMMARY

On September 22, 1996, President Bill Clinton signed the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 into law. The goal of this law is to help welfare recipients transfer to work and become self-sufficient. It strictly limits the maximum time of public cash assistance at two consecutive years or five cumulative years. This legislation fundamentally changed the way that the federal government provides assistance to needy households.

To conform to the federal law, the California Department of Social Services adopted the California Work Opportunity and Responsibility to Kids (CALWORKs) program on January 1, 1998. Institutions and funds were set up based on CALWORKs to help welfare recipients move from welfare to work. At the policy level, a main concern is how to fairly distribute and efficiently use resources to maximize the role of limited funds and to minimize possible negative impacts. At the technical level, a main concern is to identify the factors that hinder welfare recipients from working.

Surveys and empirical studies have demonstrated that besides job skills and child care, lack of reliable transportation is a key factor that prevents many welfare recipients from finding and retaining jobs. Solutions seem to be obvious: Either aid welfare recipients in obtaining a car or improve transit service, or ideally, both. However, in the implementation of these approaches, many concerns—particularly equity (i.e., whether non-welfare recipients will be disproportionately and negatively affected by either of the solutions)—arise.

Traditional four-step travel demand models can be used to simulate the impacts of transportation policies. However, almost none of these models has a measure on traveler economic welfare (utility) to deal with the equity issues involved in this policy context. In this study, we added a component to the travel demand model adopted by the Sacramento Area Council of Governments (SACOG) to measure the traveler benefits of two policy scenarios, car ownership promotion, and improvements in transit as suggested by Small and Rosen¹ and Rodier and Johnston².

In this study, the authors tested the possible impacts of promoting car ownership versus transit improvements on job accessibility, work trips, and traveler benefits at the system level by running a travel demand model adopted by the SACOG. In the car scenario, the zero-car households assigned a car had higher job accessibility and larger positive changes in traveler benefits than those in the Base Case scenario. The other households had reduced traveler benefits, compared to the Base Case, due to slight increases in congestion. In the transit scenario, all households had gains in traveler benefits, and the households without a car gained more than those with a car. The households without a car gained more in traveler benefits in the transit scenario than in the car scenario. The total gain in traveler benefits (for all households) was higher in the transit scenario. In both scenarios, the changes in total travel

time, congestion, and vehicle miles traveled (VMT) were small, but mode shares changed substantially.

INTRODUCTION

On September 22, 1996, President Bill Clinton signed the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 into law. The goal of this law is to help welfare recipients transfer to work and become self-sufficient. It strictly limits the maximum time of public cash assistance at two consecutive years or five cumulative years. This legislation fundamentally changed the way that needy households access welfare.

To conform to the federal law, the California Department of Social Services enacted the California Work Opportunity and Responsibility to Kids (CALWORKs) program on January 1, 1998. From 1998 to 2001, the number of welfare recipients was reduced by 1.4 million. A survey done in 1998 and 1999 in the Bay Area showed that 90% of one-parent households and 94% of two-parent household that left welfare reported earnings from subsequent employment.³ At the state level, the results were not so optimistic. In 1998 and 1999, 41.4% of adults on welfare were employed. In contrast, only 12.2% and 15.3% of case closures were attributed to increased earnings, and only 3.1% and 3.5% of case closures were attributed to new employment.⁴

These data suggest that there is great variation in the rate at which welfare recipients transfer to self-sufficiency across counties within California. Many factors, such as education, job skills, race, and social networks, may contribute to the variation. But an important determinant, which is often stated by welfare recipients and statistically supported by empirical studies is transportation.⁵ In large American cities, welfare recipients often reside in the inner city and have low car ownership while most entry-level jobs that welfare recipients are qualified for are located in the suburbs. The welfare recipients and entry-level jobs are spatially mismatched. Insufficient transit service and low access to private automobiles make it difficult for welfare recipients to commute between the inner city and suburbs. Empirical studies have demonstrated that the larger the city, the worse the transportation barrier.⁶

Thus, the common policy recommendations seem to be improve transit to overcome the spatial separation between the residences of welfare recipients and entry-level jobs, or enhance car ownership among welfare recipients, or both. Although there is debate about the role of transit in moving welfare recipients to self-sufficiency,⁷ both approaches have been adopted in practice.

Important planning questions arise concerning the two approaches. First, to what extent will the two approaches affect regional job accessibility and, specifically, the job accessibility of those households who heavily rely on transit? Second, to what extent is the level of service of the highway network affected by the application of the two approaches? Third, how are traveler benefits redistributed among households in the different income classes? Because the foci of the two policies are welfare recipients, we expect that with a successful policy, welfare recipients—or more generally, low-income households—will have larger percentage gains in

traveler benefits than will households with higher incomes, and the performance of the transportation system will not be negatively affected.

In this study, we make use of the travel demand forecast model adopted by SACOG to simulate the impacts of enhancing car ownership and of improving transit to address these policy evaluation questions.

LITERATURE REVIEW

The physical separation of entry-level jobs and the people who need the jobs captured sociologists' attention in the 1960s. Kain studied the correlation between the high unemployment rates of blacks in the inner city and jobs in Chicago and Detroit, and concluded that the decentralization of jobs and racial residential segregation led to the high unemployment rates among inner city blacks.⁸ Insufficient public transit between the inner city and suburban jobs also was identified as a determinant. Kain's research initiated a large volume of studies on the impacts of job accessibility on employment for central-city households, or the spatial mismatch hypothesis, as it was called. Some studies have provided supportive evidence for this hypothesis.⁹ Since the Personal Responsibility and Work Opportunity Reconciliation Act was implemented in 1996, many researchers have tested whether spatial mismatch exists for welfare recipients.

Using data containing the records of welfare recipients from the Georgia Department of Family and Children's Services (DFCS) and data containing job locations from the Georgia Department of Labor, Sawichi and Moody documented via Geographic Information System (GIS) the residence locations of welfare recipients and the locations of entry-level jobs in the Atlanta region.¹⁰ The majority of the entry-level jobs were in the northern suburbs while the welfare clients mainly resided in the inner city. The welfare recipients had low access to the entry-level jobs by transit. Only 44 percent of the welfare recipients of working age were within a quarter mile of a transit line. (This percentage would be lower if the distance were measured to transit stops.) In other words, entry-level jobs and the residences of welfare recipients were poorly connected by transit, and the transportation services provided by the current transit system could not meet the welfare recipients' needs for work and other commitments.

Ong et al. studied the transportation needs and travel behaviors of the welfare recipients in Los Angeles County by surveying welfare recipients. Among welfare recipients, 93 percent were female, and 91 percent of the total recipient households were headed by a single-parent. This translated into a need for reliable and efficient transportation to fulfill multiple commitments besides work. This study showed that only 18 percent of the total trips and 26 percent of the work trips were made via public transit, and that the average commute distance of the employed welfare recipients was 7.3 miles. For the job seekers and the employed using transit, the percentages who thought transportation was a barrier to finding or retaining a job were two times that for those who owned a car or could access a car. Transit was not thought of as the reliable mode to meet the needs for work and other commitments. Therefore, owning a car (55 percent of the total recipients) was preferred to using transit.¹¹

The transportation needs of welfare recipients also were confirmed by an empirical study in Sacramento, California. Niemeier and Sumpter surveyed welfare recipients and found that among those who were actively looking for a job, nearly 60 percent stated that transportation

was the biggest obstacle hindering them from obtaining a job, followed by lack of experience, lack of adequate childcare, and lack of English language skills. Of those who relied on public transportation, 71 percent indicated that they were unable to participate in some important daily activities such as work-related activities and shopping activities, while among those who relied on personal autos, only 32 percent agreed. Not surprising, those who were employed relied more on personal autos than those who were unemployed (58 percent versus 42 percent).¹²

In a cost–benefit analysis of the Job Access and Reverse Commute (JARC) program, Thakuria et al. found that improved transit services substantially decreased the commute time for those who worked at the same locations and made farther jobs more accessible. The transit service costs were high, but the returns were high as well. Both the users and non-users of the JARC program benefited from the program, but the users gained more. In particular, discretionary transit riders gained more than did non-discretionary riders. The authors also found that many users were unlikely to use a transit system over the long term.¹³

Besides the stated preference for a personal vehicle, empirical studies have shown that owning a car significantly increases the probability of being employed, controlling for other conditions. Cervero et al., using panel data of welfare recipients and a multinomial logit model, found that in Alameda County, California, owning a personal auto significantly increased the odds of being employed while the effects of enhancing transit accessibility and regional job accessibility were statistically insignificant.¹⁴ Using panel data tracking the caseload of welfare recipients, Richards and Bruce studied the effects of car access on employment of welfare recipients in Mississippi. They found that owning a car significantly decreased the probability of being on welfare over time and significantly increased the probability of being employed and leaving welfare.¹⁵ Blumenberg surveyed welfare recipients in Fresno County, California, and found that owning a car was particularly helpful to welfare recipients who were actively looking for a job and had longer commutes.¹⁶

The welfare recipients' stated preference for owning a car and the advantages in searching and retaining a job due to owning a car were often used as evidence for policy advocacy—helping welfare recipients own a car. Many demonstration projects that provide welfare recipients with auto loans at low/no interest have been implemented.¹⁷ Additionally, many metropolitan planning organizations (MPOs) have been improving transit and treat transit as a primary mode for those who do not own a car and as an alternative transportation mode for all travelers.

However, an important issue was largely neglected in empirical studies and in practice: how the two approaches affect welfare recipients' and other travelers' travel benefits. From the perspective of policy-making, meeting welfare recipients' transportation needs should account for changes in other travelers' travel benefits. The negative effects of any action focused on improving welfare recipients' accessibility should be minimized.

In traditional four-step travel demand models, typical outputs of the model include measures of activity on road networks (e.g., traffic volumes on the links, zone-to-zone travel times, and

volume/capacity (V/C) ratios), vehicle miles traveled (VMT), and trips from production zones to attractions by mode. A good four-step travel model also will provide zonal accessibility, which is measured by the number of jobs (total or entry-level jobs) with a given travel time (on the highway network) by driving or transit. Traveler benefits as a measure of economic benefits of travelers are usually not a component in travel models used by MPOs.¹⁸ Therefore, running a traditional four-step travel demand forecast model cannot provide a satisfactory answer to concerns on the equity issues.

ANALYSIS

In this study, we chose to test the two policy scenarios in the Sacramento region. The area encompasses six northern California counties (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba), and has four major highway corridors (see [Figure 1](#)): Interstate 80 (I-80), Interstate 5 (I-5), Highway 99 and Highway 50. The city of Sacramento is the largest city and is the economic center of the Sacramento metropolitan area.

As in most urban regions in the United States, jobs—especially entry-level jobs—in the Sacramento region have been decentralizing in the past 40 years, and the decentralization continues.¹⁹ [Figure 1](#) shows the distribution of forecasted retail jobs and households (forecasted households in 2013) with low (\$3,500–7,000 per year in 1990 dollars; net income formula defined in the “modeling method” subsection) and very low income (<\$3,500 per year in 1990 dollars) at the traffic analysis zone (TAZ) level in 2013. It is clear that the TAZs that have more retail jobs are located in the suburbs while the majority of households with low and very low incomes are concentrated in the inner city. The residences of the poor are spatially separated from the jobs for which they are qualified.

As a subset of the households with very low and low incomes, households receiving public assistance live in those areas shown in [Figure 1](#). They suffer from the spatial separation of residences and jobs along with the other households with low and very low incomes. As a whole, they can be represented in the travel demand forecast model by the very low and low-income households.

MODELING METHOD

This study used SACOG’s SacMet04 travel demand model. This model was calibrated with the 2000 SACOG household travel survey data.²⁰ The highway network and data we used for our Base Case scenario were provided by SACOG. The study area has 1,309 TAZs. The forecast year is 2013. The zonal attributes, including households by size, income category, and number of workers, were forecasted by SACOG. The highway network has 19,655 links, including proposed new links for the forecast year. The transit network includes the light rail transit (LRT) lines and bus routes operated by the transit agencies and companies in the region. The dollar cost of travel is in 1990 constant dollars. The household income used in this model is “net” household income [net household income = 0.6 x (gross household income – 20,000) + 20,000] instead of reported gross income. Based on the “net” income, the households are classified into five income categories (see [Table 1](#)). To simplify mode choice for home-based work trips, SACMET04 (as well as its previous versions) aggregates the households into three income/worker classes (IWclass) and four car/worker classes (CWclass) (see [Table 1](#) and [Table 2](#)).

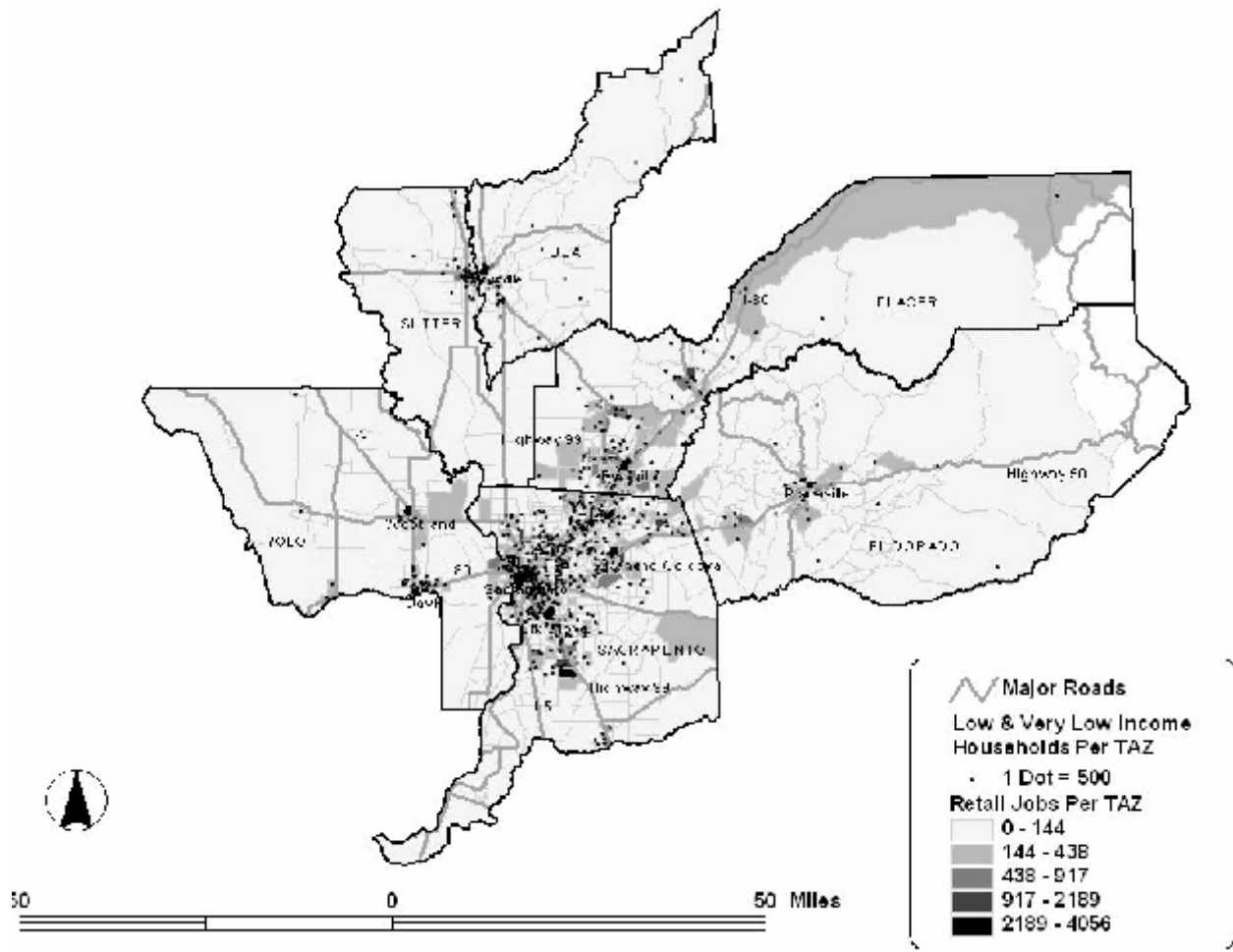


Figure 1 Spatial distributions of retail jobs and low- and very-low income households

Table 1 Household classification by income and workers (in 1990 dollars)

Income	Workers			
	0	1	2	3+
0-10,000	1	2	1	1
10,000-20,000	2	3	2	1
20,000-35,000	3	3	2	2
35,000-50,000	3	3	3	2
50,000-up	3	3	3	3

Source: DKS Associates, 2001

Table 2 Household classification by workers and cars for home-based work trips

Workers	Cars			
	0	1	2	3+
1	1	4	4	4
2	1	2	3	3
3+	1	2	2	3

Source: DKS Associates, 2001

The calculations of home-based work (HBW) trips are based on total skimmed times for the a.m. and p.m. peak periods for the HBW trips. Travel time is represented by in-vehicle and out-of-vehicle travel times in the utility function. The marginal disutility (i.e., the coefficient) of travel time is assumed to be equal for drive alone, shared ride, and transit (drive access and walk access). In other words, a minute is valued equally for driving and transit. Larger in-vehicle and out-of-vehicle travel times will lead to higher disutility. The out-of-vehicle time has a higher marginal disutility than does in-vehicle time because travelers dislike out-of-vehicle time more.

In the Base Case, the transit network has 189 bus lines and four light rail lines. The major cities in the region have their own local transit systems, and these local transit systems are connected through inter-city buses. In the inner areas of the city of Sacramento, almost all streets are within the transit service areas. Furthermore, the inner areas are connected with the suburban areas through light rail or bus lines.

The number of cars owned by households is estimated by a car ownership model. In this model, a household may choose to own 0, 1, 2, or 3+ cars according to the utility function, which includes persons in the household, workers in the household, income class, square root of retail employment within one mile, and total employment within 30-minute transit travel. Therefore, in each IWclass, there are some zero-car households.

Small and Rosen's ²¹ and Rodier and Johnston's ²² methods are used to calculate traveler benefits. Because traveler benefits are not a default output of SACMET04, we had to modify the script so that the person trips and mode choice logsums could be exported by IWclass (income-worker class in Table 1) and CWclass (car-worker class in Table 2). The equation to calculate traveler benefits, which is known technically as compensating variation (CV), in this formulation, is as follows:

$$CV_h = 1/\lambda_h \left\{ \sum_{i \in I} \sum_{j \in J} \left[\left(\ln \sum_{m \in M} e^{V_{ijmh}(p^f)} * Q_{ijh} \right) - \left(\ln \sum_{m \in M} e^{V_{ijmh}(p^o)} * Q_{ijh} \right) \right] \right\}$$

where $b = 1, \dots, H$, which is income/worker class (IWclass); Q represents the trips (for a trip purpose or for all trip purposes, contingent upon research interest) from origin zone i ($1, \dots, I$) to destination j ($1, \dots, J$); m ($1, \dots, M$) is the mode; λ_b is the marginal utility of income. The unit of CV_b is dollars per trip and can be calculated only as the difference between a policy scenario and the Base Case scenario. Small and Rosen²³ showed how the marginal utility of income can be obtained from the coefficient of the cost variable in the mode choice equations.

Base Case Scenario

In the Base Case scenario, we used the zonal inputs, road and transit networks, and model parameters as described earlier.

Policy Scenarios

We designed two scenarios to represent the policy solutions suggested in the literature: increasing job accessibility for low- and very low income households by subsidizing car purchases or by improving transit.

Table 3 Headways of transit in the Base Case and Transit scenarios

Headways in the Base Case Scenario	Headways in the Transit Scenarios
15	10
20	10
30	15
40	20
45	25
48	25
60	30
90	45
120	60

The transit scenario had the same transit lines as the Base Case scenario. The bus time factor was adjusted from 1.87 to 1.67 (link travel times for buses, compared to cars), to represent bus drivers having traffic signal override transmitters and bus-only lanes at most intersections. The headways of the transit lines are adjusted as in [Table 2](#) to represent more bus service on existing lines. Thus, in the transit scenario, the transit service was much better than that in the Base Case scenario. Within the same travel time, job accessibility by transit in the transit scenario was higher than that in the Base Case scenario.

In the car scenario, we manually assigned a car to the zero-car households in all IWclasses. Thus, the households in IWclass 1 and CWclass 1, IWclass 2 and CWclass 1, and IWclass 3 and CWclass 1 were reclassified into IWclass 1 and CWclass 2, IWclass 2 and CWclass 2, and IWclass 3 and CWclass 2, respectively. The home-based work trips for IWclass 1 and CWclass 1, IWclass 2 and CWclass 1, and IWclass 3 and CWclass 1 were therefore 0 (see [Table 6](#)).

RESULTS

CHANGES IN JOB ACCESS BY TRANSIT

In SACMET04, two approaches are used to measure zonal job accessibility: jobs (total and retail jobs) within a fixed distance (one mile and 25 miles) and jobs within a fixed travel time (by auto and by transit) for the a.m. skims. The first method leads to fixed job accessibility due to fixed jobs and distance, and thus is not of interest for policy analysis. In the second method, if the travel time by personal car or transit changes, a corresponding change will happen to reflect the influence of travel time on job accessibility. In the car scenario, the auto and transit travel times were almost not affected by the increase in the number of autos; therefore, the job accessibility either by auto or by transit at the TAZ level and at the system level was the same as in the Base Case scenario. As a whole, the increase in cars did not bring any extra benefits or lead to substantial negative impacts in terms of job accessibility. However, zero-car households who relied on non-auto modes and thus had low job accessibility in the Base Case scenario had much higher job accessibility due to owning a car.

In the transit scenario, the improvement of transit service led to higher job access in the same travel time. In the Base Case scenario, TAZs along I-80 in Northeast Sacramento and TAZs along Highway 99 in South Sacramento had good access to retail jobs by transit (see [Figure 2](#)). Only a small portion of these TAZs overlapped with TAZs with high numbers of households of low and very low income (see [Figure 1](#) and [Figure 2](#)). In the transit scenario, the access to retail jobs by transit increased on average by 11 times (10 times for total jobs), as many TAZs had very poor job accessibility in the Base Case scenario. Spatially, the areas with higher job accessibility covered more TAZs in the suburbs (which can be seen by comparing [Figure 2](#) and [Figure 3](#)). The TAZs with a higher density of low- and very low income household largely overlapped with those TAZs with high job accessibility. The TAZs with a large number of retail jobs (see [Figure 1](#)) were much closer to the high job-accessibility areas than in the Base Case scenario. To those households who relied on transit for work trips, the improvement in transit service enlarged the area for job searching and thus could make it easier for them to get and retain jobs.

Furthermore, the increase in job accessibility by transit led to a slight decrease in car ownership at all income levels. Access to total jobs by transit was a determinant in the car ownership model. A higher access to total jobs led to lower utility for owning an auto. Not surprisingly, the low income households were more sensitive to the change of job accessibility by transit. In IWclass 1, the ownership decreased by 5.50% while it decreased only 1.95% and 0.86% in IWclass 2 and IWclass 3, respectively.

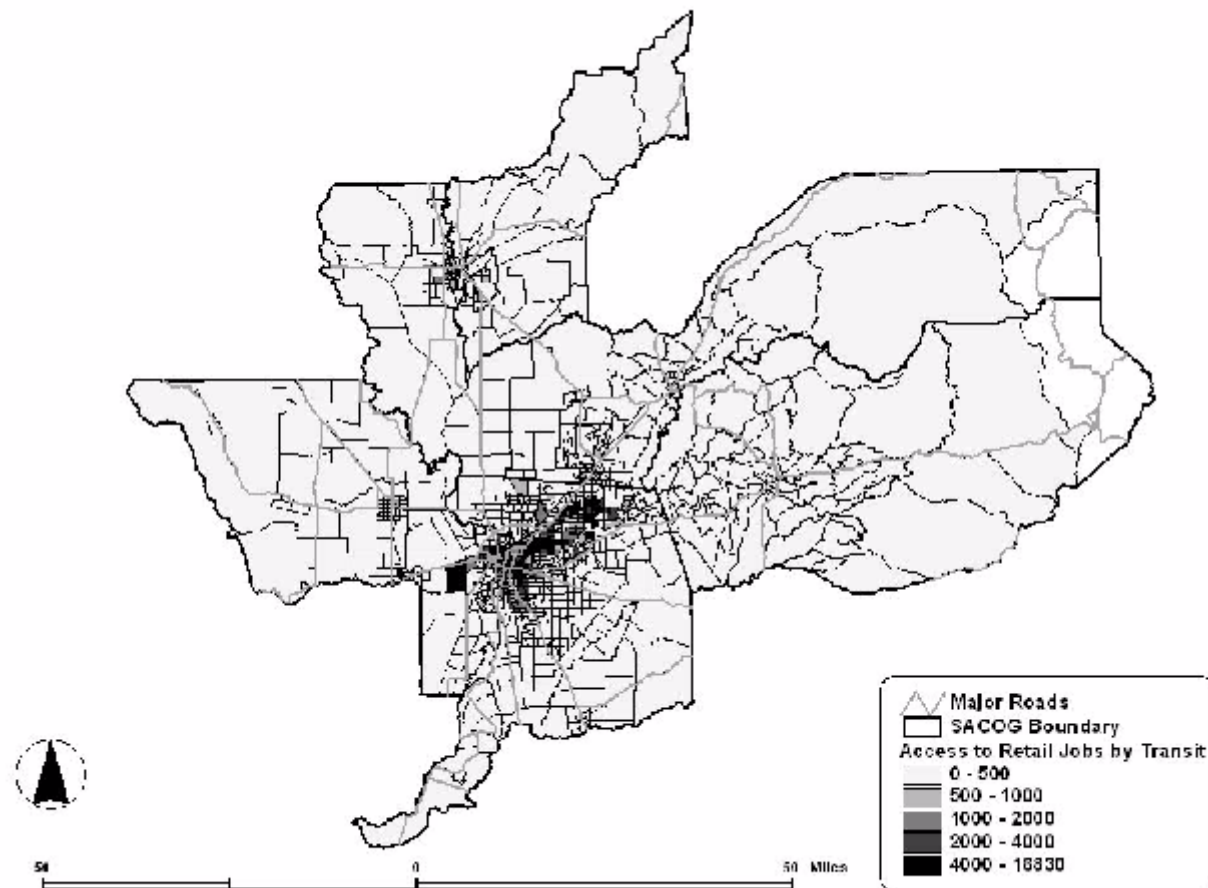


Figure 2 Spatial distribution of access to retail jobs in the Base Case scenario

CHANGES IN TRAVEL

In the car scenario, the number of cars increased by 46.28% in IWclass 1, 7.33% in IWclass 2, and 1.62% in IWclass 3, respectively. As a whole, the number of cars increased by 4.51% (67,054 cars). Compared with the Base Case scenario, the increase in number of cars increased the total daily vehicle travel time by 1.08% and traffic volumes by 1.32%. Judged by V/C ratios, the increase in cars caused extra congestion on about 4% of the links. Its impacts on the total trips, total VMT, and average miles per trip were minor (<1.00%). However, it did lead to a substantial change in the mode shares of HBW trips. As shown in Table 4, the drive-alone trips increased by 2.96% while the two-person and three-person shared-ride trips decreased by 4.83% in total. These changes were caused primarily by the increased auto availability. Transit trips decreased substantially due to a large decrease of walk-access trips and a small increase of drive-access trips. The mode shares of walk and bike trips also decreased substantially.

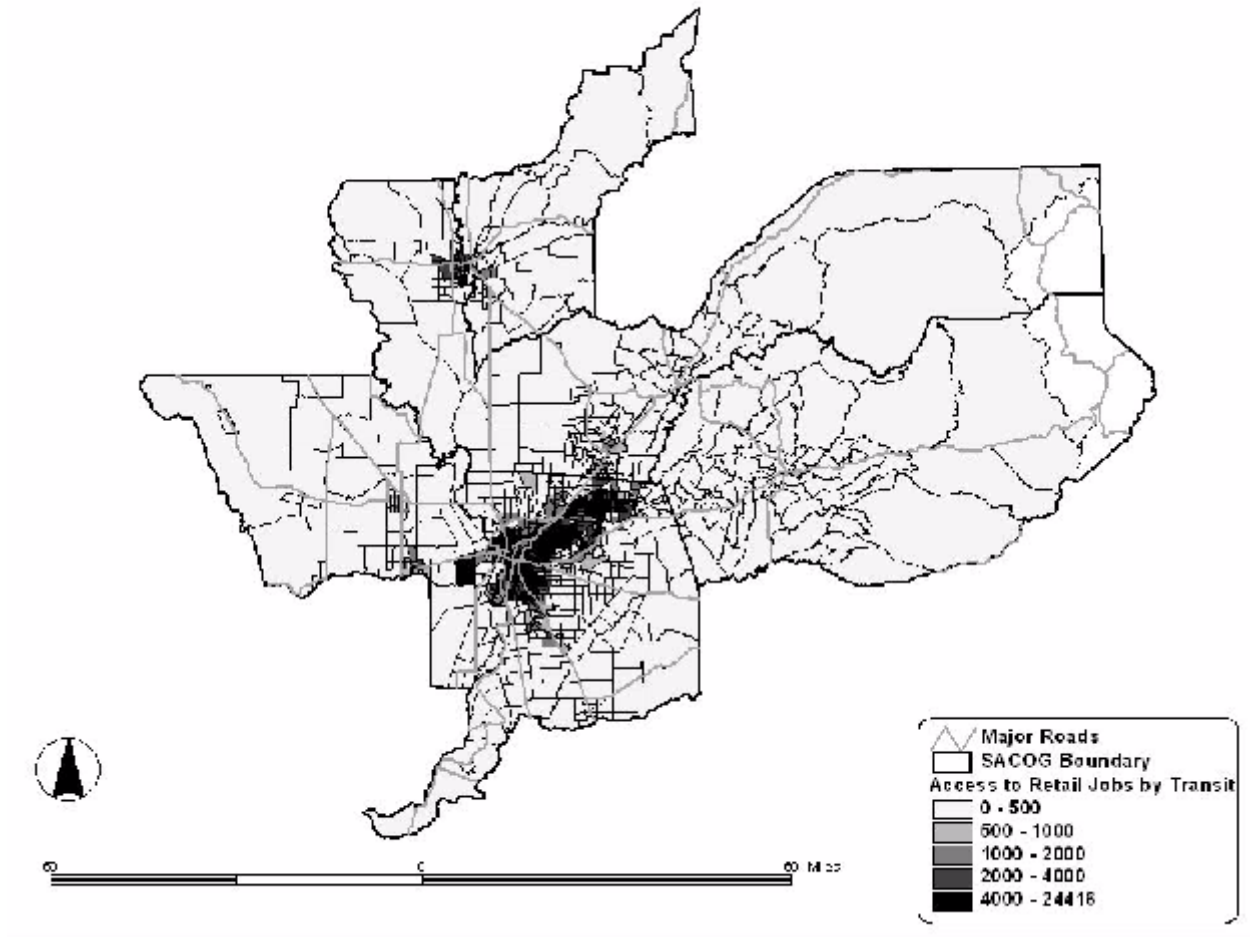


Figure 3 Spatial distribution of access to retail jobs in the Transit scenario

In the transit scenario, the decrease in the headways and the higher speeds made transit faster and transfers easier. Because the total jobs within 30 minutes by transit was a determinant of car ownership, the increase of accessible jobs by transit led to a decrease of the number of cars by 5.51% in IWclass 1, 8.65% in IWclass 2, and 2.54% in IWclass 3, respectively. The decrease in cars led to a decrease of traffic volume by 0.29% and VMT by 0.12%.

As shown in [Table 4](#), the mode shares have substantial changes. Compared with the Base Case scenario, the total auto trips dropped by 3.41% while the walk-to-transit and drive-to-transit trips jumped by 50.01% and 14.76%, respectively. These results suggest that when transit services are improved, households of all incomes would be more likely to use transit for their work trips.

Table 4 Home-based work person trips (a.m. 3-hour peak), year 2013

	DA	S2	S3	TW	TD	WK	BK
Base Case Scenario	1,258,865	122,124	33,670	28,350	11,157	25,200	56,852
Car Scenario	1,296,178	119,216	32,847	19,512	11,937	17,515	39,732
Transit Scenario	1,242,396	120,846	33,316	42,528	12,804	26,052	58,509
Auto Percent Change	2.96%	-2.38%	-2.45%	-31.17%	6.99%	-30.50%	-30.11%
Transit Percent Change	-1.31%	-1.05%	-1.05%	50.01%	14.76%	3.38%	2.91%

*DA: drive-alone; S2: shared mode, two persons; S3: shared mode, three or more persons; TW: walk-to-transit; TD: drive-to-transit; WK: walk; BK: bike.

CHANGES IN TRAVELER BENEFIT

In this study, we used the same marginal utility of income for work trips as in a previous study.²⁴ As implied in the equation on page 11, the difference of CV measures between the policy scenarios was determined by the sum of person-trips weighted by logsum. In SACMET04, the trips were counted by IWclass, by CWclass, and then by mode. IWclass and CWclass were two variables in the utility function for mode choice. Their marginal contributions to the utility were different for each mode. Therefore, if a policy factor led to a change in the variables (IWclass, CWclass, travel time, etc.) in the utility function, individually or simultaneously, it would lead to a change in the CV measure.

In the car scenario, the households without a car in the Base Case scenario were given a car, and thus their CWclasses were changed. These changes led to a change in mode share (see Table 4) and in the CV measure (see Table 5). At the system level, the travelers lost \$0.18 on average per trip. At the income-group level, IWclass 3 lost more traveler benefits than did IWclass 1 (\$0.37 vs. \$0.09), due partly to a higher value of time.

In the transit scenario, transit became more attractive due to a decrease in in-vehicle and out-of-vehicle times. More households tended to increase their transit use (see Table 4). The travelers gained \$0.32 on average per trip. The travelers in the lower income group gained slightly more benefits than those in the high-income group. A more detailed examination of the trips and CV measure by IWclass and CWclass (see Table 6) showed that the increase in transit trips as well as walk and bike trips were mainly made by those households without a car or who had one car and at least two workers. They gained more than the households in other IWclasses and CWclasses. These results are consistent with other findings in the literature.²⁵

Table 5 CV measures by IWclass of policy scenarios (unit: dollars per trip in 1990 dollars, year 2013)

IWclass	Car Scenario	Transit Scenario
1	-0.09	0.37
2	-0.07	0.23
3	-0.37	0.35
Average CV	-0.18	0.32

It was useful to compare the CV measures of the households without a car between the two scenarios. Due to the reclassification of the households in the car scenario, the CV measure for households without a car could not be calculated separately for households in the same IWclass and CWclass but owning a car. Combining the CV measures for IWclass 1 and CWclass 1 and IWclass 1 and CWclass 2, IWclass 2 and CWclass 1 and IWclass 2 and CWclass 2, and IWclass 3 and CWclass 1 and IWclass 3 and CWclass 2, we found that households without a car gained more welfare in the transit scenario than in the car scenario (see [Table 6](#)).

Table 6 CV measures by IWclass and CWclass of policy scenarios (unit: dollars per trip in 1990 dollars), year 2013

IWclass	CWclass	Car Scenario	Transit Scenario
1	1 & 2	0.03	0.26
1	3	-0.06	0.05
1	4	-0.06	0.06
2	1 & 2	0.06	0.11
2	3	0.00	0.01
2	4	-0.13	0.11
3	1 & 2	0.18	0.21
3	3	-0.28	0.04
3	4	-0.27	0.10

We present the CV outputs for only the a.m. and p.m. peak HBW trips. The other trips mostly occur under uncongested conditions, with smaller costs per trip. So, a full accounting would give results about 1.5 times as large as those shown here. Since most travel models, including this one, do not represent peak-spreading or include departure-time models, they give only approximate results. Study results, however, show differences of about \$0.5 million per day for all trips.

This is a private traveler benefits analysis. In a social (full-cost) analysis, one would add full auto-ownership costs to the CV data presented here. This would greatly increase the cost differences, but not change the rankings. One also would need to add in capital and operation costs for the additions to the transport systems in the Base Case and in the two policy scenarios.

CONCLUSION

The focus of this case study are households with low and very low incomes. However, the results can be extended to policy analysis relevant to welfare-to-work. Aiding welfare families in obtaining a car will help them overcome the transportation barrier to work and meet their multiple transportation needs. Our results demonstrate that assigning a car to those households without one would lead to only minor negative impacts in VMT, traffic volumes, and congestion, but would substantially lower the mode share of transit trips. An improved transit system makes the jobs—in particular, the entry-level jobs in suburban areas—more accessible to families who reside in inner-city areas and provides an alternative mode for all travelers.

Our results demonstrate that the CV traveler benefit measure is a useful indicator in policy analysis. In particular, it sheds light on the debate about the transportation policy choice related to welfare recipients. Our results show that households without a car benefitted in both scenarios. However, in the car scenario, the gain was accompanied by a loss in traveler benefits for the households already owning cars. An improved transit system made all households gain traveler benefit. Households without a car used more transit and gained more than did those households who used less transit. More importantly, for the objective of helping welfare recipients, the households without a car gained more in the transit scenario than in the car scenario. Note that the results alone are not enough for a policy recommendation because the feasibility of funding, detailed social costs, and other factors that will affect the decision-making are not included in this analysis.

It should be emphasized that the SACMET04 model used the past perceived out-of-pocket auto operating cost (\$0.05 per mile) instead of the full-ownership cost in the mode choice step. Judged by current gasoline prices, even this 5-cent cost is too low to reflect the impact of current fuel costs on mode-choice behavior. The mode shares of drive-alone were probably overestimated in the Base Case scenario and the car scenario, and accordingly, the gains in traveler benefits for the households being assigned a car in the car scenario were overestimated. If so, the differences in the CV measures between the auto and transit scenarios will be larger than that shown in [Table 5](#) and [Table 6](#).

ENDNOTES

1. Kenneth A. Small and Harvey S. Rosen, "Applied Welfare Economics with Discrete Choice Models," *Econometrica* 49, no. 1 (1981): 105-30.
2. Caroline J. Rodier and Robert A. Johnston, "Method of Obtaining Consumer Welfare from Regional Travel Demand Models," *Transportation Research Record* 1649 (1998): 81-5.
3. Thomas MacCurdy, Grecia Marrufo, and Margaret O'Brien-Strain. "What Happens to Families When They Leave Welfare?," Public Policy Institute of California. 2003. www.ppic.org/content/pubs/R_903TMR.pdf (accessed March 1, 2004).
4. California Department of Social Services (CDSS), "CalWORKs Characteristics Survey," (1999) www.dss.cahwnet.gov/q51804/publications/pdf/Updated%20PDF%20CalWORKS%2099.pdf (accessed February 8, 2009).
5. Robert Cervero, Onésimo Sandoval and John Landis, "Transportation as a Stimulus of Welfare-to-Work: Private versus Public Mobility," *Journal of Planning Education and Research* 22, no. 1 (2002): 50-63; Tami Gurley and Donald Bruce, "The Effect of Car Access on Employment Outcomes for Welfare Recipients," *Journal of Urban Economics* 58, no. 2 (2005): 250-72; Debbie Niemeier and Matt E. Sumpter, "Transportation Needs of Sacramento County Welfare Recipients," UCD-ITS-RR-2000-2 (Davis, CA: University of California at Davis, April 2000); Paul M. Ong, Douglas Houston, John Horton, and Linda L. Shaw, "Los Angeles County CalWORKs Transportation Needs Assessment," May 2001, www.sppsr.ucla.edu/lewis (accessed March 10, 2004); Steven Raphael and Lorien Rice, "Car ownership, employment, and earnings," *Journal of Urban Economics* 52 (2002): 109-13.
6. John D. Kasarda. "Urban Change and Minority Opportunities," In *The New Urban Reality*, ed. Paul E. Peterson, 33-68 (Washington DC: The Brookings Institute, 1985); David S. Sawichi and Mitch Moody, "Developing Transportation Alternatives for Welfare Recipients Moving to Work," *Journal of the American Planning Association* 66, no. 3 (2000): 306-18; Paul M. Ong and Douglas Miller, "Spatial and Transportation Mismatch in Los Angeles," May 2003, www.sppsr.ucla.edu/lewis (accessed March 10, 2004).
7. Thomas W. Sanchez, Qing Shen, and Zhong-Ren Peng, "Mobility Transit, Jobs Accesses and Low-Income Labor Participation in U.S. Metropolitan Areas," *Urban Studies* 41, no. 7 (2004): 1313-31; Cervero, Sandoval and Landis.
8. John Kain, "Housing Segregation, Negro Employment, and Metropolitan Decentralization," *The Quarterly Journal of Economics* 82, no. 2 (1968): 175-97.

9. Keith R. Ihlanfeldt and David L. Sjoquist, "Job Accessibility and Racial Difference in Youth Employment Rates," *American Economic Review* 80, no. 1 (1990): 267–76; Keith R. Ihlanfeldt and David L. Sjoquist, "The Spatial Mismatch Hypothesis: A Review of Recent Studies and Their Implications for Welfare Reform," *Housing Policy Debate* 9, no. 4 (1998): 849–92; Margaret Pugh, "Barriers to Work: The Spatial Divide between Jobs and Welfare Recipients in Metropolitan Areas," September 1998.
www.brookings.edu/reports/1998/07/metropolitanpolicy_pugh.aspx (accessed March 10, 2004); Steven Raphael, "The Spatial Mismatch Hypothesis and Black Youth Joblessness: Evidence from the San Francisco Bay Area," *Journal of Urban Economics* 43, no. 1 (1998): 79–111; Qing Shen, "A Spatial Analysis of Job Openings and Access in a U.S. Metropolitan Area," *Journal of the American Planning Association* 67, no. 1 (2001): 53–68; Qing Shen and Thomas W. Sanchez, "Residential Location, Transportation, and Welfare-to-Work in the United States: A Case Study of Milwaukee," *Housing Policy Debate* 16, no. 3 (2005): 393–431.
10. David S. Sawichi and Mitch Moody, "Developing Transportation Alternatives for Welfare Recipients Moving to Work," *Journal of the American Planning Association* 66, no. 3 (2000): 306–18.
11. Ong, Houston, Horton and Shaw.
12. Niemeier and Sumpter
13. Piyushimita Thakuriah, P.S. Sriraj, Siim Soot, and Joesph Persky, "Economic benefits of employment transportation services: Summary of final report," Report to Federal Transit Administration and Community Transportation Association of America, June 2008, http://pigpen.utc.uic.edu/pigpen/vonu/fta/final-report/Thakuriah_Summary_Report2008.pdf (accessed July 22, 2008).
14. Cervero et al.
15. Tami Richards and Donald Bruce, "Car ownership, employment, and earnings," *Journal of Urban Economics* 52 (2002): 109–13.
16. Evelyn Blumenberg, *The Travel Behavior and Needs of the Poor: A Study of Welfare Recipients in Fresno County, California*, MTI Report 01-23 (San José, CA: Mineta Transportation Institute, December 2001).
17. Welfare Peer Technical Assistance Network, http://peerta.acf.hhs.gov/inn_prog/subtopics.cfm?comID=43 (accessed March 10, 2004); Blumenberg 2001; Evelyn Blumenberg and Margy Waller, "The Long Journey to Work: A Federal Transportation Policy for Working Families," (2003)
www.brookings.edu/~media/Files/rc/reports/2003/07/transportation_waller/20030801_Waller.pdf (accessed August 10, 2003).
18. Rodier and Johnston; Small and Rosen.
19. Sacramento Area Council of Governments.

20. DKS Associates, Inc., *SACMET 01 Users Reference*, 2001.
21. Small and Rosen.
22. Rodier and Johnston.
23. Small and Rosen.
24. Rodier and Johnston.
25. Blumenberg and Waller; Thakuria et al.

ABBREVIATIONS AND ACRONYMS

CALWORKs	California Work Opportunity and Responsibility to Kids
CWclass	Car Worker Class
DFCS	Department of Family and Children's Services
GIS	Geographic Information System
HBW	Home-based work
IWclass	Income Worker Class
JARC	Job Access and Reverse Committee
LRT	Light rail transit
MPO	Metropolitan Planning Organization
SACOG	Sacramento Area Council of Governments
TAZ	Traffic Analysis Zone
VMT	Vehicle Miles Traveled

BIBLIOGRAPHY

- Blumenberg, Evelyn. *The Travel Behavior and Needs of the Poor: A Study of Welfare Recipients in Fresno County, California*. MTI Report 01-23. San José, CA: Mineta Transportation Institute, December 2001.
- Blumenberg, Evelyn, and Margy Waller. "The Long Journey to Work: A Federal Transportation Policy for Working Families." (2003)
www.brookings.edu/~media/Files/rc/reports/2003/07transportation_waller/20030801_Waller.pdf (accessed August 1, 2003).
- California Department of Social Services (CDSS). "CalWORKs Characteristics Survey." (1999)
www.dss.cahwnet.gov/q51804/publications/pdf/Updated%20PDF%20CalWORKS%2099.pdf (accessed March 10, 2004).
- Cervero, Robert, Onésimo Sandoval, and John Landis. "Transportation as a Stimulus of Welfare-to-Work: Private versus Public Mobility." *Journal of Planning Education and Research* 22, no. 1 (2002): 50–63.
- Gurley, Tami, and Donald Bruce. "The Effect of Car Access on Employment Outcomes for Welfare Recipients." *Journal of Urban Economics*, 58, no. 2 (2005): 250–72.
- DKS Associates, Inc. *SACMET 01 Users Reference*, 2001.
- Ihlanfeldt, Keith R., and David L. Sjoquist. "Job Accessibility and Racial Difference in Youth Employment Rates." *American Economic Review* 80, no. 1 (1990): 267–76.
- Ihlanfeldt, Keith R., and David L. Sjoquist. "The Spatial Mismatch Hypothesis: A Review of Recent Studies and Their Implications for Welfare Reform." *Housing Policy Debate* 9, no. 4 (1998): 849–92.
- Kain, John. "Housing Segregation, Negro Employment, and Metropolitan Decentralization." *The Quarterly Journal of Economics* 82, no. 2 (1968): 175–97.
- Kasarda, John D. "Urban Change and Minority Opportunities." In *The New Urban Reality*, ed. Paul E. Peterson, 33–68. Washington, D.C.: The Brookings Institute, 1985.
- MacCurdy, Thomas, Grecia Marrufo, and Margaret O'Brien-Strain. "What Happens to Families When They Leave Welfare?" Public Policy Institute of California. 2003.
www.ppic.org/content/pubs/R_903TMR.pdf (accessed March 10, 2004).
- Niemeier, Debbie, and Matt E. Sumpter. "Transportation Needs of Sacramento County Welfare Recipients." UCD-ITS-RR-2000-2. Davis, CA: University of California at Davis, April 2000.
- Ong, Paul M., Douglas Houston, John Horton, and Linda L. Shaw. "Los Angeles County CalWORKs Transportation Needs Assessment." May 2001. www.spsr.ucla.edu/lewis (accessed March 10, 2004).

- Ong, Paul M., and Douglas Miller. "Spatial and Transportation Mismatch in Los Angeles." May 2003. www.sppsr.ucla.edu/lewis (accessed March 10, 2004).
- Pugh, Margaret. "Barriers to Work: The Spatial Divide between Jobs and Welfare Recipients in Metropolitan Areas." September 1998. www.brookings.edu/reports/1998/07metropolitanpolicy_pugh.aspx (accessed March 10, 2004).
- Raphael, Steven. "The Spatial Mismatch Hypothesis and Black Youth Joblessness: Evidence from the San Francisco Bay Area." *Journal of Urban Economics* 43, no. 1 (1998): 79–111.
- Raphael, Steven and Lorien Rice. "Car ownership, employment, and earnings." *Journal of Urban Economics* 52 (2002): 109-13.
- Richards, Tami and Donald Bruce. "Car Access and Employment Outcomes for Tennessee Welfare Recipients." *Journal of Urban Economics* 58, No. 2 (2005): 250–272.
- Rodier, Caroline J., and Robert A. Johnston. "Method of Obtaining Consumer Welfare from Regional Travel Demand Models." *Transportation Research Record* 1649 (1998): 81-5.
- Sanchez, Thomas W., Qing Shen, and Zhong-Ren Peng. "Mobility Transit, Jobs Accesses and Low-Income Labor Participation in US Metropolitan Areas." *Urban Studies* 41, no. 7 (2004): 1313-31.
- Sacramento Area Council of Governments. "Greater Sacramento Region Job Access/Reverse Commute Transportation Plan." April 2000.
- Sawichi, David S., and Mitch Moody. "Developing Transportation Alternatives for Welfare Recipients Moving to Work." *Journal of the American Planning Association* 66, no. 3 (2000): 306-18.
- Shen, Qing. "A Spatial Analysis of Job Openings and Access in a U.S. Metropolitan Area." *Journal of the American Planning Association* 67, no. 1 (2001): 53–68.
- Shen, Qing and Thomas W. Sanchez. "Residential Location, Transportation, and Welfare-to-Work in the United States: A Case Study of Milwaukee." *Housing Policy Debate* 16, no. 3 (2005): 393–431.
- Small, Kenneth A., and Harvey S. Rosen. "Applied Welfare Economics with Discrete Choice Models." *Econometrica* 49, no. 1 (1981): 105-30.
- Thakuriah, Piyushimita, P.S. Sriraj, Siim Soot, and Joesph Persky. "Economic benefits of employment transportation services: Summary of final report." Report to Federal Transit Administration and Community Transportation Association of America. June 2008. http://pigpen.utc.uic.edu/pigpen/vonu/fta/final-report/Thakuriah_Summary_Report2008.pdf (accessed July 22, 2008).

ABOUT THE AUTHORS

ROBERT A. JOHNSTON

Robert A. Johnston is an emeritus professor in the Department of Environmental Science and Policy at the University of California, Davis, where he also serves as a faculty researcher at UCD's Institute of Transportation Studies. Current consulting involves the evaluation of regional travel demand models and land use models for public and private clients and reviews of environmental assessments of large projects. He has been an expert witness in several National Environmental Policy Act (NEPA) lawsuits. Johnston's current research involves applying an integrated urban model to California. Johnston's GIS-based urban growth model is being applied to about 20 rural counties in California for the California DOT. In 2006–07, Professor Johnston was on a National Academy of Sciences (NAS) committee that issued a book on the state of travel modeling in the United States. He recently developed a model for projecting energy use and greenhouse gases from general plans.

SHENGYI GAO

Shengyi Gao is a postdoctoral researcher in the Information Center for the Environment, University of California, Davis. He received his Ph.D. in Transportation Technology and Policy from UC Davis in 2006. His research interests include the relationships between land use and transportation, transportation equity, urban growth modeling, and application of geographic information system technology in transportation and land use planning. He is currently working on the California Production, Exchange, and Consumption Allocation System (PECAS), which is an integrated land use-transportation model.

PEER REVIEW

San José State University, of the California State University system, and the MTI Board of Trustees have agreed upon a peer view process to ensure that the results presented are based upon a professionally acceptable research protocol.

Research projects begin with the approval of a scope of work by the sponsoring entities, with in-process reviews by the MTI research director and the project sponsor. Periodic progress reports are provided to the MTI research director and the Research Associates Policy Oversight Committee (RAPOC). Review of the draft research product is conducted by the Research Committee of the board of trustees and may include invited critiques from other professionals in the subject field. The review is based on the professional propriety of the research methodology.

MTI FOUNDER

Hon. Norman Y. Mineta

MTI BOARD OF TRUSTEES

Honorary Co-Chair

Hon. James Oberstar **

Chair
House Transportation and
Infrastructure Committee
House of Representatives
Washington, DC

Honorary Co-Chair

Hon. John L. Mica **

Ranking Member
House Transportation and
Infrastructure Committee
House of Representatives
Washington, DC

David L. Turney *

Chair/President/CEO
Digital Recorders, Inc.
Dallas, TX

William W. Millar ^

Vice Chair/President
American Public Transportation
Association (APTA)
Washington, DC

Hon. Rod Diridon, Sr. #

Executive Director
Mineta Transportation Institute
San Jose, CA

Ronald Barnes

General Manager
Veolia Transportation/East
Valley RPTA
Mesa, AZ

Rebecca Brewster

President/COO
American Transportation
Research Institute
Smyrna, GA

Donald H. Camph

President
California Institute for
Technology Exchange
Los Angeles, CA

Anne P. Canby

President
Surface Transportation
Policy Project
Washington, DC

Jane Chmielinski

President
DMJM Harris
New York, NY

William Dorey

President/CEO
Granite Construction, Inc.
Watsonville, CA

Mortimer Downey

Chairman
PB Consult Inc.
Washington, DC

Nuria Fernandez

Commissioner
City of Chicago,
Department of Aviation,
Chicago, IL

Steve Heminger

Executive Director
Metropolitan Transportation
Commission
Oakland, CA

Hon. John Horsley #

Executive Director
American Association of State
Highway & Transportation
Officials (AASHTO)
Washington, DC

Joseph Boardman

President/CEO
Amtrak
60 Massachusetts Ave., N.E.
Washington, DC 20002

Will Kempton

Director
California Department of
Transportation
Sacramento, CA

Brian Macleod

Senior Vice President
Gillig Corporation
Hayward, CA

Dr. Bruce Magid

Dean
College of Business
San José State University
San José, CA

Stephanie Pinson

President/COO
Gilbert Tweed Associates, Inc.
New York, NY

Hans Rat

Secretary General
Union Internationale des
Transports Publics
Bruxelles, Belgium

Vickie Shaffer

General Manager
Tri-State Transit Authority
Huntington, WV

Paul Toliver #

President
New Age Industries
Seattle, WA

Michael S. Townes #

President/CEO
Transportation District
Commission of Hampton Roads
Hampton, VA

Edward Wytkind

President
Transportation Trades
Department, AFL-CIO
Washington, DC

** Honorary

* Chair

^ Vice Chair

Past Chair

Directors

Hon. Rod Diridon, Sr.

Executive Director

Karen E. Philbrick, Ph.D.

Research Director

Peter Haas, Ph.D.

Education Director

Donna Maurillo

Communications Director

Asha Weinstein Agrawal, Ph.D.

National Transportation Finance Center

Brian Michael Jenkins

National Transportation Security Center

Research Associates Policy Oversight Committee

Asha Weinstein Agrawal, Ph.D.

Urban and Regional Planning
San José State University

Jan Botha, Ph.D.

Civil & Environmental Engineering
San José State University

Katherine Kao Cushing, Ph.D.

Environmental Science
San José State University

Dave Czerwinski, Ph.D.

Marketing and Decision Science
San José State University

Frances Edwards, Ph.D.

Political Science
San José State University

Taeho Park, Ph.D.

Organization and Management
San José State University

Diana Wu

Martin Luther King, Jr. Library
San José State University



MINETA
TRANSPORTATION INSTITUTE

Created by Congress in 1991



SAN JOSÉ STATE
UNIVERSITY

Funded by U.S. Department of
Transportation and California
Department of Transportation

