WANTING TO TRAVEL, MORE OR LESS: EXPLORING THE DETERMINANTS OF THE DEFICIT AND SURFEIT OF PERSONAL TRAVEL

Sangho Choo
Department of Civil and Environmental Engineering
One Shields Avenue
University of California, Davis
Davis, CA 95616
voice: (530) 754-7421
fax: (530) 752-6572
e-mail: cshchoo@ucdavis.edu

Gustavo O. Collantes
Institute of Transportation Studies
One Shields Avenue
University of California, Davis
Davis, CA 95616
voice: (530) 754-4407
fax: (530) 752-6572
e-mail: gcollantes@ucdavis.edu

and

Patricia L. Mokhtarian
Department of Civil and Environmental Engineering
and
Institute of Transportation Studies
One Shields Avenue
University of California, Davis
Davis, CA 95616
voice: (530) 752-7062
fax: (530) 752-7872
e-mail: plmokhtarian@ucdavis.edu

Revised February 2004
Forthcoming, *Transportation*

WANTING TO TRAVEL, MORE OR LESS: EXPLORING THE DETERMINANTS OF THE DEFICIT AND SURFEIT OF PERSONAL TRAVEL

by

Sangho Choo
Gustavo O. Collantes
and
Patricia L. Mokhtarian

ABSTRACT

This study investigates the determinants of people's desire to increase or decrease the amount of travel they do. We use data from 1,357 working commuters, residents of three different neighborhoods in the San Francisco Bay Area, California. The dependent variables are indicators of Relative Desired Mobility for ten categories of travel (short- and long-distance overall and by several mode- and purpose-specific categories). These variables are measured on a five-point ordinal scale ranging from "much less" to "much more", through which the respondents indicated the amount of travel they want to do (in the category in question) compared to what they are doing now. Censored ordered probit models were developed for these variables, with explanatory variables including general travel attitudes, specific liking for travel in each of the same separate categories, objective and subjective measures of the amount currently traveled in each category, and personality, lifestyle, and socio-demographic characteristics. The results support the hypotheses that the liking for travel has a strong positive impact, and subjective qualitative assessments of mobility have a strong negative impact, on the desire to increase one's travel. Finally, a number of general types of effects on Relative Desired Mobility were identified, among them complementarity and substitution effects. The results of this study can provide policy makers and researchers with new and valuable insight into key principles that affect individual travel demand.

Keywords: affinity for travel, ordered probit, travel attitudes, utility of travel

1. INTRODUCTION

Do people actually want to travel? Not according to the conventional wisdom of the transportation profession, which holds that travel is purely a disutility to be minimized. The fundamental demand (as the common thinking goes) is to participate in various activities that happen to be spatially diverse, and travel is only tolerated as a necessary "evil" means for achieving the desired end. Although many in the profession realize that this assumption is a simplification of reality, many others accept it almost as an article of faith. Even those who understand it to be only an approximation generally believe it to be an adequate one, and until recently there has been little effort to empirically test this belief.

Building on insights previously expressed by others (e.g., Jones, 1978; Reichman, 1976; Hupkes, 1982), we have begun a multi-faceted study of the positive utility of travel, that challenges the notion of travel as purely a derived demand. Early papers in this series (Salomon and Mokhtarian, 1998; Mokhtarian and Salomon, 2001) focused on the conceptual basis for such a positive utility. Three components to the utility of travel were identified: (1) the conventional component – the utility of arriving at a desired destination; (2) the utility of activities that can be conducted while traveling (listening to music, talking to a companion, thinking or relaxing, potentially talking on a mobile phone, working on a laptop, or reading); and (3) the utility intrinsic to travel itself. The third component of utility involves psychological needs or motivations such as the enjoyment of movement itself (including, but not exclusively, the enjoyment of speed), curiosity or information-seeking, variety-seeking, a need for escape, a need for independence or desire for freedom, the satisfaction of skillfully handling a vehicle, and the "display" of travel or a vehicle as a status symbol. While even most transportation professionals would readily acknowledge the role of these motivations in the demand for leisure or discretionary travel, we contend that those same motivations are at work to some extent in the demand for daily mandatory and maintenance travel – and that it is important to inquire further into the question of "to what extent".

Later papers and reports in the series (Curry, 2000; Mokhtarian *et al*., 2001; Redmond and Mokhtarian, 2001; Collantes and Mokhtarian, 2002; Choo and Mokhtarian, 2004; Clay and Mokhtarian, 2002; Cao and Mokhtarian, 2003; Schwanen and Mokhtarian, forthcoming; Ory *et al*., forthcoming) delve into the question of "to what extent", among other questions. These studies present results from an extensive ongoing empirical analysis of the positive utility of travel, using data collected from a fourteen-page survey returned by about 1900 adult residents of three distinct San Francisco Bay area neighborhoods.

The current paper addresses precisely the question of the circumstances under which people actively want to travel more (or less) than they are currently doing. Specifically, we analyze a set of questions in the survey that measure what we refer to as "relative desired mobility". For a number of different categories of travel (the data are described in more detail in Section 2), respondents indicated whether they wanted to travel much less, less, about the same, more, or much more than they were currently doing. Using ordered probit, we model the responses to these questions as functions of general travel-related attitudes, specific liking for the same various categories of travel, the amounts individuals are currently traveling (both in objectively

measurable terms and in respondents' own qualitative, subjective judgements), personality traits, lifestyle orientations, and socio-demographic characteristics.

We hypothesized that relative desired mobility would be negatively associated with current mobility, and positively associated with travel liking. That is, the more a person currently travels in a certain category, the more she would want to reduce her travel in that category, and the more she likes a certain kind of travel, the more she would want to increase that kind. We further hypothesized that subjective mobility would be more important to relative desired mobility than objective mobility – that one's perception of the amount of travel he does should have a stronger impact on his desire to reduce or increase it than the actual amount of travel he does. All of these expectations were well-supported by the results, which offer a number of additional insights as well.

The premise and findings of this study have important implications for policy and planning. In the traditional transportation planning procedure, trip generation is modeled as a function of demographic characteristics such as income, household size, and vehicle ownership. Such demand models often underestimate future travel, perhaps in part because they do not allow for the likelihood that certain kinds of people, for certain kinds of travel, actively want to travel more than they are doing now. Similarly, many transportation policies to reduce traffic congestion have focused not only on charging social costs to highway users (by means such as congestion pricing and fuel taxes) but also on limiting automobile use (by means such as higher parking pricing and high-occupancy-vehicle lanes). One reason many such policies have been less effective than expected may be due to their failure to account for the fact that some people do view travel intrinsically positively, and hence are resistant to policies designed to motivate them to reduce their travel. It is essential to be aware of this diversity in individuals' views of travel when forecasting the response to various policies and trends, in order to build forecasts that are behaviorally realistic.

The organization of this paper is as follows. Section 2 describes the empirical context of the study, including brief definitions of the key types of variables used in this analysis. Section 3 discusses several general issues related to model specification and estimation. Section 4 provides an overview of the key results, while Section 5 describes a number of recurring types of effects identified in the study. Section 6 offers some concluding remarks.

2. EMPIRICAL CONTEXT

2.1 The Data

The data analyzed in this study come from a fourteen-page self-administered survey mailed in May 1998 to 8,000 randomly selected households in three neighborhoods of the San Francisco Bay Area. Half of the total surveys were sent to an urban neighborhood of North San Francisco and the other half were divided evenly between the suburban cities of Concord and Pleasant Hill. These areas were chosen to represent the diverse lifestyles, land use patterns, and mobility options in the Bay Area. Approximately 2,000 surveys were completed by a randomly selected adult member of the household and returned, for a 25% response rate. The subset of 1,357 cases used in this analysis constitutes those respondents identified as workers (part-time or full-time)

who commute at least once a month. Table 1 presents some key socio-demographic characteristics of the sample. The sample is relatively balanced in terms of representation by neighborhood and gender. Nearly 95% of respondents have one or more personal vehicles in their households. Higher incomes are overrepresented compared to Census data, as is typical for self-administered questionnaires.

[Table 1 goes about here]

2.2 The Variables

The information retrieved by the survey can be grouped into 11 categories, of which the 10 used in the current study are: Objective Mobility, Subjective Mobility, Relative Desired Mobility, Travel Liking, Attitudes, Personality, Lifestyle, Excess Travel, Mobility Constraints, and Socio-demographics.

The three mobility categories and the Travel Liking category had similar structures. In each case, measures were obtained both overall and separately by purpose and mode, for short-distance and long-distance travel. Short-distance trips were defined as those of 100 miles or less, one way. The short-distance purposes measured in the survey were: commute, work/school-related travel, grocery shopping, to eat a meal, for entertainment/ social/recreational activities, and for the purpose of taking others where they need to go. The short-distance modes measured were: personal vehicle, bus, train/heavy rail/light rail and walking/jogging/bicycling. Long-distance measures were obtained for the work/school-related and entertainment/social/re-creational purposes, and for the personal vehicle and airplane modes.

2.2.1 The Dependent Variables: Relative Desired Mobility

Relative Desired Mobility refers to how much a person wants to travel compared to what she is doing now. We asked the respondents to rate this Relative Desired Mobility on a five-point Likert-type scale anchored by "much less" and "much more". We selected nine out of the 16 measures of Relative Desired Mobility to be modeled in the present study: short-distance overall, work/school-related, entertainment/social/recreational, and by personal vehicle, and long-distance overall, work/school-related, entertainment/social/ recreational, by personal vehicle, and by airplane. A previous study involved modeling the commute Relative Desired Mobility (Redmond and Mokhtarian, 2001), and those results are included here for completeness.

Figure 1 presents the distributions of the ten Relative Desired Mobility variables analyzed here. For simplicity of presentation we combine the first and second categories (much less/less), and the fourth and fifth categories (more/much more), for each variable. Not surprisingly, people want to increase long-distance travel more than short-distance travel, entertainment or recreation travel more than commute or work/school-related travel, and airplane travel more than personal vehicle travel. What is perhaps more surprising is the extent to which people want to maintain their current amounts of travel, even in categories other than entertainment. More than half the sample wanted "about the same" amount of short-distance overall travel. Half to two-thirds of the sample wanted about the same amount of commuting and work-related travel, and about 60% wanted to maintain current levels of personal vehicle travel. These numbers suggest that sizable

proportions of the population will be relatively unreceptive to policies intended to motivate reductions in travel. In any case these distributions indicate that individuals' Relative Desired Mobility varies by travel distance, purpose, and mode.

[Figure 1 goes about here]

2.2.2 The Explanatory Variables

Objective Mobility:
These questions asked about distance and frequency of travel by mode and trip purpose, as well as travel time for the commute trip. For short-distance trips, respondents were asked how often they traveled for each purpose, with six categorical responses ranging from "never" to "5 or more times a week". Respondents were also asked to specify how many miles they traveled each week, in total and by mode and purpose.

The long-distance Objective Mobility variables come from a section of the survey in which respondents were asked how often they traveled to various parts of the globe "last year", by purpose (for entertainment and work/school-related activities) and mode (personal vehicle, airplane and other) combinations, with an "other" category to catch any remaining travel. These responses indicated number of trips directly, and were also converted into approximate distances by measuring from a central position in the Bay Area to a central location within the destination region.

Trips were combined across world regions to obtain three different measures of distance:
(a) Total miles, the simple sum of the estimated miles for each reported trip.
(b) Natural log of miles, the natural logarithm of one plus the total number of miles. One mile was added to each total so that when zero miles were actually traveled in a given category, the log transformation would return the value zero (= ln(1)) rather than $-\infty$ (= ln(0)).
(c) Sum of the natural log of miles for each trip, obtained by taking the natural logarithm of one plus the number of miles of each trip in the category *separately*, and summing across all trips in the category.

The second and third measures reduce the weight of long-distance trips, assuming that each additional mile traveled has a diminishing marginal impact. Compared to the second measure, the third measure gives more weight to a greater number of trips traveling the same number of miles. For example, compare two different travel patterns: nine trips to Western States (6,300 miles total) versus one trip to Asia (7,500 miles). The Asia trip might take one or two weeks, while the trips to Western States could collectively involve five to nine weeks. Considering this fact suggests that the nine Western States trips constitute a heavier amount of travel than the single Asia trip, and application of the third measure reflects this conceptualization, returning a value of 58.97 for the Western States trips but only 8.92 for the Asia trip (adapted from Curry, 2000). Discriminating each of these variables by travel mode (personal vehicle, airplane, and other means), plus retaining the original "total" variables, yielded a set of 12 measures of distance that were used in the models.

Subjective Mobility:
We are interested not only in the Objective amount an individual travels, but also in how that amount of travel is perceived. One person may consider 100 miles a week to be a lot, while another considers it minimal. For each of the same overall, purpose, and mode categories for short- and long-distance, respondents were asked to rate the amount of their travel on a five-point semantic-differential scale anchored by "none" and "a lot".

Travel Liking:
Whether a respondent who already travels a lot wants to reduce it or do even more is likely to be largely influenced by how much he enjoys traveling. Respondents were asked to rate each of the same categories as for Subjective Mobility and Relative Desired Mobility, on a five-point scale from "strongly dislike" to "strongly like". They were specifically instructed, "We are *not* asking how you feel about the activity at the destination, but about the travel required to get there" (we discuss the general issue of whether respondents in fact were rating the destination activity rather than the travel, in the Conclusions section). The Travel Liking variables are viewed as indicators of affective attitudes — specifically attitudes toward travel.

General Travel Attitudes:
The survey contained 32 attitudinal statements related to travel, land use, and the environment, to which individuals responded on the five-point Likert-type scale from "strongly disagree" to "strongly agree". These 32 variables were then distilled, through factor analysis (Redmond, 2000), into six underlying dimensions: travel dislike, pro-environmental solutions, commute benefit, travel freedom, travel stress, and pro-high density.

Personality:
Respondents were asked to indicate how well (on a five-point scale from "hardly at all" to "almost completely") each of 17 words and phrases described their personality. Each of these traits was hypothesized to relate in some way to one's orientation toward travel, or to reasons for wanting to travel for its own sake. These 17 attributes reduced to four Personality factors: adventure seeker, organizer, loner, and the calm personality.

Lifestyle:
The survey contained 18 Likert-type scale statements relating to work, family, money, status and the value of time. These 18 questions comprised four Lifestyle factors: status seeker, workaholic, family/community-oriented and a frustrated factor. These variables are expected to affect travel attitudes, desires, and behavior.

Excess Travel:
Thirteen statements asked how often (on a three-point scale: "never/seldom"=0, "sometimes"=1, "often"=2) the respondent engaged in various activities that would be considered unnecessary or excess travel. The Excess Travel indicator is the sum of the responses to these statements, ranging from 0 for the respondent who never/seldom did any of them to 26 for the respondent who often did all of them. This variable can be considered an indicator of Objective Mobility, but also has a psychological flavor indicating an enjoyment of travel beyond the purely utilitarian. The index may represent a strong desire for travel generally, or a preference for

discretionary travel which may have a negative relationship with mandatory travel for such purposes as commuting and taking others where they need to go.

Mobility Constraints:
In our study, Mobility Constraints are physical or psychological limits on travel. These constraints may affect the amount an individual travels or her/his enjoyment of that travel. In our survey, these constraints are measured by questions concerning limitations on traveling by certain modes or at certain times of day (with ordinal response categories "no limitation", "limits how often or how long", and "absolutely prevents"), and the availability of an automobile when desired.

Socio-demographics:
Finally, the survey included an extensive list of Socio-demographic variables to allow for comparison to other surveys and to Census data. A number of relationships between these variables and the key endogenous variables can be hypothesized. The Socio-demographic variables include neighborhood and car type dummies, age, years in the U.S., education and employment information, and household information such as number of people in the household, their age group, and personal and household income.

3. MODEL SPECIFICATION ISSUES

The Relative Desired Mobility dependent variables are measured on a five-point ordinal scale anchored by "much less" and "much more", rather than on a continuous scale. Presenting the respondents with a *discrete* set of ordinal options from which to rate their Relative Desired Mobility is a typical and appropriate survey design choice to simplify the task of responding. However, doing so constrained the respondents into being able to give only an approximation to their true answer. We hypothesize that the true amount more or less that a respondent wants to travel lies on a continuous scale (unbounded at each end), and that her reported response represents a mapping from her true answer to the category that best represented that answer. "Ordered response" models, of which ordered probit and ordered logit are the most widely used, are designed for exactly such circumstances.

The assumption of normally distributed error terms leads to the formulation of the ordered probit model, which postulates that the dependent variable (here the true Relative Desired Mobility) for person *i* satisfies:

$$y_i^* = \boldsymbol{\beta}' \mathbf{x}_i + \varepsilon_i .$$

In the above expression, y_i^* is the continuous *unobserved* (latent) variable representing the respondent's "true" underlying Relative Desired Mobility, $\mathbf{x}_i$ is a vector of explanatory variables, $\boldsymbol{\beta}$ is a vector of unknown coefficients to be estimated, and ε_i is the normally distributed error term, with mean equal to zero and variance equal to one. The *observed* Relative Desired Mobility variable y_i is specified as

$$
\begin{aligned}
y_i &= 0 \text{ (much less), if } -\infty = \mu_{-1} < y_i^* \le \mu_0 \,, \\
y_i &= 1 \text{ (less), if } \mu_0 < y_i^* \le \mu_1 \,, \\
y_i &= 2 \text{ (about the same), if } \mu_1 < y_i^* \le \mu_2 \,, \\
y_i &= 3 \text{ (more), if } \mu_2 < y_i^* \le \mu_3 \,, \\
y_i &= 4 \text{ (much more), if } \mu_3 < y_i^* < \mu_4 = +\infty .
\end{aligned}
$$

The μs are threshold parameters to be estimated together with $\boldsymbol{\beta}$, under the condition that $\mu_0 < \mu_1 < \mu_2 < \mu_3 < \mu_4 = +\infty$, so that the probabilities will be non-negative. The parameter μ_0 is generally set to zero without loss of generality, since the sample likelihood remains unchanged if the constant term $\exists_0$ and all .s are shifted by the same amount.

A special boundary case arises with our data. Specifically, when a respondent's Subjective Mobility is "none" and she does not wish to travel in that category, 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, we put specific instructions 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 Relative Desired Mobility of "less" or "much less".

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. However, we believe that these responses most likely represent either a strong emotional (rather than rational) reaction against the type of travel in question ("I dislike it so much, I want to do it even *less* than none"), or a careless response approach that simply took the lowest of the desired amount categories without reading them carefully ("I'm not doing it at all and I don't want to do it, so my relative desired amount must be the lowest category"). The pattern found across all categories of travel in the survey is interesting, with the least popular categories of travel (such as for work purposes and by bus) having the largest number of problematic responses (Curry, 2000). Such a pattern is consistent with either explanation.

Although investigating the extent to which any of these explanations holds would be an interesting study in survey design and analysis, the current data do not permit such an investigation. To maintain logical consistency, we recoded "much less" and "less" Relative Desired Mobility responses to "about the same" when Subjective Mobility was "none". To respect the information offered by these cases, though, we treated these observations as censored. That is, when Subjective Mobility was "none" we treated any Relative Desired Mobility response of "about the same", "less", or "much less" as representing $y_i^* \le \mu_2$, without specifying its position relative to μ_0 and μ_1. We treated as censored even Subjective Mobility = "none" cases whose original Relative Desired Mobility response was "about the same", on the assumption that some of them would have exhibited a response mechanism similar to the others if they had not read the instructions. In other words, when Subjective Mobility was "none" and

the observed indicator of Relative Desired Mobility was "about the same" or less, we argue that the unobserved latent measure of the respondent's desires, y_i^*, cannot be located with confidence in a particular bounded interval of the real line, and that the most we can say is that it falls somewhere below μ_2.

Censored ordered probit models were thus developed for the nine Relative Desired Mobility variables listed in Section 2.2.1, and analyzed together with the model for commute Relative Desired Mobility found in Redmond and Mokhtarian (2001). The LIMDEP econometrics package (Greene, 1995) was used to estimate the models. The initial model specifications contained 114 variables measuring travel Attitudes, Personality, Lifestyle, Objective and Subjective Mobility, Travel Liking, Mobility Constraints, and Socio-demographic traits. Each of these variables had a conceptual justification for inclusion. The significance of the variables in the initial model specifications was inspected, and statistically insignificant variables were eliminated. Variations on the remaining specification were further tested to obtain a final model having all (and only) significant explanatory variables. Through this procedure the final models were obtained, all of whose explanatory variables were not only statistically significant, but also conceptually interpretable. We tested for potential multicollinearity among the independent variables, using ordinary least squares estimation of the final model specifications. All variance inflation factors (VIFs) for the independent variables in the final models are less than 10, a suggested threshold value for multicollinearity (Kennedy, 1998). These results, plus the statistical significance and conceptual interpretability of the variables, indicate that the final models do not have any serious multicollinearity problems.

Although there are no universally-accepted measures of goodness of fit for the ordered probit model (censored or not), Veall and Zimmermann (1992) report that, in their ordered probit simulations involving one explanatory variable and up to four categories, the following modified McKelvey/Zavoina (1975) statistic most nearly replicated the "true" R^2 obtained by conducting OLS on the underlying continuous variable:

$$R^2_{MZ} = \frac{\sum_{i=1}^{N} (\hat{y}_i^* - \bar{\hat{y}}_i^*)^2}{\sum_{i=1}^{N} (\hat{y}_i^* - \bar{\hat{y}}_i^*)^2 + N},$$

where $\hat{y}_i^* = \hat{\boldsymbol{\beta}}' x_i$ (the predicted value of the latent variable y_i^* based on the estimated parameters $\hat{\beta}$) and $\bar{\hat{y}}_i^* = \sum_{i=1}^{N} \hat{y}_i^* / N$ (the average value of $\hat{y}_i^*$). The numerator of the fraction can be viewed as a measure of explained variance (analogous to the regression sum of squares for regular regression models), and N $(= N\sigma^2$, since σ is taken to be one without loss of generality, $= \sum_{i=1}^{N} \sigma^2 = \sum_{i=1}^{N} \mathrm{var}(\varepsilon_i))$ is a measure of unexplained variance; hence R^2_{MZ} has the familiar interpretation of proportion of total variance explained by the model. We used the R^2_{MZ} statistic

as our measure of goodness of fit, which, for the models presented here, ranges from 0.237 to 0.454 (see Table 2).

4. OVERVIEW OF THE MODEL RESULTS

Table 2 provides a summary of the model results, by presenting the signs of the significant coefficients as well as the modified McKelvey/Zavoina goodness-of-fit statistics for each model. The summary table also presents the estimates of the μ coefficients, all of which had very high t-statistics although, as expected, they get successively larger with each one, indicating that the μs are successively more significantly different from zero, the farther from zero they are. The results indicate that the span of the underlying (latent) continuous dependent variable within categories of the discrete scale indeed vary across categories and across models, adding support for the use of an ordered discrete methodology over ordinary least squares (OLS). LIMDEP 7.0 normalizes μ_0 to zero and thus only the values obtained for the other three threshold parameters are presented. For example, for the short-distance overall model, the estimates of the μs imply that the widths of the "less", "about the same", and "more" categories on the continuous latent scale are 1.64, 2.22, and 1.16, respectively. Those widths are neither identical nor symmetric around the middle category, confirming that the observed ordinal scale does not have interval properties. These values show that the "about the same" response category embraces a wider range of respondents' true feelings than do the "less" or "more" categories. It can also be seen that a wider (on the continuous latent scale) range of true feelings leads the respondent to answer "less", compared to the range that leads him to answer "more".

[Table 2 goes about here]

Our two major hypotheses were that Subjective Mobility would be negatively related and that Travel Liking would be positively related to Relative Desired Mobility. The former hypothesis states that the higher the subjective assessment people make of their actual amount of travel, *ceteris paribus*, the less inclined they are to increase their travel. Travel Liking, on the other hand, connotes an affective attitude toward traveling. Appropriately specific affective attitudes can be good predictors of an individual's intention (conative attitude) to behave in a certain way. The desire of an individual to increase or decrease her amount of travel can be viewed as a preference measure, that is a precursor of an *intention* to modify her current level of travel[1]. In light of this, we expect the liking for a specific type of travel to be a good, and direct, predictor of the relative desire to increase or decrease the same type of travel.

These hypotheses were, for the most part, strongly supported by the results. The influence of Travel Liking was powerful and universal: in every Relative Desired Mobility model, the corresponding Travel Liking measure (always with a positive coefficient) was by far the most significant variable in the model. The t-statistics for these variables ranged from 7.15 for the long-distance overall model to 17.62 for the long-distance work/school-related model. In six of the 10 models, both the short- and long-distance measures of Travel Liking for the dependent

[1] It is not an intention directly, since one can desire to do something she has no intention of actually doing, due to recognized constraints. For example, a study of 791 English car drivers found that 33% reported wanting to reduce auto travel over the next year, but only 7% reported being likely to do so (Stradling, *et al.*, 2000).

variable category of travel were (positively) significant. Table 2 highlights this result through shading of the corresponding cells.

The fact that the Travel Liking variables (SD and LD) are highly significant in the models provides a direct indication that there is an intrinsic affinity for travel for its own sake (varying by individual, purpose, mode and circumstance), prompting a desire to travel more. Such an effect of Travel Liking can potentially add travel at the margin that is unnecessary or excess from the perspective of simply meeting the demand for spatially separated activities (it is not excess from the standpoint of maximizing the individual's utility).

The results for Subjective Mobility are somewhat more complex. The hypothesis was unequivocally supported for the four short-distance models (plus the previous model for commuting) and two of the five long-distance models estimated in this study. In two of the three remaining models, related variables appear with expected signs, providing reasonable support for the hypothesis. For example, in the model for long-distance personal vehicle travel, overall long-distance Subjective Mobility enters with a negative sign. In the model for long-distance airplane travel, long-distance Subjective Mobility for overall and work-related trips both enter with negative signs, and so does a measure of Objective Mobility by airplane.

The remaining model, for long-distance entertainment travel, constitutes an interesting exception to the pattern. No Subjective or Objective Mobility variables whatsoever were significant in this model. This means that, at least within the range of travel experienced by our respondents, their desires to change their amount of this kind of travel (whether up or down or neither) are independent of how much they are currently doing. Since most people reported wanting more of this kind of travel, we interpret this result as a kind of "insatiability effect". It is natural that this effect would appear for what is arguably the most fun and exciting category of travel studied here, long-distance entertainment. It should be noted however that this model does contain Travel Liking variables that, in view of their positive relationships to Objective Mobility (Mokhtarian, *et al.*, 2001) and Subjective Mobility (Collantes and Mokhtarian, 2002), could capture some of the effect of these variables.

Another initial hypothesis was that Objective Mobility would not be a direct predictor of Relative Desired Mobility, but that it would rather be filtered through Subjective Mobility. The models presented here show that in fact Subjective Mobility variables are more important to explaining the corresponding Relative Desired Mobility than are the corresponding Objective Mobility variables, with three models (short-distance work/school-related and entertainment/recreation/social, and long-distance entertainment/recreation/social) having no significant Objective Mobility variables at all. While this might not be too surprising, the finding that one's perceived rather than actual amount of travel better predicts one's desire to modify that amount, is an important contribution of this study. On the other hand, Objective Mobility variables are not entirely absent, with several short-distance Objective Mobility measures appearing in both short- and long-distance Relative Desired Mobility models, and similarly for long-distance.

Three Lifestyle factors repeatedly enter the models: the frustrated person (in four models), the status seeker (in six models), and the family/community-oriented person (in four models). The first of these was frequently encountered in the models of Objective Mobility developed on the

same data (Mokhtarian, *et al*., 2001), with negative coefficients, as opposed to the positive coefficients it holds in the present models. It is interesting then, that, even in this sample of residents of a congested metropolitan area, frustration is consistently associated with *traveling less* than others, and *wanting to travel more* — not, for example, the other way around. The systematically positive association between status seekers and their Relative Desired Mobility is consistent with the inclination of these people to show off. This lifestyle trait may be prompted by some degree of dissatisfaction (frustration). In fact, the one Objective Mobility model for which this variable turned out to be significant showed that status seekers have lower long-distance overall actual mobility. The family/community-oriented factor shows a saturation with short-distance and non-discretionary travel and a (likely ensuing) deficit of long-distance discretionary travel. These results are compatible with the lower walking/jogging Objective Mobility of family-oriented people (Mokhtarian, *et al*., 2001), and their higher personal-vehicle short-distance Subjective Mobility (Collantes and Mokhtarian, 2002).

In view of their pervasiveness in the models for Objective and Subjective Mobility, the scant impacts of the adventure seeker Personality factor and the Excess Travel indicator on Relative Desired Mobility are noteworthy. We believe that the effects of these two variables are generally accounted for through the other variables (Objective Mobility, Subjective Mobility, and especially Travel Liking) that do appear in the models. The presence of the adventure seeker variable in the model for long-distance travel by airplane, and the Excess Travel indicator in the model for long-distance travel by personal vehicle, suggests that at least for these types of travel, there are important aspects to being an adventure seeker or an excess traveler that are not fully captured by the Travel Liking and other variables alone. These aspects may simply be a further extension of the Travel Liking dimension (for two people who both respond that they "strongly like" travel, the adventure seeker may strongly like it *more* than the other person), or they may represent a positive orientation toward travel that is more complex than can be captured by the single, simple, Travel Liking variable.

Given that adventure seekers and excess travelers have high Objective and Subjective Mobilities as well as high Travel Likings for the categories in question, *but* that Objective Mobility, Subjective Mobility, and Travel Liking are already largely accounted for in those models, the *additional* positive impact of the adventure seeker and excess traveler variables on Relative Desired Mobility points to an insatiability of those types of people for those categories of travel.

Among the Socio-demographic variables, the age category and the urban neighborhood indicator are frequently appearing predictors of Relative Desired Mobility, both entering with mixed signs. Indicators of household composition abound in Table 2 — at least one of these indicators enters in six models, also with mixed signs. There is virtually no effect of the characteristics of the personal vehicle on Relative Desired Mobility, indicating that the desire for more or less travel is generally independent of the type of vehicle one drives. Interestingly, the only exceptions were for short-distance commuting and work/school-related travel: driving either a mid-sized or a sports car was associated with wanting to increase one's work/school-related travel (as was driving a recent-vintage vehicle of any type), while driving a minivan was associated with wanting to decrease commuting.

It is also interesting that income is relatively insignificant as a predictor of Relative Desired Mobility, entering (negatively) only in the model for air travel. We believe that the effect of income is accounted for indirectly: higher incomes are associated with higher Objective Mobility (Mokhtarian, *et al*., 2001), and higher Subjective Mobility (Collantes and Mokhtarian, 2002), and higher Subjective Mobility is associated with lower Relative Desired Mobility (as shown in the present study)[2]. The significance of income in the model for long-distance air travel may represent simply a "residual" effect of mobility not captured by the specific variables in the model, or there may be a more subtle psychological interpretation: for two people having the same Objective and Subjective Mobility, the one with higher income may also have greater work-related stress, for example, and thus be more desirous of reducing air travel.

5. TYPES OF INFLUENCES ON RELATIVE DESIRED MOBILITY

The interpretations of the variables entering the individual models, together with the overview of the models presented here, leads to the identification of a number of general types of effects on Relative Desired Mobility. We briefly describe each of them in this section, and summarize them in Table 3. Although length limitations preclude a discussion of each explanatory variable in the table, we mention selective ones to serve as illustrations of the identified types of effects. A more complete discussion of the variables in each individual model is found in Choo, *et al*. (2001).

[Table 3 goes about here]

Complementarity

In many cases, a variable representing one category of travel appeared to induce a desire to increase the amount of travel in a different (usually related) category of travel. This suggests a complementary relationship between the two types, in which a positive orientation toward the first type accompanies a positive orientation toward the second. For example, in several instances, Travel Liking for a short-distance category of travel had a positive influence on Relative Desired Mobility for the long-distance counterpart, and conversely.

Competing Preferences

The liking, desire or preference for a certain type of travel or activity may trigger a desire to reduce the amount of travel in some categories, so as to be able to increase the amount of time devoted to the preferred activity/travel. For example, a liking for taking other people where they needed to go, or high amounts of that type of travel, were associated with lower Relative Desired Mobility for several types of long-distance travel.

Substitution

In a number of cases, the liking for, or engagement in, one type of travel was associated with a desire to *decrease* a related alternate type of travel, i.e. the desire to substitute one type of travel for another. In other cases, higher perceived mobility by one mode (specifically bus, rail, and walk) was associated with a desire to *increase* travel by a different mode (specifically, personal vehicle) – again, a desired substitution effect. In two cases, we suggested that occupation-related

[2] The same argument can apply to other variables (including, but not limited to, other demographic variables such as gender) not explicitly found in these models; the effects of such variables may indirectly be accounted for through their relationships with variables that *are* present here.

variables point to a substitutability between work-related functions and entertainment/recreational/social functions.

Saturation

Logically, increasing amounts of real or perceived mobility with respect to a certain type of travel result in a decreasing desire for the same or a related kind of travel. This helps explain the negative sign exhibited by numerous Objective and Subjective Mobility variables in models of related Relative Desired Mobility variables. A few other variables, however, constituted indirect indicators of saturation. For example, a high score on the family/community-oriented factor was associated with lower Relative Desired Mobility for overall short-distance and work/school-related long-distance travel.

Relative Mobility Deprivation

In a number of instances, increasing amounts of a given variable (sometimes one type of mobility) suggest increasing restrictions on some (other) type of mobility, thereby inducing a positive Relative Desired Mobility for that (latter) category of travel. For example, high levels of long-distance personal vehicle travel seem to stimulate the desire for more short-distance personal vehicle travel, while increasing personal vehicle availability constraints (measured as a decreasing percentage of time a personal vehicle is available) has a similar effect on both short-distance and long-distance personal vehicle travel.

Insatiability

In several cases we identified a desire to increase mobility in a certain category for a group of people whose Objective Mobility or Subjective Mobility in that category was already higher than average. We refer to this effect as insatiability, although such a term in this context can only be understood in a relative sense. That is, in an absolute sense insatiability often does not exist. The appetite in question is generally *capable* of being satisfied, it is just that within the range of experience of the individual the appetite is *not* satisfied, sometimes despite considerable "feeding". Thus, adventure-seekers, excess travelers, and those who like long-distance entertainment travel all wanted more long-distance travel of various kinds, despite the fact that those respondents already have above-average long-distance travel.

Family-related Travel

The mixed nature of the impacts of family-related variables on Relative Desired Mobility points to the complexity of the role that family plays in travel-related decisions. On the one hand, the positive impact of several variables related to household size and a family-oriented lifestyle on relative desired amounts of travel of a recreational nature suggests that the more central the role the family plays, the higher the desire to travel in those categories. On the other hand, the negative impact of other household size variables *in the same models*, no less, hints of the burdensome side of traveling with family. The negative effects seen here are distinguished from those of the family-related variables in the competing preferences category. Here, the negative effects are assumed to indicate a reduced desire to travel *with family*. In the case of competing preferences, the negative effects are assumed to indicate a reduced desire to travel for non-family trips (specifically work/school-related), due to a desire to be with family.

6. CONCLUSIONS

In this study, we modeled Relative Desired Mobility – people's desire to reduce, maintain, or increase their current levels of travel, as indicated on a five-point ordinal scale – for nine different categories: short-distance overall, work/school-related, entertainment/recreation/social, and personal vehicle; and long-distance overall, work/school-related, entertainment/recreation/social, personal vehicle, and airplane. We also included a previously-published model of commute Relative Desired Mobility for completeness.

The models were estimated under an ordered probit formulation, that being the most appropriate class of models for our context of discrete ordinal observed dependent variables with censoring. The modified McKelvey/Zavoina R^2 goodness-of-fit measures for the models range from 0.237 to 0.454.

Our two major hypotheses were that Subjective Mobility would be negatively related to Relative Desired Mobility (the higher the assessment people make of their actual amount of travel, the less they will want to increase their travel), and that Travel Liking would be positively related (the higher people's liking for travel, the more they will want to increase their travel). These hypotheses were, for the most part, strongly supported by the model results. The influence of Travel Liking was powerful and universal: in every Relative Desired Mobility model, the corresponding Travel Liking measure (always with a positive coefficient) was by far the most significant variable in the model. In six of the 10 models, both the short- and long-distance measures of Travel Liking for the dependent variable category of travel were (positively) significant.

The fact that the Travel Liking variables (SD and LD) are highly significant in the models provides a direct indication that there is an intrinsic affinity for travel for its own sake (varying by individual, purpose, mode and circumstance), prompting a desire to travel more. Such an effect of Travel Liking can potentially add travel at the margin that is unnecessary or excess from the perspective of simply meeting the demand for spatially separated activities (it is not excess from the standpoint of maximizing the individual's utility).

It is reasonable to question, however, the extent to which respondents were able to distinguish their attitudes toward travel itself (as putatively measured both by Travel Liking and by Relative Desired Mobility) from their attitudes toward the activity conducted at the destination, or to some extent their attitudes toward activities that can be conducted while traveling. Despite our explicit urging to concentrate on the travel itself (see Section 2.2.2), it is likely that even respondents who read those instructions found it difficult to separate their feelings so cleanly. Future studies could address this concern through more focused attention to these particular variables than was possible in our broad survey, ideally through interactive probing and confirmation of responses.

In the meantime, with respect to the present study we offer a four-fold answer to this justifiable concern. First, even in the worst case that the responses were *entirely* about the destination activity and not at all about the travel, they still have travel implications. Although the activities (work, entertainment) captured by these variables have in-home alternatives, it is well-under-

stood that those alternatives are often inferior to their out-of-home counterparts on a number of dimensions. To the extent that that is the case, the simple descriptive data shown in Figure 1 point to a substantial level of current and potential demand *for the travel required to engage in those activities*. Second, the conceptual considerations presented in the Introduction and at greater length in the references cited there provide a number of plausible reasons why travel itself could have positive utility. Thus, the concept is not *prima facie* absurd; the question is not whether people can possibly like travel for its own sake, but only the degree to which they do, compared to a liking for the activities it enables.

Third, it is important to understand that the observed purpose-specific variation in the liking for travel has several sources, including: (a) confusing a liking for the activity at the destination with a liking for the travel; (b) interactions between travel and *purpose*, not destination (e.g., *independent of destination*, one may enjoy the travel less on a long distance work trip than on a comparable long distance vacation trip, due to stress over pre-trip preparations and anxiety about one's performance at the destination); and (c) interactions between travel and the *route or destination*, rather than the destination activity *per se* (e.g., *independent of trip purpose*, one may dislike congested travel, and local commute trips are often congested, so one expresses a dislike for commute travel). Only the first source constitutes the spurious confounding of travel and activity that we are concerned about; the latter two sources constitute legitimate variations in the *quality of the travel experience*.

Finally, the argument that people confound destination activities with the travel required to reach them is most compelling for the five categories that in fact relate to travel purposes: short distance commute, work/school, and entertainment, and long distance work/school and entertainment. It is less persuasive (although not entirely baseless) to suggest that the three *mode-based* ratings of travel (personal vehicle for short and long distance, and airplane), or the two *overall* ratings of travel (short and long distance, each placed first in their respective sections so that the respondent was reacting first to the "abstract concept" of travel rather than travel tied to a particular type of activity *or* mode), have the same problem. The fact that respondents could like, and want more of (or not want to decrease), "generic" travel, is telling.

While the results for Subjective Mobility are more complex than those for Travel Liking, they also support our hypothesis overall. We further found, consistent with expectation, that respondents' subjective assessments of their amounts of travel more strongly influenced their Relative Desired Mobility than did their actual (reported) amounts of travel.

In addition, we identified a number of general types of effects on Relative Desired Mobility: complementarity, competing preference, substitution, saturation, relative mobility deprivation, insatiability, and family-related travel. These recurring themes provide a general conceptual basis from which to view the impacts of specific variables.

Overall, the results of this study provide a better understanding of the demand for travel, and the response to policies or trends affecting that demand. Especially in transportation planning and policymaking, the relationships of Travel Liking and Subjective Mobility to Relative Desired Mobility in this study have important implications for the forecasts of revealed and latent travel demand based on current mobility patterns. Also, the identified general types of effects on

Relative Desired Mobility can give transportation policy makers an insight into key principles that affect individual travel demand. Further analysis of this data set will focus on the development of simultaneous equations models to represent the multiple interrelationships of cause and effect found among the variables analyzed here.

ACKNOWLEDGEMENTS

This research was funded by the DaimlerChrysler Corporation and the University of California Transportation Center. The contributions of Xinyu Cao and Michael Clay to the models' interpretations are gratefully acknowledged. The comments of three anonymous referees have improved the paper.

REFERENCES

Cao X & Mokhtarian PL (2003) *Modeling the Individual Consideration of Travel-Related Strategies*. Institute of Transportation Studies, University of California, Davis, Publication No. UCD-ITS-RR-03-3. Available on the Internet at www.its.ucdavis.edu/publications/2003/RR-03-3.pdf.

Choo S & Mokhtarian PL (2004) What type of vehicle do people drive? The role of attitude and lifestyle in influencing vehicle type choice. *Transportation Research A* **38(3)**: 201-222.

Choo S, Collantes GO, & Mokhtarian PL (2001) *Modeling Individual's Relative Desired Travel Amounts.* Institute of Transportation Studies, University of California, Davis, Publication No. UCD-ITS-RR-01-13. Available on the Internet at http://its.ucdavis.edu/publications/2001/RR-01-13.pdf.

Clay MJ & Mokhtarian PL (2002) *The Adoption and Consideration of Commute-Oriented Travel Alternatives*. Institute of Transportation Studies, University of California, Davis, Publication No. UCD-ITS-RR-02-04. Available on the Internet at www.its.ucdavis.edu/publications/2002/RR-02-04.pdf.

Collantes GO & Mokhtarian PL (2002) *Determinants of Subjective Assessments of Personal Mobility*. Institute of Transportation Studies, University of California, Davis, Publication No. UCD-ITS-RR-02-11. Available on the Internet at www.its.ucdavis.edu/publications/2002/RR-02-11.pdf.

Curry RW (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 on the Internet at http://its.ucdavis.edu/publications/2000/rr-00-06.pdf.

Greene WH (1995) *LIMDEP Version 7.0 User's Manual*. Bellport, NY: Econometric Software.

Hupkes G (1982) The law of constant travel time and trip-rates. *Futures* **14**: 38-46.

Jones PM (1978) Destination choice and travel attributes. In: Hensher D & Dalvi Q (eds.), *Determinants of Travel Choice* (pp. 266-311). New York: Praeger.

Kennedy P (1998) *A Guide to Econometrics, 4th ed.*. Cambridge, Mass.: MIT Press.

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

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

Mokhtarian PL & Salomon I (2001) How derived is the demand for travel? Some conceptual and measurement considerations. *Transportation Research A* **35(8)**: 695-719.

Ory DT, Mokhtarian PL, Salomon I, Redmond LS, Collantes GO, and Choo S (forthcoming) When is commuting desirable to the individual? Special issue of *Growth and Change* on Advances in Commuting Studies, eds. Peter Nijkamp and Jan Rouwendal.

Redmond LS (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. Available on the Internet at http://its.ucdavis.edu/publications/2000/RR-00-08.pdf.

Redmond LS & Mokhtarian PL (2001) The positive utility of the commute: Modeling ideal commute time and relative desired commute amount. *Transportation* **28(2)**: 179-205.

Reichman S (1976) Travel adjustments and life styles – A behavioral approach. In: Stopher PR & Meyburg AH (eds.), *Behavioral Travel-Demand Models* (pp. 143-152). Lexington, MA: Lexington Books.

Salomon I & Mokhtarian PL (1998) What happens when mobility-inclined market segments face accessibility-enhancing policies? *Transportation Research D* **3(3)**: 129-140.

Schwanen T & Mokhtarian PL (forthcoming) The extent and determinants of dissonance between actual and preferred residential neighborhood type. *Environment and Planning B*.

Stradling SG, Meadows ML, & Beatty S (2000) Helping drivers out of their cars: Integrating transport policy and social psychology for sustainable change. *Transport Policy* **7**: 207-215.

Veall MR & Zimmermann KF (1992) Pseudo-R^2 in the ordinal probit model. *Journal of Mathematical Sociology* **16(4)**: 333-342.

LIST OF TABLES AND FIGURE

Notes on contributors

Sangho Choo is a Ph.D. candidate in Civil and Environmental Engineering, and a graduate student researcher at the Institute of Transportation Studies of the University of California, Davis. His research focuses on transportation planning, and travel behavior toward information and communications technology.

Gustavo O. Collantes is a Ph.D. candidate in Transportation Technology and Policy, and a graduate student researcher at the Institute of Transportation Studies of the University of California, Davis. His research interests include transportation policy, travel behavior, land use and transportation, and telecommunications-transportation interactions.

Patricia L. Mokhtarian is Professor of Civil and Environmental Engineering and Associate Director of the Institute of Transportation Studies at the University of California, Davis. She specializes in the study of travel behavior.

Table 1: Socio-demographic Characteristics of the Sample

Category	Frequency	Percent
Neighborhood (N=1,357)		
Concord (suburban)	318	23.4%
Pleasant Hill (suburban)	369	27.2%
North San Francisco (urban)	670	49.4%
Gender (N=1,351)		
Female	691	51.1%
Male	660	48.9%
Employment status (N=1,357)		
Full-time worker	1,140	84.0%
Part-time worker	217	16.0%
Age (N=1,356)		
18-23	44	3.2%
24-40	584	43.1%
41-64	685	50.5%
> 65	43	3.2%
Personal income (N=1,326)		
< $15,000	96	7.2%
$15,000-34,999	282	21.3%
$35,000-54,999	405	30.5%
$55,000-74,999	241	18.2%
$75,000-94,999	132	10.0%
> $95,000	170	12.8%
Number of personal vehicles in HH (N=1,352)		
0	71	5.3%
1	456	33.7%
2	537	39.7%
3 or more	288	21.3%

Table 2: Summary of Effects on Relative Desired Mobility

	SHORT DISTANCE (SD)					LONG DISTANCE (LD)				
	Overall	**Commute***	**Work/School**	**Entertainment**	**Personal Vehicle**	**Overall**	**Work/School**	**Entertainment**	**Personal Vehicle**	**Airplane**
N	1283	1155	1208	1348	1268	1338	1336	1345	1336	1305
R^2_{MZ}	0.366	N.A.	0.334	0.237	0.454	0.342	0.444	0.400	0.348	0.433
EXPLANATORY VARIABLE										
Objective Mobility										
Frequency of commute (SD)	–				–					
Frequency of work/school-related travel (SD)	–									
Frequency of travel going to eat a meal (SD)	+				–		+			+
Frequency of travel taking others where they need to go (SD)										–
Weekly miles in BART (SD)									+	
Total weekly miles (SD)		+								
Weekly miles commuting (SD)	–	–					–			
Weekly miles work/school-related (SD)		–								
Weekly miles to eat a meal (SD)							+			
Weekly miles taking others where they need to go (SD)									–	
Commute time		–								
Distance to work					–				–	
Excess commute	–				–					
Sum of natural log of miles for each work/school-related trip (LD)						–	–			
Miles for work/school/entertainment by personal vehicle (LD)					+					
Miles for work/school/entertainment by airplane (LD)										–
Subjective Mobility										
Overall (SD)	–									
Commuting (SD)		–								
Work/school-related (SD)			–							
Entertainment/recreation/social (SD)			+	–						
Personal vehicle (SD)					–					
Bus (SD)					+					
Train/BART/light rail (SD)					+		+			
Walking/jogging/bicycling (SD)				+	+	+				
Grocery shopping (SD)	+									
Taking others where they need to go (SD)									+	+
Overall (LD)						–	–		–	–
Work/school-related (LD)						–	–			–
Entertainment/recreation/social (LD)						+			+	

(Table 2 continued)

	SHORT DISTANCE (SD)					LONG DISTANCE (LD)				
	Overall	**Commute***	**Work/School**	**Entertainment**	**Personal Vehicle**	**Overall**	**Work/School**	**Entertainment**	**Personal Vehicle**	**Airplane**
Travel Liking										
Overall (SD)	+							–	–	
Commuting (SD)		+								
Work/school-related (SD)	+		+				+			
Entertainment/recreation/social (SD)			–	+				+		+
Grocery shopping (SD)				–			–			
Taking others where they need to go (SD)						–		–		–
Personal vehicle (SD)					+				+	
Train/BART/light rail (SD)					–					
Walking/jogging/bicycling (SD)					–					
Overall (LD)		–				+		+		
Work/school-related (LD)	+		+				+			
Entertainment/recreation/social (LD)				+		+		+	+	+
Personal vehicle (LD)				+	+		–		+	–
Airplane (LD)						+	+			+
General Travel Attitudes										
Pro-environmental solutions factor					–					
Commute benefit factor	+	+	+		+			–		
Travel dislike factor						–		–		
Pro-high density factor							+			
Lifestyle										
Frustrated factor score			+	+	+	+				
Status seeker factor score	+	+		+	+				+	+
Family & community-oriented factor score	–						–	+		+
Workaholic factor score		+								
Personality										
Adventure seeker factor score										+
Organizer factor score						–		–		–
Entertainment/recreation/social (LD)						+			+	
Excess Travel										
Excess travel indicator									+	
Frequency of travel by a longer route to experience more of the surroundings		–								
Mobility Constraints										
Percent of time a vehicle is available	–				–				–	
Limitations on taking public transportation					+					

(Table 2 continued)

	SHORT DISTANCE (SD)					LONG DISTANCE (LD)				
	Overall	**Commute***	**Work/School**	**Entertainment**	**Personal Vehicle**	**Overall**	**Work/School**	**Entertainment**	**Personal Vehicle**	**Airplane**
Socio-demographics										
Female				+		+				
Age			–	+			–	–		
Number of people in the household				+				–		–
Number of workers in the household								+		+
Number of adults in the household		+								
Number of children in the household										+
Number of people under 6 years old in the household									–	
Number of people 6-15 years old in the household								+		
Number of people 75 years old and older			+							
Someone other than preschoolers needs special care			–							
Manager or professional (occupational)			+							
Sales (occupational)				–						
Personal income category										–
Urban	–			+	–	+		+		
Year of personal vehicle			+							
Vehicle type mid-size or sports			+							
Vehicle type is van/minivan		–								
Threshold Parameters										
μ_1	1.159	N.A.	0.577	1.335	0.975	1.506	1.323	1.569	1.351	1.693
μ_2	3.377	N.A.	3.606	3.487	3.387	3.069	3.506	3.096	3.376	3.152
μ_3	5.016	N.A.	4.893	5.033	4.872	3.960	4.768	3.924	4.475	4.113

Notes:

* This model is summarized from Redmond and Mokhtarian (2001), for completeness.

A shaded cell indicates the Subjective Mobility and Travel Liking variables significant in the corresponding Relative Desired Mobility model.

Care must be taken in the interpretation of the threshold parameters because LIMDEP allows only for right censoring, whereas our original model involved left censoring. To estimate the model, we reversed the RDM variable by subtracting each observed value from 4. For ease of interpretation, we reversed the resulting signs on the β coefficients in the table above, so that a positive coefficient indicates a higher value of RDM as in our original specification. We did not alter the LIMDEP-generated estimates of μ, however, 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.

Table 3: Types of Effects on Relative Desired Mobility

Effect	Explanatory Variable (direction of effect)	Relative Desired Mobility Variable
Comple-mentarity	Miles by personal vehicle (LD) (+)	Personal Vehicle (SD)
	Frequency of travel to eat a meal (SD) (+)	Overall (SD)
		Work/School-Related (LD)
		Airplane (LD)
	Weekly miles to eat a meal (SD) (+)	Work/School-Related (LD)
	Travel Liking overall (LD) (+)	Entertainment/Recreation/ Social (LD)
	Travel Liking work/ school-related (SD) (+)	Work/School-Related (LD)
	Travel Liking entertainment/recreation/social (SD) (+)	Entertainment/Recreation/ Social (LD)
		Airplane (LD)
	Travel Liking personal vehicle (SD) (+)	Personal Vehicle (LD)
	Travel Liking work/ school-related (LD) (+)	Work/School-Related (SD)
	Travel Liking entertainment/recreation/social (LD) (+)	Entertainment/ Recreation/Social (SD)
	Travel Liking personal vehicle (LD) (+)	Personal Vehicle (SD)
Competing Preferences	Travel Liking entertainment/recreation/social (SD) (-)	Work/School-Related (SD)
	Someone (other than preschoolers) needing special care (-)	Work/School-Related (SD)
	Family/community-oriented (-)	Work/School-Related (LD)
	Travel Liking chauffeuring (SD) (-)	Overall (LD)
		Entertainment/Recreation/ Social (LD)
		Airplane (LD)
	Weekly miles chauffeuring (SD) (-)	Personal Vehicle (LD)
	Frequency chauffeuring (SD) (-)	Airplane (LD)
	Travel Liking personal vehicle (LD) (-)	Work/School-Related (LD)
Substitu-tion	Subjective Mobility for bus (SD) (+)	Personal Vehicle (SD)
	Subjective Mobility for train/BART/light rail (SD) (+)	Personal Vehicle (SD)
	Subjective Mobility for walking/jogging/ bicycling (SD) (+)	Personal Vehicle (SD)
	Travel Liking grocery shopping (SD) (-)	Entertainment/Recreation/ Social (SD)
	Travel Liking train/ BART/light rail (SD) (-)	Personal Vehicle (SD)
	Travel Liking walking (SD) (-)	Personal Vehicle (SD)
	Travel Liking overall (SD) (-)	Entertainment/Recreation/ Social (LD)
		Personal Vehicle (LD)
	Travel Liking personal vehicle (LD) (-)	Airplane (LD)
	Sales occupation (-)	Entertainment/Recreation/ Social (SD)
	Organizer (-)	Entertainment/Recreation/ Social (LD)
	Weekly miles commuting (SD) (-)	Work/School-Related (LD)
	Subjective Mobility overall (LD) (-)	Work/School-Related (LD)
	Commute distance (-)	Personal Vehicle (LD)

(Table 3 continued)

Effect	Explanatory Variable (direction of effect)	Relative Desired Mobility Variable
Saturation	Weekly miles commuting (SD) (-)	Commute (SD)
	Commute time (-)	Commute (SD)
	Commute distance (-)	Personal Vehicle (SD)
		Personal Vehicle (LD)
	Excess commute (-)	Personal Vehicle (SD)
	Frequency of commute (-)	Overall (SD)
		Personal Vehicle (SD)
	Sum of logs of miles for each trip (LD) (-)	Overall (LD)
	Miles for work/school/ entertainment by airplane (LD) (-)	Airplane (LD)
	Subjective Mobility overall (SD) (-)	Overall (SD)
	Subjective Mobility commuting (SD) (-)	Commute (SD)
	Subjective Mobility work/school-related (SD) (-)	Work/School-Related (SD)
	Subjective Mobility entertainment/recreation/ social (SD) (-)	Entertainment/Recreation/ Social (SD)
	Subjective Mobility personal vehicle (SD) (-)	Personal Vehicle (SD)
	Subjective Mobility overall (LD) (-)	Overall (LD)
	Subjective Mobility work/school-related (LD) (-)	Work/School-Related (LD)
	Organizer (-)	Overall (LD)
		Entertainment/Recreation/ Social (LD)
		Airplane (LD)
	Weekly miles chauffeuring (SD) (-)	Personal Vehicle (LD)
	Urban dummy variable (+)	Overall (LD)
	Family/community-oriented (-)	Overall (SD)
		Work/School-Related (LD)
Relative Mobility Deprivation	Household size (+)	Entertainment/Recreation/ Social (SD)
	Miles by personal vehicle (LD) (+)	Personal Vehicle (SD)
	Percentage of time a personal vehicle is available (-)	Personal Vehicle (SD)
		Personal Vehicle (LD)
	Physical/anxiety limitations on taking public transportation (+)	Personal Vehicle (SD)
	Weekly miles by train/BART/ light rail (SD) (+)	Personal Vehicle (LD)
	Subjective Mobility chauffeuring (SD) (+)	Personal Vehicle (LD)
		Airplane (LD)
Insatiability	Travel Liking entertainment/recreation/social (LD) (+)	Entertainment/Recreation/ Social (LD)
	Excess Travel indicator (+)	Personal Vehicle (LD)
	Adventure seeker (+)	Airplane (LD)
	Urban dummy variable (+)	Overall (LD)
		Entertainment/Recreation/ Social (LD)
Family Related Travel	Family/community-oriented (+)	Entertainment/Recreation/ Social (LD)
		Airplane (LD)
	Number of workers in the household (+)	Entertainment/Recreation/ Social (LD)
		Airplane (LD)
	Number of household members between 6 and 15 years old (+)	Entertainment/Recreation/ Social (LD)
	Number of children in the household (+)	Airplane (LD)
	Number of people in household (-)	Entertainment/Recreation/ Social (LD)
		Airplane (LD)

Note: SD = Short distance, LD = Long distance.

Figure 1: Distribution of Relative Desired Mobility (N=1,357)