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When is Commuting Desirable to the Individual?

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ABSTRACT Commuting is popularly viewed as a stressful, costly, time-wasting experience from the individual perspective, with the attendant congestion imposing major social costs as well. However, several authors have noted that commuting can also offer benefits to the individual, serving as a valued transition between the home and work realms of personal life. Using survey data collected from about 1,300 commuting workers in three San Francisco Bay Area neighborhoods, empirical models are developed for four key variables measured for commute travel, namely: Objective Mobility, Subjective Mobility, Travel Liking, and Relative Desired Mobility. Explanatory variables include measures of general travel-related attitudes, personality traits, lifestyle priorities, and sociodemographic characteristics. Both descriptive statistics and analytical models indicate that commuting is not the unmitigated burden that it is widely perceived to be. About half of the sample were relatively satisfied with the amount they commute, with a small segment actually wanting to increase that amount. Both the psychological impact of commuting, and the amounts people want to commute relative to what they are doing now, are strongly influenced by their liking for commuting. An implication for policy is that some people may be more resistant than expected toward approaches intended to induce reductions in commuting (including, for example, telecommuting). New creativity may be needed to devise policies that recognize

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the inherent positive utility of travel, while trying to find socially beneficial ways to fulfill desires to maintain or increase travel.

Introduction

The daily commute is commonly viewed as a stressful, time-consuming, and costly experience. Each morning and evening there are constant reports of traffic accidents and congestion via television, radio and, more recently, the Internet. In a statewide survey of California residents, for example, traffic congestion was cited by more than 80 percent of the sample to be a problem in their community (Baldassare 2002). In addition to the direct impacts on the individual commuter, the negative social impacts of commuting can be seen in society's growing dependence on nonrenewable energy sources (increasingly imported from politically less stable regions of the world), in the toxins that pollute skies and affect children's health, and in the freeways and parking lots (sometimes one and the same) that pervade modern landscapes.

These negative impacts have prompted policy makers to encourage approaches designed to decrease the amount individuals travel, approaches such as telecommuting and mixed-use neighborhoods. Such policies typically assume travel to be generated entirely by the desire to participate in spatially separated activities. The thinking is that if activities are brought closer together physically, or if their substitution is facilitated by telecommunications, people will need to (and therefore will) travel less.

One problem with policies intended to reduce commute travel is that many individuals do not consider their commute to be all that bad. In fact it may offer a number of benefits, as has been suggested elsewhere. Even viewing travel purely as a derived demand, Stopher (2004) argues that people grow more accepting of congestion over time (i.e., have a greater willingness to pay), as their incomes rise and mobility expectations increase. But in addition to the conventional view that people travel to attain the benefits of being at a different destination, Mokhtarian and Salomon (2001) point out that positive utility can reside in activities that can be conducted while traveling, as well as in the act of traveling itself. With respect to commuting, examples of the former source of utility include opportunities to think, converse, listen to music, read, or even sleep while traveling, while examples of the latter source include the enjoyment of variety, of speed, or even just movement; the acquisition of first-hand information about one's surroundings; and opportunities to exhibit a skill or a status vehicle, or to escape. A number of studies attest to these and other benefits of commuting unrelated to the derived demand for being at a spatially separated work location (Albertson 1977; Beroldo 2002; Edmonson 1998; Larson 1998; Mokhtarian and Salomon 1997; Richter 1990; Higano and Orishimo 1990; Shamir 1991). Individuals who value these benefits may see traffic congestion as a problem in their communities, but for them personally, it is not really a burden. It is telling that in the same survey of Californians cited above, a comparable majority (82 percent) is very or somewhat satisfied with their own commute (Baldassare 2002). Similarly, a nationwide survey found that only 36 percent of U.S. adults agreed that "traffic congestion is a source of stress in my life" (Edmonson 1998).

Formal and anecdotal evidence supports the seemingly contradictory views of Californians. Some quantitative studies (Gordon, Richardson, and Jun 1991; Levinson and Kumar 1994) have shown that average individual commute times have stayed relatively stable over many years, although others (Cervero and Wu 1998; Clark and Kuijpers-Linde 1994) have presented contrary evidence. The 2000 U.S. Census indicates that, in the San Francisco Bay Area (the source of the empirical data analyzed here), the average commute time increased by about four minutes (14.8 percent) from 1990 to 2000 (Metropolitan Transportation Commission 2002). Although such an increase is non-trivial in the aggregate, at the disaggregate level many people will find changes around that magnitude to be too small to notice or be concerned about. At the system level, the Texas Transportation Institute's Annual Mobility Study (2002) shows that metropolitan congestion continues to grow, with the average length of time that highways in urban areas are congested increasing from 4.5 hours in 1982 to 7 hours in 2000. But workers who do have long commutes are adopting strategies to make their commute less stressful and more productive (*The Economist* 1998; Mokhtarian and Salomon 1997). Further, news articles in the popular press tell the stories of individuals who experience very long commutes and wouldn't want it any other way (Sipress 1999; Lindelof 2000; Taylor 2000; Hendrick 2001; El Nasser 2002).

Thus, two mechanisms, one subjective and one objective, may be at work in producing this apparent disconnect between the personal and the collective experience of the commute. Subjectively, when the individual is saturated with media messages that congestion and commuting are terrible, she draws the natural conclusion that her reasonably pleasant commute must be an exception. In fact, in some cases it may be the extremely congested conditions or the extraordinarily long commutes that are the exception, but they receive disproportionate public attention because they are more newsworthy than the thousands of routinely uneventful trips. Objectively, however, it seems quite possible for congestion genuinely to be increasing in terms of aggregate measures, even while conditions do not worsen at the disaggregate level. Extensive system-wide congestion could result from the amalgamation of large numbers of relatively short vehicle trips, which at the individual level are not very onerous (Taylor 2002). The number of those short trips could be growing over time (e.g., through employment growth or mode shifts), thereby increasing congestion, but with the individual commute not lengthening much, or being mitigated though the various coping mechanisms referenced above. For example, an individual changing from public transit to driving alone, or changing from a short-distance but slower urban route to a longer-distance but faster suburban route, may actually shorten his personal commute time while increasing aggregate congestion (Levinson and Kumar 1994).

The purpose of the present study is to further investigate the sometimes perplexing behavior and attitudes of commuters. Four specific research questions are addressed, each associated with a particular conceptual construct. (1) Why do some individuals commute long distances and others very short distances? (Objective Mobility) (2) If two people commute the same distance each day, why does one person consider this to be a lot of travel, whereas the other considers it to be very little? (Subjective Mobility) (3) Again with two people having the same commute length, why does one want to commute a lot more,

and the other a lot less? (Relative Desired Mobility) (4) And what determines whether a person likes or dislikes commuting? (Travel Liking) The present study is part of an ongoing project studying attitudes toward travel itself, and synthesizes material from some previous portions of the project (Redmond and Mokhtarian 2001b; Collantes and Mokhtarian 2002; Choo, Collantes, and Mokhtarian forthcoming) with new results original to this paper.[1] Using data collected for the ongoing project, empirical models are developed for each of the four conceptual constructs listed above.

The organization of this paper is as follows. Section two describes the empirical context of the project, and the categories of variables available in the data set. Sections three through six present the models of Objective Mobility, Subjective Mobility, Travel Liking, and Relative Desired Mobility, respectively. Finally, section seven offers some conclusions and directions for further research.

Empirical Context and Data Available

To address the research questions presented above, a survey were designed and distributed to residents of three neighborhoods of the San Francisco Bay Area in May 1998. Half of the 8,000 original surveys were sent to an urban neighborhood in North San Francisco, which is located less than two miles from the regional Central Business District and is served heavily by transit. The other half of the surveys were divided evenly between the East Bay suburban cities of Pleasant Hill and Concord. The selection of neighborhoods was motivated by previous research (see Kitamura, Mokhtarian, and Laidet 1997) and intended to capture differences in both neighborhood design and regional accessibility (the original concept was to send half the surveys to an urban neighborhood and half to a suburban neighborhood; due to the lack of a single "representative" suburb, two somewhat different suburban neighborhoods were selected). The surveys were distributed randomly to households within each neighborhood, with a randomly selected adult member of each household asked to complete it. Approximately 2,000 surveys were returned (corresponding to a response rate near 25 percent), of which 1,358 respondents worked either part-time or full-time and commuted with some frequency. This subset of commuting workers constitutes the sample analyzed in the present paper. Some key demographic characteristics of the sample are shown in Table 1.

Table 1 indicates that the sample is relatively balanced in terms of gender and neighborhood location. The youngest and oldest age categories have few observations, but as the sample comprises full- and part-time workers, this is not surprising. Higher incomes are over-represented compared to the Census (see Curry 2000 for further discussion). However, as the goal of the work is to model the impact of income and other variables on commute measures, rather than to ascertain the population distribution of such measures, it is more important simply to have a reasonable spread of incomes than that they be exactly representative (Babbie 1998).

The variables measured by the survey can be classified into a number of categories, of which ten are relevant to the present study: Objective Mobility, Subjective Mobility, Relative Desired Mobility, Travel Liking, Attitudes, Personality, Lifestyle, Excess Travel,

TABLE 1. SOCIODEMOGRAPHIC CHARACTERISTICS OF SAMPLE (N = 1,358).

Characteristic		Number (percent)
Concord		318 (23.4)
Pleasant Hill		369 (27.2)
North San Francisco		671 (49.4)
Female[a]		692 (51.1)
Have a driver's license[b]		1,338 (98.7)
Work full-time		1,141 (84.0)
Personal income[c]	<$15,000	31 (2.3)
	$15,000-34,999	141 (10.6)
	$35,000-54,999	269 (20.3)
	$55,000-74,999	250 (18.9)
	$75,000-94,999	220 (16.6)
	>$95,000	411 (31.1)
Age[d]	18-23	44 (3.2)
	24-40	584 (43.0)
	41-64	686 (50.5)
	>65	43 (3.2)
Characteristic		**Mean (std. dev.)**
Total people in household		2.39 (1.22)
Total children under 18 in HH[e]		0.45 (0.84)
Total workers in HH (full/part-time)[f]		1.77 (0.80)
Number of personal vehicles in HH[g]		1.87 (1.08)
Total short distance travel (miles/week)[d]		219.46 (188.67)

[a] N = 1,352; [b] N = 1,356; [c] N = 1,322; [d] N = 1,357; [e] N = 1,351; [f] N = 1,354; [g] N = 1,353.

Mobility Constraints, and Sociodemographics. Each category is briefly described below. Descriptive statistics for the commute-related variables in the first four categories (the four dependent variables in these models) are provided in sections three, four, five, and six, respectively.

Objective Mobility. These questions inquire about the distance and frequency of travel, segmented by mode and trip purpose, for both short and long (greater than one hundred miles one way) trips. For the distance questions on short-distance travel, participants were asked to state the number of miles they traveled in a typical week for each category, including "commuting to/from work or school." In a separate section of the survey, participants were directly asked their one-way commute time and distance.

Subjective Mobility. Here respondents were asked for a subjective assessment of their travel. Again segmenting travel by mode, trip purpose, and trip length (short and long), respondents rated their amount of travel on a five-point semantic-differential scale anchored by "none" and "a lot."

Travel Liking. Similar to the Subjective Mobility measures, participants rated their liking for travel (segmented into the same categories) on a five-point scale ranging from "strongly dislike" to "strongly like."

Relative Desired Mobility. These questions focused on how much travel individuals wish to undertake, compared to their current levels. Again, a five-point scale, here anchored by "much less" and "much more," was used and travel was segmented in a manner similar to Objective Mobility, Subjective Mobility, and Travel Liking.

Attitudes. Attitudes towards travel, land use, and the environment were captured using responses on a five-point, Likert-type scale, to thirty-two statements. Through factor analysis (see Redmond 2000 or Mokhtarian, Salomon, and Redmond 2001 for details of the factor analyses on these as well as the Personality and Lifestyle variables), the statements were distilled into six basic dimensions, of which three were significant in the final models presented here. The "pro-high density" factor scores are negatively associated with the statements "Having a large yard is important to me" and "A multiple family unit would not give me enough privacy" and positively associated with statements such as "I like living in a neighborhood where there is a lot going on." High scores on the "commute benefit" factor are associated with agreement on such statements as "I use my commute time productively" and "My commute trip is a useful transition between home and work." The "travel freedom" factor score increases with agreement to the statement that "In terms of local travel, I have the freedom to go anywhere I want to," and similarly for long-distance travel.

Personality. Respondents rated seventeen attributes on a five-point scale (anchored by "hardly at all" to "almost completely") in terms of how well the attributes described them. Here, the factor analysis revealed four personality types. Only the "organizer" trait proved significant in the models presented here, and is based on positive associations with such words and phrases as "efficient," "on time," and "like a routine."

Lifestyle. The survey contained eighteen statements relating to work, family, money, status, and the value of time. Respondents agreed or disagreed with the statements using a five-point, Likert-type scale. Four lifestyle factors emerged, of which three were each significant in at least one of the final models: the status seeker (based on agreement with statements such as "A lot of the fun of having something nice is showing it off"), workaholic ("I'd like to spend more time at work"), and family/community related ("I'd like to spend more time with my family and friends") factors.

Excess Travel. To qualitatively measure excess travel, participants indicated how often (on a three-point scale: "never/seldom," "sometimes," "often") they engaged in each of thirteen activities involving seemingly unnecessary travel, such as traveling "with no destination in mind" and "mainly to be alone."

Mobility Constraints. Here, participants selected, on a three-point scale ("No limitation," "Limits how often or how long," "Absolutely prevents"), the degree to which physi-

cal conditions or anxieties prevented them from engaging in a variety of travel forms, such as "driving on the freeway" and "flying in an airplane." The percentage of time an automobile is available to the participant is also considered to be a Mobility Constraint (oriented in the reverse direction).

Sociodemographics. The survey captured an extensive amount of typical sociodemographic data to allow for comparison of the sample with more general populations. The data included measures of age, income, household size, employment type, number of household workers, education level, gender, and vehicle type (for more details, see Curry 2000).

Objective Mobility

The measurement and modeling of Objective Mobility (i.e., how much do or will people travel?) is a key goal of regional planning organizations. The typical regional travel demand model uses land use and sociodemographic inputs in an effort to characterize the daily travel generated by a collection of individuals. In this regard, the models presented here are rather typical. However, the consideration of Attitude, Lifestyle, and Personality variables makes the work more relevant and unique. Although previous studies have included attitudinal variables in mode choice models (e.g., Dobson et al. 1978; Dumas and Dobson 1979; Tischer and Phillips 1979; Kitamura, Mokhtarian, and Laidet 1997), the focus has been limited to the attitudes towards certain modes of travel. To the authors' knowledge, the current work is the first to represent the quantity of travel demanded or generated, as a function of attitudes towards travel itself as well as the more conventional explanatory variables (although, as discussed in Mokhtarian, Salomon, and Redmond (2001) this effect appears more strongly for work-related travel than for commuting, and more strongly still for other categories of travel).

Eight separate models of four dependent variables are presented here. Tables 2 and 3 present the sample distribution of each dependent variable, which are the following: commute miles per week, commute minutes per week, one-way commute distance, and one-way commute time. The one-way commute distance and time data were obtained by asking participants, "How far do you live from work?" and "How long does it usually take you to get to work (one way)?" Similarly, at a point much earlier in the survey, respondents were asked the amount of miles they travel per week in various categories, including "commuting to/from work or school." The final variable, commute minutes per week, was derived from the one-way commute time and another variable, which captured the frequency of commuting.

The mean of the sample for the commute miles per week variable is approximately 125, which corresponds to a one-way trip of about 13.6 miles per day (the mean commute frequency in the sample is approximately 4.6 round trips per week); the mean of the one-way commute distance variable is 14.0 miles. Thus, these two separate measures exhibit a high degree of consistency. The two variables are also reasonably close to the average trip length of 12.1 miles for home-based work trips in the Metropolitan Transportation Commission's (2001) Regional Travel Demand Model.[2]

TABLE 2. MILES AND MINUTES PER WEEK COMMUTING TO/FROM WORK OR SCHOOL.

Miles per week			Minutes per week		
Range	Frequency	Share	Range	Frequency	Share
<25	225	16.6%	<50	43	2.9%
25 to 49	287	21.1%	50 to 99	105	7.0%
50 to 74	211	15.5%	100 to 149	200	13.3%
75 to 99	73	5.4%	150 to 199	199	23.3%
100 to 149	130	9.6%	200 to 299	256	17.1%
150 to 199	79	5.8%	300 to 399	206	13.7%
200 to 249	92	6.8%	400 to 499	146	9.7%
250 to 499	215	15.8%	500 to 749	150	10.0%
=>500	45	3.3%	=>750	46	3.1%
Total	1,357	100%	Total	1,357	100%
	N = 1,357, Mean = 125.8, Std. Dev. = 136.5			N = 1,357, Mean = 275.2, Std. Dev. = 198.4	

TABLE 3. ONE-WAY COMMUTE DISTANCE AND TIME.

One-way commute distance (miles)			One-way commute time (minutes)		
Range	Frequency	Share	Range	Frequency	Share
<2.5	174	12.8%	<10	82	6.0%
2.5 to 4.9	270	19.9%	10 to 14	162	11.9%
5.0 to 7.4	241	17.8%	15 to 19	233	17.2%
7.5 to 9.9	57	4.2%	20 to 24	176	13.0%
10.0 to 14.9	111	8.2%	25 to 29	83	6.1%
15.0 to 19.9	114	8.4%	30 to 44	294	21.7%
20.0 to 24.9	84	6.2%	45 to 59	161	11.9%
25.0 to 49.9	258	19.0%	60 to 89	134	9.9%
=>50.0	47	3.5%	=>90.0	32	2.4%
Total	1,356	100.0%	Total	1,357	100.0%
	N = 1,356, Mean = 13.99, Std. Dev. = 14.57			N = 1,357, Mean = 29.85, Std. Dev. = 20.48	

For each of the four dependent variables, Objective Mobility was modeled in two distinct ways: with and without so-called "transportation supply" variables of commute speed and primary commute mode.[3] For the commute time dependent variables, inclusion of the transportation supply variables recognizes the physically causal relationship between them: Commute time is almost mechanically a function of distance, speed, and mode.[4] For the commute distance dependent variables, only commute speed was included, on the assumption that commute length influences the choice of mode more than vice versa. Not surprisingly, when included, the transportation supply variables were extremely significant and dominated the explanatory power of the model. For this reason, models were also built excluding these variables, to better identify the behaviorally causal influences on commute time and distance—an explanation from first principles, so to speak. Both of these approaches used ordinary least squares linear regression analysis, and the results are summarized in the left- and right-hand portions of Table 4, respectively.

As expected, and in line with traditional travel demand generation models, sociodemographic measures most heavily impact each of the dependent variables. Examining the transportation supply models first, the commute speed variable holds the intuitive positive sign in both the distance and time models. These results indicate that commuters traveling at higher speeds are not only willing to commute longer distances, but also spend more time commuting. Also as expected, traveling in an automobile decreases commute time, whereas traveling by rail increases commute time.

When the transportation supply variables are excluded from consideration, the models in the right-hand set of columns result. The R^2 values in the models without the transportation supply variables are substantially lower than those for the corresponding models with transportation supply data, indicating the importance of the physical causes of commute distance and time. A number of interesting trends emerge when all eight models are examined jointly.

The personal income variable is the only measure to appear in all of the models (household income was also considered, but was not significant); personal income enters each model with a positive sign, supporting well-documented assertions that higher incomes are associated with skilled work, which is less densely distributed across the region than lower-skill opportunities, resulting in longer commutes. Suburban residents, on average, travel farther to work than city dwellers. For commute time, the suburban dummy variable is only significant when the transportation supply measures are omitted, indicating that the variable is a good proxy for commute speed and/or mode. The age category variable, which in this sample is dominated by twenty-four- to forty- and forty-one- to sixty-four-year-olds (these two categories comprise 94 percent of the sample), indicates that twenty-four- to forty-year-olds are commuting farther, on average, than forty-one- to sixty-four-year olds. This may be a result of the younger group trading off housing size against commute length so as to have a larger home for their young families or the elder age category having the ability, over time, to change residential or work locations to achieve a shorter commute. The number of children age six to fifteen appears (with a negative coefficient) only in the

models of one-way measures of time and distance and not in the models for the weekly measures. This result may indicate parents' placing more importance on having the ability to return home more quickly when a child is in need rather than on reducing their overall weekly commute time.

Aside from Sociodemographic and transportation supply variables, the only variables significant in any of the models are those in the Mobility Limitations, Attitudes, and Personality categories. The Mobility Limitations variables are only present in the non-transportation supply models and appear to be partially accounting for mode choice (through the variable measuring percentage of time an automobile is available) and commute speed (through the variable capturing limitations to traveling on freeways). The single significant Attitude variable is the "pro high-density" factor score. The pro high-density variable enters half of the models, always with a positive sign, indicating that those with strong pro high-density views tend to commute farther than those with moderate views. While this result may initially seem counterintuitive (as city dwellers typically travel shorter distances than suburban dwellers), it may indicate that those drawn strongly to high-density neighborhoods place the importance of their home environment above their desire for a short commute. With the relative scarcity of high-density neighborhoods in the San Francisco Bay Area in comparison to diverse job locations (i.e., Silicon Valley, downtown San Francisco, downtown Oakland), the result may be longer commutes for those with a strong desire to live in high-density locations. Thus, the positive coefficient of the suburban dummy may be reflecting the conventional wisdom (shorter commutes for urban dwellers) as a general trend, while the positive coefficient of the pro high-density variable is partially counteracting that trend specifically for those who are committed to urban living as a lifestyle, even if they must thereby commute longer distances to a desired job. Perhaps a more expected result is the significance of the "organizer" Personality variable, entering half of the models with a negative sign. Organizers, who enjoy being efficient and on time among other traits, commute, on average, less than those without strong organizer characteristics.

While the Attitude and Personality variables are clearly less important to commute distance and time than Sociodemographics and transportation supply, their significance in models of mandatory travel is an interesting result.

Subjective Mobility

Although the majority of attention in travel demand modeling is focused on Objective Mobility (which is relatively easy to measure), Subjective Mobility may play a more important role in influencing the amount one travels. Subjective Mobility is a measure of how individuals filter their Objective Mobility to form subjective judgments. For example, one person may consider traveling one hundred miles per week to be "a lot" of travel, whereas another individual may consider the same one hundred miles to be "not much" travel at all. When considering policies aimed at reducing the amount of travel, it is important to understand not only the quantity of travel that is taking place, but also how the individual views that quantity.

TABLE 4. OBJECTIVE MOBILITY COMMUTE MODELS.

Category	Explanatory Variables	Dependent variable (adjusted R-squared)*							
	Variable	Models with transportation supply variables				Models without transportation supply variables			
		One-way commute distance [miles][1] (0.586)	Weekly commute miles[1] (0.385)	One-way commute time [min][1] (0.205)	Weekly commute minutes[1] (0.192)	One-way commute distance [miles][2] (0.176)	Weekly commute miles[3] (0.178)	One-way commute time [min][4] (0.067)	Weekly commute minutes[8] (0.106)
Transportation supply	Commute speed [>=0]	0.0427**	0.0381**	0.0121**	0.0101**	—	—	—	—
	Commute mode dummy—personal vehicle [0,1]			–0.411**	–0.426**	—	—	—	—
	Commute mode dummy—rail [0,1]			0.413**	0.388**	—	—	—	—
Socio-demographic	Full-time employment dummy [0,1]		0.277**		0.321**		0.282**		0.347**
	Personal income category [1, . . . ,6]	0.0700**	0.106**	0.0510**	0.0549**	0.110**	0.163**	0.0736**	0.0753**
	Suburban dummy [0,1]	0.218**	0.448**			0.644**	0.820**	0.229**	0.225**
	Female [0,1]					–0.0962**			
	Number of persons age 6-15 in household [0,1, . . . 3]	–0.0831**		–0.0745**		–0.0905		–0.0925**	
	Number of persons age 24-40 in household [0,1, . . . 7]		0.125**	0.0658**	0.0956**		0.0814**	0.0776**	0.105**

	Number of persons age 41-64 in household [0,1,2,3]	–0.0539							
	Length of time (in years) in the United States [0, . . . ,83]					–0.00787**	–0.00673**		
	Single adult without children family status dummy [0,1]		0.168**	0.129**	0.216**			0.143**	0.306**
	Two or more adults without children family status dummy [0,1]								0.103**
	Vehicle year interaction [0,42, . . . ,98]***					0.00354**			
Mobility Limitations	Percent of time personal vehicle is available category [0,20, . . . ,100]							–0.00336**	–0.00464**
	Conditions which prevent or limit driving on the freeway category [1,2,3]					–0.252	–0.343**	–0.173	–0.232**
Attitudes—Personality	Pro hi-density factor score [–2.49,2.26]	0.0917**	0.0920	0.0519**				0.0648**	
	Organizer factor score [–2.89,2.62]	–0.0452			–0.0490			–0.0600**	–0.0697**

[ ] = range of possible responses * Note: After experimentation with alternate forms, each dependent variable was defined as the natural logarithm of the stated variable +1. ** Note: Explanatory variable is significant at the 99th percentile (all other variables are significant at the 95th percentile level); each coefficient is expressed to three significant digits. *** Note: This variable is the age of the vehicle for those with a car, and 0 for those without a car.
N = [1] 1,317; [2] 1,295; [3] 1,305; [4] 1,314

The purpose of the Subjective Mobility modeling is twofold. First, the measures of Objective Mobility (time, distance, speed, frequency?) most strongly influencing Subjective Mobility must be determined. Second, after controlling for the objective quantity of travel, the factors influencing one's subjective assessments of amount of travel must be investigated. The initial hypothesis is that one's affinity for travel (captured by the Travel Liking variables) will negatively impact Subjective Mobility—i.e., that an enjoyment of commuting (or travel in general), because it reduces the sense of travel as a necessary burden, will tend to diminish one's awareness of travel amounts, or reduce the cognitive weight (psychological impact) that travel carries.

The subjective rating of one's commute travel on a five-point scale, anchored by "none" and "a lot," is the dependent variable in this model. Table 5 summarizes the responses to that question. There are relatively few "none" responses, which is not surprising in view of the purposeful selection of commuters for this study; the surprise may be that there are any "none" responses at all. However, it is natural that those with very short commutes might think of them as being essentially "none," or closer to "none" than to the second point on the scale.

The results of the ordered probit model of Subjective Mobility are shown in Table 6 (for a general discussion of ordered probit models, please refer to an econometrics text, such as Greene 2000; for a discussion of ordered probit models in a context similar to those presented here, please see Choo, Collantes, and Mokhtarian 2001). As expected, the subjective assessment of travel is heavily influenced by Objective Mobility measures. It is striking that virtually every objective measure of commute and work-related travel available in the data set is significant, namely frequency of commuting, frequency of short-distance work/school

TABLE 5. SUBJECTIVE ASSESSMENT OF AMOUNT OF TRAVEL AND TRAVEL LIKING SUMMARY.

Subjective Mobility Survey Statement: I feel that I travel . . . commuting to work or school			**Travel Liking Survey Statement:** How do you feel about *traveling* for commuting to work or school? We are *not* asking about how you feel about the activity at the destination, but about the travel required to get there.		
Response	Frequency	Share	Response	Frequency	Share
1—None	29	2.1%	1—Strongly dislike	123	9.1%
2	302	22.2%	2—Dislike	424	31.2%
3	328	24.2%	3—Neutral	520	38.3%
4	267	19.7%	4—Like	254	18.7%
5—A lot	431	31.8%	5—Strongly like	37	2.7%
Total	1,357	100%	Total	1,358	100%

TABLE 6. SUBJECTIVE ASSESSMENT OF COMMUTE TRAVEL MODEL (N = 1,288).

Dependent Variable: Subjective Mobility for work/school commute travel–1 [0, . . . ,4]*

Explanatory Variables	**Coefficient**	**t-statistic**
Constant	0.274	0.52
Objective Mobility		
Frequency of commute (SD) [1, . . . ,6]	0.348	5.45
Frequency of work/school-related travel (SD) [1, . . . ,6]	0.090	4.52
Square root of work/school commute miles/week (SD) [>=0]	32.7	2.89
Square root of one-way commute time [>=0]	0.149	4.80
Square root of one-way commute distance [>=0]	0.118	2.92
Log of total miles by personal vehicle (LD) [>=0]	–0.0197	–1.85
Travel Liking [1, . . . ,5]		
Overall (SD)	0.101	2.06
Commute (SD)	–0.647	–4.05
Commute squared (SD)	0.0829	3.04
Sociodemographics		
Educational background [1, . . . ,6]	–0.096	–3.76
Vehicle year interaction [0,42, . . . ,98]**	–0.00494	–3.34
Vehicle type: Small [0,1]	0.190	2.41
Vehicle type: Large [0,1]	0.639	2.37
Threshold Parameters		
μ_1	1.563	18.67
μ_2	2.372	27.46
μ_3	3.007	33.75

SD = Short Distance LD = Long Distance [ ] = range of possible or observed responses

Log-likelihood at convergence = –1634.049 Log-likelihood at zero = –1860.122

$R^2_{MZ} = 0.348$[5]

* Note: Since LIMDEP (see Greene 1995) requires the lowest value of the ordered response variable to be zero, one was subtracted from the coded values of this variable shown in Table 5.

** Note: This variable is the age of the vehicle for those with a car, and 0 for those without a car.

related travel, weekly miles commuting, one-way commute time, and one-way commute distance. Each of these measures positively impacts the assessment of mobility, which follows intuition (the more I actually travel, the more I think I travel). The implication is that individuals' subjective assessments of their commute travel are synthesized across all those dimensions, not dominated by one or two (i.e., it is not just the total amount of travel, it is how often they have to do it, and how long each trip is, that matter as well).

Another interesting cognitive mechanism appears through the inclusion of the long distance personal vehicle miles variable (also an Objective Mobility measure), which has a negative impact on Subjective Mobility. This result indicates that those who spend a lot of time traveling long distances (defined as trips longer than one hundred miles, one-way) in a personal vehicle are less sensitive to the amount of commute travel they experience, i.e., that the perception of one's amount of commute travel may be influenced by what proportion of one's total travel it constitutes.

Including just the Objective Mobility variables in the ordinary-least squares regression version of the model (not shown) only lowers the R^2 to 0.253 from 0.291, which indicates that the majority of explanatory power can be attributed to these variables (Collantes and Mokhtarian 2002). However, if it is assumed that the Objective Mobility variables properly control for an individual's quantity of travel (which seems reasonable in view of the number and variety of such variables in the model), the remaining variables may be examined to investigate why travelers with the same objective commute characteristics assess their commutes differently.

Aside from the Objective Mobility variables, it is apparent that only Travel Liking and Sociodemographic measures impact Subjective Mobility. An individual's *overall* short-distance Travel Liking is positively related to a high subjective assessment of commute travel, which contradicts the authors' original hypothesis of Travel Liking negatively impacting Subjective Mobility. Such a positive relationship of Travel Liking to Subjective Mobility appeared repeatedly across the Subjective Mobility models estimated for various travel categories (Collantes and Mokhtarian 2002), and prompted a revision of the initial hypothesis. At least after the fact, it seems reasonable to expect that strong feelings in *either* direction—liking *or* disliking—could make travel more intensely experienced (as a pleasure in one case and a burden in the other) and, hence, could elevate one's subjective assessment of the amount traveled. At the same time, it should be acknowledged that travel may simultaneously possess both pleasurable and burdensome aspects, even for a given individual who basically likes (or basically dislikes) travel, and that liking travel may reduce the cognitive weight of the burdensome elements.

This discussion suggests a possible nonlinear relationship of Travel Liking to Subjective Mobility, and, in fact, for the more directly related *commute* Travel Liking variable, this is precisely what happens: it enters the model in a quadratic form. The fact that the functional form is an upwardly opening parabola is consistent with the (revised) expectation that high levels of either disliking or liking would magnify one's subjective assessment of his amount of commuting. Interestingly, however, the minimum impact of commute Travel Liking on Subjective Mobility occurs near the positive end (around 4) of

the liking scale. Thus, for most of the range of the Travel Liking variable, increases in Travel Liking correspond to decreases in Subjective Mobility, as originally hypothesized—suggesting that at least for the commuting travel category, the burden-reduction effect is dominant. Only at the extreme positive end of the Travel Liking scale does the pleasure-intensification effect apparently outweigh the burden-reduction effect, resulting in a higher commute Subjective Mobility for those who "strongly like" commuting than for those who merely "like" it. In point of fact, however, the absolute impact of commute Travel Liking will always be negative, in view of the magnitude of the two coefficients and the range of the Travel Liking variable; it is just that the impact on Subjective Mobility will be *most* negative at Travel Liking = 4.

The important Sociodemographic measures are educational background, vehicle age, and vehicle type. Those with high education levels rate the amount of their commute travel lower than do those with lower education levels, suggesting that an interesting and fulfilling job (more likely to be held by those with higher education) can diminish the negative impact of the long commute to such a job. Interestingly, commuting in both large and small vehicle types increases the awareness of travel amounts, as does commuting in older vehicles. This magnification may be for different reasons in each case: Large vehicles may be more difficult to maneuver in crowded traffic and to park; small vehicles may be less comfortable (e.g., having fewer amenities and more likely to be manual transmission) and raise safety concerns; and older vehicles may be more mechanically unreliable.

It is important to note that variables not included in the survey could also influence Subjective Mobility (or any of the four key dependent variables). For example, an individual traveling to a home she very much enjoys (due to its size, location, or amenities) may be more anxious to return from work than would a similar individual with a different housing situation. Similar arguments could be made for those going to and from a job they enjoy (as alluded to above). Though the data do contain indicators of job type and income, less objective measures, such as relationships with coworkers and supervisors, may be equally or more important to one's subjective assessment of the commute.

Travel Liking

As shown in the Subjective Mobility model, measures of Travel Liking have a significant impact on how a given amount of commute travel is subjectively assessed. As will be shown in the next section, Travel Liking also influences whether individuals want to travel more or less for commuting than they are currently doing. These results highlight the importance of understanding what kinds of people like to travel—or more specifically, in the current context, what kinds of people like commuting.

Travel Liking was captured by asking survey participants to select the label that best represents their feeling for commute travel. A summary of the responses is shown in Table 5. Interestingly, only 40 percent of the sample dislikes (31 percent) or strongly dislikes (9 percent) commuting, while 21 percent actually enjoy the activity. These results certainly challenge the popular notion of commuting as a uniformly dreadful necessity of daily life.

The dependent variable for the commute Travel Liking model is measured on the five-point scale ranging from one (strongly dislike) to five (strongly like), as shown in Table 5. As proposed previously (Mokhtarian and Salomon 2001), the joy certain individuals find in undirected travel (moving in a vehicle provides a sense of motion, speed, and control; moving across a landscape satisfies desires for variety and scenic beauty), may also be found in mandatory travel, such as commuting. As such, it is hypothesized that Travel Liking will be impacted by innate Attitude, Personality, and Lifestyle characteristics. Also, it is expected that large amounts of commute travel (high levels of Objective Mobility) will negatively impact Travel Liking.

The results of the ordered probit model are shown in Table 7. The model contains variables in a variety of categories. As expected, measures of commute-related Objective Mobility negatively impact Travel Liking. Those who are forced (viewing the commute trip as mandatory) to travel long distances or for long times, tend to dislike the commute, as do those who commute primarily via public transit (perhaps not their desired mode). Similarly, a high subjective assessment of all short-distance travel (which is usually dominated by commute travel) negatively impacts Travel Liking.

The most significant variable in this model is the Attitude factor score for "commute benefit" (see section two). The strong positive relationship between this factor and Travel Liking indicates that those who view their commute time as productive and do not find it to be very stressful (whether because the commute is, in fact, objectively *not* stressful, or because their personality is on the calm side, or because they actively adopt coping mechanisms to improve their productivity and reduce the stress of the commute) have a higher liking for this type of mandatory travel.

The significant variables in the Lifestyle, Excess Travel, and Sociodemographics categories demonstrate the importance of the household to an individual's travel attitudes. The "family/community related" Lifestyle measure has a negative impact on Travel Liking. This result seems intuitive—the more individuals value time with their families, the less they enjoy being apart from them while commuting. This result is supported by the inclusion of the number of persons age twenty-four to forty Sociodemographic variable. Respondents having people in this age group in the household are likely to be in that age group themselves, and they may be more anxious to arrive home to young families and/or active social lives.

Seemingly contradictory to these results, the Sociodemographic measure of overall household size is *positively* related to Travel Liking. However, this result is illuminated by the Excess Travel measure, which shows that commute travel can provide a means of escape—a chance to be alone (Edmonson 1998). As the household size increases, one's liking for the solitude offered by commute travel may also increase.

The Lifestyle, Excess Travel, and Sociodemographic variables together offer a finely nuanced view of a paradox that is probably experienced by many. Although one's primary focus may be family and social activities, many also crave time for themselves—which, in modern society, may be most readily available in the automobile during the daily commute (Edmonson 1998).

TABLE 7. TRAVEL LIKING FOR WORK/SCHOOL COMMUTE TRIPS MODEL (N = 1,337).

Dependent Variable: Travel Liking for work/school commute trips–1 [0, . . . ,4]*		
Explanatory Variables	**Coefficient**	**t-statistic**
Constant	2.054	13.08
Objective Mobility		
Work/school commute miles/week (SD) [>=0]	–0.00124	–3.82
One-way commute time (minutes) [>=0]	–0.00573	–2.82
Primary commute mode is bus or ferry [0,1]	–0.321	–2.94
Subjective Mobility		
Overall short distance [1, . . . ,5]	–0.108	–3.53
Attitudes		
Commute benefit factor score [–2.9,2.6]	0.641	18.26
Travel freedom factor score [–2.9,2.3]	0.150	3.71
Lifestyle		
Family/community related [–3.9,2.1]	–0.245	–5.91
Excess Travel [1,2,3]		
Frequency of travel mainly to be alone	0.176	3.09
Sociodemographics		
Number of people in the household [1,2,8, . . .]	0.125	4.96
Number of persons age 24-40 in household	–0.0878	–2.69
Threshold Parameters		
μ_1	1.467	23.63
μ_2	2.775	39.63
μ_3	4.094	43.15

SD = Short Distance LD = Long Distance [ ] = range of possible or observed responses

Log-likelihood at convergence = –1528.627 Log-likelihood at zero = –1823.467

$R^2_{MZ} = 0.398$

* Note: Since LIMDEP requires the lowest value of the ordered response variable to be zero, one was subtracted from the coded values of this variable shown in Table 7.

Relative Desired Mobility

One outcome of the amount that is currently traveled (Objective Mobility), filtered by how that quantity of travel is subjectively viewed (Subjective Mobility) and moderated by how much travel is liked (Travel Liking), is Relative Desired Mobility—how much more or less people want to travel compared to their current amounts. It is hypothesized that Relative Desired Mobility will be negatively associated with Subjective Mobility (the more that I feel I commute, the less inclined I will be to increase it), and positively associated with Travel Liking (the more I like commuting, the more inclined I will be to increase it).

The Relative Desired Mobility question was posed to the sample of commuters, whose responses are shown in Table 8. In keeping with stereotype, nearly half of the sample indicated wanting to commute less (35 percent) or much less (15 percent) than they do now. Perhaps surprisingly, however (although not in view of the Baldassare study cited earlier), an almost equal proportion (49 percent) expressed relative contentment with the amount they commute. Only 21 people (1.5 percent) out of the sample indicated wanting to commute more or much more than they do now. The authors believe there to be a social bias against admitting to wanting to commute more, however (see, e.g., McNamara 2000), a view supported by the comparison to a similar measure that was taken more neutrally and indirectly in the survey. Specifically, about 7 percent of the sample reported having an "ideal commute time" at least five minutes longer than their actual commute time, and for "only" 42 percent of the sample was that ideal at least 5 minutes less than the actual (Redmond and Mokhtarian 2001b). The consistent message from both measurements though, is that nearly half the sample was reasonably satisfied with the amount they commute.

Table 8 also presents a variety of commute-oriented characteristics for each of the Relative Desired Mobility amount categories. As expected, those who desire "much less" and "less" commuting tend to travel significantly greater distances and for greater amounts of time than those who desire "about the same" amount of commuting (this pattern breaks down at the "more" and "much more" categories, probably due to small sample sizes). Interestingly, the mean ideal one-way commute time is near sixteen minutes. If commuting were strictly derived from a desire to participate in spatially separated activities, a value of zero might have been expected (see Redmond and Mokhtarian 2001b for further discussion). It is also interesting that the mean ideal commute time is rather stable across the first three Relative Desired Mobility categories, suggesting that the distribution of ideal commute time is largely independent of the amount of commuting one actually does.

The dependent variable for the Relative Desired Commute amount model is measured on a five-point scale corresponding to the values shown in Table 9. A special boundary condition made it necessary to estimate the Relative Desired Mobility models as "censored." Specifically, when a respondent's commute Subjective Mobility is "none" and she does not wish to travel in that category, apparently the only logical answer to the corresponding Relative Desired Mobility question is "about the same," which would logically result in her Subjective Mobility being still "none" (all else equal). Recognizing that this might be a difficult case for respondents to handle, specific instructions were included to that effect in the survey. Nevertheless, and unsurprisingly, not all respondents read or heeded these instructions, and in some cases a Subjective Mobility response of "none" was matched with a Rel-

TABLE 8. RELATIVE DESIRED COMMUTE AMOUNT.

Survey Statement: For commuting to work or school, I'd like to travel . . . compared to what I do now

Response	Frequency	Share	Mean of relevant variables for each category of dependent variable			
			Weekly commute miles	One-way commute time (min.)	One-way commute distance (miles)	Ideal one-way commute time (min)
1—Much less	204	15.0%	263.4	50.9[a]	27.9	13.8[b]
2—Less	469	34.5%	146.1[c]	35.1	16.8[d]	16.1[e]
3—About the same	664	48.9%	68.8	19.8	7.7	15.9[f]
4—More	14	1.0%	152.9	31.6	17.4	23.6
5—Much more	7	0.5%	107.1	22.4	13.1	22.0[g]
Total or Mean	1,358	100%	125.8[h]	29.9	14.0[i]	15.8[j]

[a] N = 203; [b] N = 192; [c] N = 468; [d] N = 467; [e] N = 443; [f] N = 633; [g] N = 6; [h] N = 1,357; [I] N = 1,356; [j] N = 1,288.

ative Desired Mobility of "less" or "much less." As indicated in section four, it is plausible that some "none" Subjective Mobility responses constituted the respondent's view of the best way to represent "very little," and hence that at least a "less" Relative Desired Mobility response (although probably not "much less") would be logically consistent (see Curry 2000 for further discussion of this matter). However, to be directly consistent with the available categories, "much less" and "less" Relative Desired Mobility responses were recoded to "about the same" when Subjective Mobility was "none," and these observations were treated as censored (Choo, Collantes, and Mokhtarian forthcoming).

Table 9 presents the resulting model. As expected, commute-oriented measures of Objective Mobility, Subjective Mobility, and Travel Liking all influence Relative Desired Mobility for commuting. The work-oriented Objective and Subjective Mobility measures all have a negative impact on Relative Desired Mobility, meaning the more I am forced to travel for work (again, making the assumption that work-related travel is mandatory), the less I would like to commute. The Objective Mobility measure of total miles per week enters the model with a positive sign, which helps moderate the negative influence of the commute travel. Examining the beta coefficients (i.e., the coefficients of the standardized explanatory variables) in the ordinary least-squares regression version of the model (not shown here) indicates that the net effect of all the Objective Mobility measures will nearly always be negative. The exception is when work-related travel accounts for a small portion of overall travel, which then causes the Desired Mobility for the commute to be positive.

As mentioned previously, Travel Liking variables have a significant impact on Relative Desired Mobility. The commute Travel Liking measure enters the model with the expected positive sign—the more I like commute travel, the more of it I hope to do. In contrast, the more I like long-distance travel overall, the less I want to commute. Such a relationship

points to at least an informal tradeoff between travel categories, suggesting the presence of a desired overall travel time budget.

The "commute benefit" Attitude factor has a positive impact on Relative Desired Mobility, as expected. The "status seeker" and "workaholic" Lifestyle traits are also both positively associated with Relative Desired Mobility. A workaholic may have adjusted her preferences to reflect a willingness to undergo long commutes in exchange for a desired job, whereas a status seeker may welcome the opportunity to enjoy and display his prized automobile while commuting.

The Excess Travel measure of "taking a longer than required route" is negatively associated with a desire for a longer commute. It may be that for individuals who frequently engage in this form of Excess Travel, the time spent commuting could be better spent on more leisure-oriented travel.

TABLE 9. RELATIVE DESIRED COMMUTE AMOUNT ORDERED PROBIT MODEL (N = 1,292).

Dependent Variable: 5–Relative Desire Commute Amount [4, . . . ,0]*		
Explanatory Variables	**Coefficient**	**t-statistic**
Constant	2.616	6.45
Objective Mobility [>=0]		
Work/school commute miles/week (SD)	–0.00287	–7.01
Work/school-related activities miles/week (SD)	–0.00150	–2.19
Ln (one-way commute time + 1)	–0.109	–2.18
One-way commute time	–0.237	–1.68
Total miles/week (SD)	0.00136	5.43
Subjective Mobility [1, . . . ,5]		
Commute	–0.168	–5.37
Travel Liking [1, . . . ,5]		
For commuting to work or school (SD)	0.520	13.32
Overall (LD)	–0.103	–2.68
Attitudes		
Commute benefit factor score [–2.9,2.6]	0.286	5.91
Lifestyle		
Status seeker factor score [–1.7,2.7]	0.0875	2.08
Workaholic factor score [–2.1,2.3]	0.0918	2.03
Excess Travel [1,2,3]		
Frequency of travel by a longer route to experience more of the surroundings	–0.142	–2.62

TABLE 9. (CONTINUED)

Explanatory Variables	Coefficient	t-statistic
Sociodemographics		
Total number of adults in household [1,2, . . . 7]	0.122	3.53
Vehicle type: Minivan [0,1]	–0.323	–2.10
Threshold Parameters		
μ_1	0.444	4.03
μ_2	3.297	27.82
μ_3	4.919	39.94

SD = Short Distance LD = Long Distance [ ] = range of possible or observed responses

Log-likelihood at convergence = –997.773 Log-likelihood at zero = –1389.012

$R^2_{MZ} = 0.553$

* Note: Care must be taken in the interpretation of the threshold parameters because LIMDEP allows only for right censoring, whereas the original model involved left censoring. To estimate the model, the RDM variable was reversed by subtracting each observed value from 5. For ease of interpretation, the resulting signs on the β coefficients in the table above were reversed, so that a positive coefficient indicates a higher value of RDM as in the original specification. The LIMDEP-generated estimates of μ, however, were not altered, so that the ranges $(-\infty, 0)$, $(0, \mu_1)$, (μ_1, μ_2), (μ_2, μ_3), and $(\mu_3, +\infty)$ refer to "much more," "more," "about the same," "less," and "much less," respectively.

The number of adults in the household is positively associated with a desire for a longer commute. Similar to the Travel Liking model, this result could be indicative of a desire to have time alone for members of large households, and, conversely, may demonstrate a single parent's desire to return home quickly. The minivan vehicle-type variable may also be contributing to family-oriented desires. The minivan is typically associated with women (at least in this sample), and women typically are more involved in household duties such as grocery shopping and chauffeuring children. It follows, then, that the minivan variable has a negative impact on Relative Desired Mobility (Redmond and Mokhtarian 2001b).

Conclusions and Recommendations for Further Research

This paper presented models for four key variables measuring behavior, attitudes, and preferences with respect to commute travel: Objective Mobility, Subjective Mobility, Travel Liking and Relative Desired Mobility. The Objective Mobility models demonstrated the importance of traditional Sociodemographic and transportation supply variables to determining weekly and daily commute distance and time. However, non-traditional Atti-

tude and Lifestyle variables entered into certain Objective Mobility models, illustrating the influence of such variables even on mandatory travel.

The Subjective Mobility model provided insight into why two people, who commute the same objective amount per week, view that amount of travel differently. Travel Liking measures were very important to this subjective assessment. The model demonstrated a quadratic relationship with Travel Liking, indicating how strong feelings, both positive and negative, can impact memory and recall mechanisms to magnify one's subjective assessment of travel amounts.

The appearance of Travel Liking in the Subjective Mobility and Relative Desired Mobility models warranted an independent investigation of that measure, to better understand what causes individuals to like commuting. The model showed that certain Attitudes, such as those related to seeing a benefit in commute travel, played an important role in Travel Liking, as did traditional transportation supply and Sociodemographic data. The Sociodemographic data, when paired with the Attitude data, painted an interesting picture of a conflicting desire to be with one's family as well as to have time to oneself.

The Relative Desired Mobility models captured some of the reasons behind the need to commute more or less than one's current amount. As expected, the current amount of commuting heavily impacted this desire. However, the most significant variable in the model was Travel Liking, again demonstrating the importance of this measure.

Future analysis of these data will use structural equations modeling (SEM) to further refine the inter-relationships present among the four dependent variables. In the single-equation models presented here, certain causality assumptions had to be made. Many of these assumptions were relatively straightforward—for example, intuitively, it is expected that Objective Mobility will impact Subjective Mobility rather than vice versa. Other assumptions were less clear-cut. For example, these models show measures of Travel Liking to influence Subjective Mobility and measures of Subjective Mobility to impact Travel Liking. Both directions of causality are plausible, and SEM will help identify the extent to which each direction holds.

The descriptive statistics presented here indicate that a certain portion of the population enjoys traveling, even for the daily commute, and the models presented offer insight into the factors influencing that enjoyment. The results suggest that policies aimed strictly at reducing travel time and distance may not be uniformly accepted by all individuals. More research is needed to develop and test creative policies that allow for the satisfaction of an innate desire to travel but which guide that desire in more socially beneficial ways.

NOTES

1. Specifically: The nine Objective Mobility and Travel Liking models are entirely new to this paper (other models of Objective Mobility for commute miles per week, and ten other categories of travel, appear in Redmond and Mokhtarian (2001a)). The Subjective Mobility model is an ordered probit version of the ordinary least squares (OLS) model appearing in Collantes and Mokhtarian (2002). The Relative Desired Mobility model is a censored ordered probit version of the ordered probit model that appears in Redmond and Mokhtarian (2001b), and is also discussed in Choo, Collantes,

and Mokhtarian (2001) together with Relative Desired Mobility models for nine other categories of travel. With the exception of the Relative Desired Mobility model in Redmond and Mokhtarian (2001b), neither the models presented here nor their predecessors have been published in the peer-reviewed literature, aside from summary tables presenting all models of a particular variable type (e.g, the Subjective Mobility models), showing only the signs but not the magnitudes and p-values of the statistically significant coefficients.

2. The Metropolitan Transportation Commission (MTC) is the regional planning organization for the San Francisco Bay Area.
3. Both of these variables are derived from other data in the survey: The commute speed variable is the ratio of commute time and commute distance, and the primary commute mode variable is derived from a set of rules based on reported travel distance by mode and purpose separately. For the 1,358 commuting workers analyzed in this study, the shares of the primary commute modes are 79.4 percent (personal vehicle/motorcycle), 9.7 percent (bus/ferry), 8.2 percent (train/BART/light rail), 2.4 percent (walking/jogging/bicycling), and 0.1 percent (other).
4. As just mentioned, commute speed is in fact simply computed as commute distance divided by time. However, this nonlinear relationship does not guarantee any particular relationship among these three variables in a linear model of time or distance as a function of speed: The ratio of distance and time across the sample may be such that the pairwise linear correlation of speed with either time or distance may be significant or insignificant. Thus, conceptually it is reasonable to treat commute speed as if it were obtained through independent measurement. Empirically, the pairwise correlation is relatively high for speed and distance (0.679), and relatively low for speed and time (0.187).
5. Veall and Zimmermann's (1992) modified McKelvey/Zavoina (1975) statistic: $R^2_{MZ} = \frac{\sum_{i=1}^{N}(\hat{y}_i^* - \bar{\hat{y}}_i^*)^2}{\sum_{i=1}^{N}(\hat{y}_i^* - \bar{\hat{y}}_i^*)^2 + \mathrm{N}}$, where $\hat{y}_i^* = \hat{\beta}' x_i$ is the model-predicted dependent variable. Under the assumption $\mathrm{Var}(\varepsilon_i) = 1$ (hence the unexplained variance equals $\sum_{i=1}^{N} 1 = N$), the $\mathrm{R}^2_{\mathrm{MZ}}$ statistic is the proportion of total variance that is explained by the model. Although there is no commonly accepted goodness-of-fit measure for ordered response models, Veall and Zimmermann's study suggests that $\mathrm{R}^2_{\mathrm{MZ}}$ outperforms other measures (including McFadden's R^2) in terms of most closely replicating what the true R^2 for the underlying continuous latent variable would be.

REFERENCES

Albertson, L.A. 1977. Telecommunications as a travel substitute: Some psychological, organizational, and social aspects. *Journal of Communication* 27(2): 32-43.

Babbie, E. 1998. *The Practice of social research*, 8th ed. Belmont, CA: Wadsworth Publishing Company.

Baldassare, M. 2002. *PPIC statewide survey: Special survey on land use*. Public Policy Institute of California, November. Available at http://www.ppic.org/publications/CalSurvey32/survey32.pdf, accessed December 13, 2002.

Beroldo, S. 2002. *Commute profile 2002: A survey of San Francisco Bay Area commute patterns*. RIDES for Bay Area Commuters, Inc., October. The author may be contacted at sberoldo@rides.org.

Cervero, R., and K.L. Wu. 1998. Sub-centring and commuting: Evidence from the San Francisco Bay Area. *Urban Studies* 35: 1059-1076.

Choo, S., G.O. Collantes, and P.L. Mokhtarian. 2001. *Modeling individuals' relative desired travel amounts*. Research Report UCD-ITS-RR-01-13, Institute of Transportation Studies, University of California, Davis, November. Available at http://its.ucdavis.edu/publications/2001/RR-01-13.pdf.

———. Forthcoming. Wanting to travel, more or less: Exploring the determinants of a perceived deficit or surfeit of personal travel. *Transportation*.

Clark, W.A.V., and M. Kuijpers-Linde. 1994. Commuting in restructuring urban regions. *Urban Studies* 31: 465-483.

Collantes, G.O., and P.L. Mokhtarian. 2002. *Determinants of subjective assessments of personal mobility*. Research Report UCD-ITS-RR-02-11, Institute of Transportation Studies, University of California, Davis, August. Available at http://its.ucdavis.edu/publications/2002/RR-02-11.pdf.

Curry, R.W. 2000. *Attitudes toward travel: The relationships among perceived mobility, travel liking, and relative desired mobility.* Master's Thesis, Department of Civil and Environmental Engineering, University of California, Davis, June. Available at http://its.ucdavis.edu/publications/2000/RR-00-06.pdf.

Dobson, R., F. Dunbar, C.J. Smith, D. Reibstein, and C. Lovelock. 1978. Structural models for the analysis of traveler attitude-behavior relationships. *Transportation* 7: 351-363.

Dumas, J.S., and R. Dobson. 1979. Linking consumer attitudes to bus and carpool usage. *Transportation Research A* 13: 417-423.

The Economist. 1998. A survey of commuting: To travel hopefully. September 5, pp. 3-18.

Edmonson, B. 1998. In the driver's seat. *American Demographics*, March, pp. 46-52.

El Nasser, H. 2002. Commuting offers coveted refuge for some. *USA Today*, May 30.

Gordon, P., H.W. Richardson, and M-J. Jun. 1991. The commuting paradox: Evidence from the top twenty. *Journal of the American Planning Association* 57(4): 416-420.

Greene, W.H. 1995. *LIMDEP version 7.0 user's manual*. Econometric Software, Inc., Bellport, New York.

———. 2000. *Econometric analysis*, 4th ed. Upper Saddle River, NJ: Prentice-Hall Inc.

Hendrick, B. 2001. Some people LOVE being stuck in their cars. Some people LIKE long commutes. Are these people CRAZY?! *The Atlanta Journal-Constitution*, Friday, June 1.

Higano, Y., and I. Orishimo. 1990. Impact of spatially separated work places on urban residential location, consumption and time allocation. *Papers of the Regional Science Association* 68: 9-21.

Kitamura, R., P.L. Mokhtarian, and L. Laidet. 1997. A micro-analysis of land use and travel in five neighborhoods in the San Francisco Bay Area. *Transportation* 24(2): 125-158.

Larson, J. 1998. Surviving commuting. *American Demographics,* July, pp. 55ff.

Levinson, D., and A. Kumar. 1994. The rational locator: Why travel times have remained stable. *Journal of the American Planning Association* 60(3): 319-332.

Lindelof, B. 2000. Many commuters savor private luxury of drive time. *The Sacramento Bee*, February 8, pp. A1 and A12.

McKelvey, R.D., and W. Zavoina. 1975. A statistical model for the analysis of ordinal level dependent variables. *Journal of Mathematical Sociology* 4(1): 103-120.

McNamara, M. 2000. The shameful secret is out: Some of us enjoy commuting. *Los Angeles Times*, Wednesday, February 9, p. 2 of the "Southern California Living" section.

Metropolitan Transportation Commission. 2001. *1998 Base year validation of travel demand models for the San Francisco Bay Area (BAYCAST-90): Technical summary*, May. Available at http://www.mtc.ca.gov/datamart/forecast.htm, accessed January 4, 2003.

Metropolitan Transportation Commission. 2002. Census 2000 supplementary survey data for San Francisco Bay Area. Available at http://www.mtc.ca.gov/datamart/census/BayAreaC2SS.htm, accessed January 18, 2003.

Mokhtarian, P.L., and I. Salomon. 1997. Modeling the desire to telecommute: The importance of attitudinal factors in behavioral models. *Transportation Research A* 31(1): 35-50.

———. 2001. How derived is the demand for travel? Some conceptual and measurement considerations. *Transportation Research A* 35.8: 695-719.

Mokhtarian, P.L., I. Salomon, and L.S. Redmond. 2001. Understanding the demand for travel: It's not purely "derived." *Innovation: The European Journal of Social Science Research* 14(4): 355-380.

Redmond, L.S. 2000. *Identifying and analyzing travel-related attitudinal, personality, and lifestyle clusters in the San Francisco Bay Area*. Master's Thesis, Transportation Technology and Policy Graduate Group, Institute of Transportation Studies, University of California, Davis, September. Research Report UCD-ITS-RR-00-08. Available at http://www.its.ucdavis.edu/publications/2000/RR-00-08.pdf.

Redmond, L.S., and P.L. Mokhtarian. 2001a. *Modeling objective mobility: The impact of travel-related attitudes, personality, and lifestyle on distance traveled.* Research Report UCD-ITS-RR-01-09, Institute of Transportation Studies, University of California, Davis, June. Available at http://repositories.cdlib.org/itsdavis/UCD-ITS-RR-01-09/.

———. 2001b. The positive utility of the commute: Modeling ideal commute time and relative desired commute time. *Transportation* 28: 179-205.

Richter, J. 1990. Crossing boundaries between professional and private life. In Grossman H & Chester L (eds) *Behavioral travel-demand models* pp. 143-63. Hillsdale, NJ: Lawrence Erlbaum.

Shamir, B. 1991. Home: The perfect workplace? In Zedeck, Sheldon (ed) *Work and family* pp. 273-311. San Francisco, CA: Jossey-Bass.

Sipress, A. 1999. Not all commuters driven crazy. *Washington Post*, October 18, pp. A1 and A12.

Stopher, P. 2004. Reducing road congestion: A reality check. *Transport Policy.*

Taylor, B.D. 2002. Rethinking traffic congestion. *Access* (The magazine of the University of California Transportation Center) 21 (Fall): 8-16.

Taylor, M. 2000. Drivers brave traffic tie-ups to travel solo. *San Francisco Chronicle*, June 19, pp. A1 and A11.

Texas Transportation Institute. 2002. *2002 urban mobility study*, News Release, June 20. Available at http://mobility.tamu.edu/ums/news_release.

Tischer, M.L., and R.V. Phillips. 1979. The relationship between transportation perceptions and behavior over time. *Transportation* 8: 21-36.

Veall, M.R., and K.F. Zimmermann. 1992. Pseudo-R^2 in the ordinal probit model. *Journal of Mathematical Sociology* 16(4): 333-342.