MODELING THE INDIVIDUAL CONSIDERATION OF TRAVEL-RELATED STRATEGIES

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EXECUTIVE SUMMARY

This report is one of a series of research documents produced by an ongoing study of individuals' adoption and consideration of travel-related strategies in response to congestion.

It is widely recognized that congestion has serious consequences for sustainable development. Governments have been adopting a wide range of measures to alleviate congestion. However, the limited effectiveness of these strategies has been puzzling policy makers. The gap between policy assumptions and individuals' behaviors is believed to greatly affect the effectiveness of such strategies. Also, the dynamic nature of individuals' response to congestion further exacerbates the discrepancy between assumption and reality. Therefore, the primary goal of this report is to develop disaggregate discrete choice models for the consideration of travel-related strategies and examine any patterns emerging across the models, in order to better understand the determinants of individuals' consideration of each strategy, to improve predictions of the effectiveness of proposed policies, and to help design more effective policies. In so doing we also explore the relationship between the earlier adoption of a strategy and its reconsideration, helping us to further understand the dynamic nature of individuals' behavioral response to congestion.

The data for this series of studies come from a 1998 mail-out/mail-back survey of 1,904 residents in three neighborhoods in the San Francisco Bay Area: Concord and Pleasant Hill representing two different kinds of suburban neighborhoods comprising about half the sample, and an area defined as North San Francisco representing an urban neighborhood comprising the remainder. The questions in the survey were classified into 11 categories of variables: objective mobility, subjective mobility, relative desired mobility, travel liking, travel attitudes, personality, lifestyle, excess travel, adoption and consideration of travel-related strategies, mobility constraints, and demographic characteristics. For this study, we chose to focus on commuting workers since they contribute most heavily to peak-period congestion, and are likely to be the most active in the adoption and consideration of travel-related strategies; the subset of 1283 cases that consists of commuting workers with relatively complete responses to key questions is used in this analysis. Binary logit models were developed for the consideration of each individual travel-related strategy. Each dependent variable, consideration of the given strategy, was defined as a binary variable, and the other variables were viewed as potential explanatory variables. Generally, the significance level 0.05 was used to incorporate or release variables in the final "best" model.

Specifically, based on our initial expectations, we developed binary logit models for the consideration of each of 16 individual travel-related strategies, which can be conceptually categorized as low-cost (in the generalized sense) travel maintaining/increasing, medium-cost travel reducing, and high-cost location/lifestyle change (see Table ES-1). Except for the model of consideration of changing from driving alone to some other means, which is based on personal vehicle/motorcycle commute mode users, all other models presented in this summary are estimated on the full sample (for some strategies, the full report includes additional models estimated only on non-adopters of those strategies, for reasons explained in Section 3.1). Table ES-1 (Table 32 in the text) summarizes the variables significant in each model, with positive and negative signs indicating the direction of effect for each variable. ρ^2 and adjusted ρ^2 are used to measure the goodness of fit of these models. The ρ^2 s range from 0.183 for the

model of consideration of getting a better car, to 0.628 for the model of consideration of "Move your home closer to work". The adjusted ρ^2 s for the models range from 0.158 to 0.615. Since the market shares (MSs) for several of the strategies were quite unbalanced, in those cases the MS ρ^2 was already rather high. To measure the explanatory contribution of the true variables to the models, we re-estimated the final models with the constant term fixed to zero and computed the ρ^2 s again. The comparison between ρ^2 s for models with and without the constant term shows that the true variables in the model always account for at least 87% of the information explained by the full model, and carry at least 95% of the explanatory power of the model in more than half of the cases. Thus, even when the statistical achievement of the full model does not appear to be great compared to the MS model, its contribution to an understanding of the relevant behavioral mechanisms can be substantial.

The key results of this report are as follows:

Objective mobility: Objective mobility variables are generally positively associated with the consideration of the travel-related strategies presented in this study. The more an individual travels for short distance, the more likely she is to consider the low-cost travel-maintaining/increasing strategies. Whether the large amount of short-distance travel is by necessity or by choice, the low-cost travel-maintaining/increasing strategies offer appealing options for making that travel more pleasant or productive. While both frequency and distance of short-distance travel influence the consideration of the lower-cost strategies, it is logically enough not the frequency but the distance of short-distance travel that has a more important impact on the consideration of the medium- or high-cost travel-reduction strategies.

Subjective mobility: Generally, short-distance subjective mobility variables are positively associated with the consideration of the travel-related strategies. The effect of subjective mobility on the consideration of the travel-related strategies is quite similar to that of objective mobility.

Relative desired mobility: The negative association of the relative desired mobility variables with the consideration of the travel-maintaining/increasing strategies was counter to our initial expectation (see Section 2.3): we thought that the more people want to increase their travel, the more likely they would be to consider strategies that support traveling equal or greater amounts. Instead, these strategies appear to be more desirable to those who want to *decrease* their travel, as a way of making their undesired (but perhaps necessary) current travel more palatable. On the other hand, both effects may be at work and cancel each other out in many cases, which may explain why only a few relative desired mobility variables are significant in this group of models. By contrast, the effects of the relative desired mobility variables on the consideration of the travel-reducing and major location/lifestyle change strategies are bi-directional; that is, they may positively or negatively affect the consideration. However, the positive coefficients of these variables indicate competing preferences – the adoption of the strategies in these two bundles would decrease the amount of commute travel, so as to be able to increase the amount of time devoted to the desired activity/travel. Worth noting is that individuals wanting *less* commuting are *more* likely to seek medium- and high-cost adjustments (telecommuting, residential and employment relocation in this case) to reduce the commute.

Travel liking: Liking short-distance travel for entertainment and liking long-distance travel overall increase the probability of considering the travel-maintaining/increasing strategies. In general, however, the relative absence of travel liking variables from these models is noteworthy. In some cases effects in opposite directions may be counteracting each other; in other cases the effects of travel liking may be captured by related variables that *are* in the models.

Travel attitudes, personality and lifestyle: The attitude, personality and lifestyle factors that most commonly, and positively, affect the consideration of the travel-related strategies are pro-environmental solutions (attitude), adventure seeker (personality) and frustrated (lifestyle). Individuals advocating environmental protection are more likely than others to consider reducing their commute and/or minimizing solo driving to decrease their personal energy consumption and impacts on the environment. Also, they are more likely to consider getting a fuel efficient car to decrease their fuel consumption. The adventure seeker factor score has a positive impact on the consideration of several different strategies in all three conceptual categories. The excess travel indicator, which captures many of the characteristics of the adventure seeker factor, is significant and positive for a seventh strategy. The frustrated factor score is significant in five models. Individuals who are frustrated may view travel-related strategies as potentially one way to increase their control and/or life satisfaction.

Mobility constraints: Mobility constraints increase the probability of considering the travel-related strategies in all three conceptual bundles. It is noteworthy that limitations on driving during the day and vehicle availability are each significant in four models, and that these two constraints are more likely to affect the consideration of the workstyle adjustments. This suggests that a desire to shorten the commute is an important motivation for individuals with such constraints to consider these travel-related strategies.

Demographics: Age-related variables (age category and years lived in the U. S.) appear most commonly in the models. Their generally negative effects indicate that older people are less likely to consider most of these strategies. In these models, year of personal vehicle is only (and, logically, negatively) associated with the auto improvement strategies. Individuals having dependent care are more inclined to acquire more temporal and/or spatial flexibility to better provide the necessary care. Higher personal and household incomes either directly or indirectly have a positive impact on the consideration of travel-related strategies.

Former adoption of travel-related strategies: Apart from "Change jobs closer to home", the former adoption of each of the remaining 15 individual strategies significantly affects the consideration of the same strategy, as shown by the shaded cells in Table ES-1. On one hand, among the 15 strategies, the former adoption of getting a mobile phone, getting a better car, and getting a fuel efficient car are negatively associated with their respective reconsiderations, implying that the former adoption is still in force and the individual is enjoying the utility of such an adoption. On the other hand, the former adoption of each of the other 12 strategies has a positive impact on its reconsideration. Either the individual is enjoying and still wants to enjoy the benefits from the former adoption, or such strategies are attractive again as circumstances change. Given that these strategies are adopted once, it is natural that they would be adopted repeatedly over a person's working life. Whenever time since adoption of a strategy is significant to the reconsideration of the same strategy (specifically, for the five strategies C, D, F, G, and O), it appears with the opposite sign to that of the binary former adoption variable,

meaning reinforcement rather than counteraction of the former adoption variable. In addition, the effects of three pairs of former adoption variables on the consideration of another strategy (specifically, the binary adoption and time since adoption of strategies F on C, M on D, and G on I) follow the same pattern as those of former adoption variables on the consideration of the same strategy, indicating that the adoption of one strategy is more likely to trigger the consideration of the other related strategy in the short term. As shown in the off-diagonal blocks of Table ES-2 (Table 33 in the text), when the former adoption of a strategy is significant, its dominant effect on the consideration of another strategy is positive: the former adoption of strategy *i* increases the probability of considering strategy *j*. Table ES-3 (Table 34 in the text) summarizes the effects of prior adoption, with the strategies grouped according to empirical similarities (see Section 2.2.2). It shows that complementary effects are obviously exhibited in the home-based work bundle. The former adoption of each of the strategies in the alter employment bundle does not affect the consideration of any other strategies studied here, suggesting that working part-time and quitting work are likely to be the most radical and exhaustive changes to cope with congestion. Although not as radical, mode change strategies are also isolated in their nearly complete lack of influence on the consideration of other strategies (with the exception, ironically, that changing to driving alone has a negative influence on the consideration of changing to part-time work). Although the former adoption of changing jobs closer to home does not significantly affect its reconsideration, it frequently appears with a positive coefficient in models of the consideration of other strategies; conversely, the former adoption of "Move your home closer to work", which is in the same bundle as the employment relocation, is only significant in the model of its own reconsideration. This may imply that, in contrast to a new residential location, some aspects of a new job (*e. g.* a higher salary, increased flexibility) offer individuals an opportunity to seek other kinds of changes, which, of course, may not only be for transportation reasons.

Overall, the key findings provide evidence in support of most of our initial hypotheses. A more detailed comparison of some of these hypotheses and results is summarized in Table ES-4 (Table 35 in the text). Although a few unexpected relationships emerged and there are cases in which our findings failed to support some hypotheses, the results were generally consistent with our prior expectations.

In conclusion, the consideration of travel-related strategies is affected not only by the amounts of travel that individuals actually did, but also by their subjective assessments, desires, and affinities with respect to travel. This study helps us further understand the influences of these mobility-related variables on the consideration of each strategy. However, the effects of objective mobility, subjective mobility, relative desired mobility and travel liking are always intertwined in individuals' choice processes, which contributes to the substantial diversity of their responses. Further, since it is objective mobility that is often the basis of public policy, these relationships imply that individuals may not respond to public policies designed to adjust their behaviors in the way that policy makers expected. An individual's travel attitudes, personality, and lifestyle play an important role in her consideration of travel-related strategies. The frequent appearances of these factors further illustrate how different people respond to congestion, and hence provide helpful information to better understand individuals' diverse behaviors. However, it is difficult for policy makers to acquire such information for various reasons. An individual's past experience greatly affects her consideration of travel-related strategies. In the current study, there is evidence that (1) the former adoption of a strategy, and sometimes the time since adoption as well, has an important impact on the consideration of the

same strategy, with a positive association dominating; and (2) the adoption of one strategy sometimes triggers the consideration of another related change *in the short term*. These findings suggest that the effectiveness of public policies is impacted by individuals' past experiences. Finally, demographic characteristics may affect the response to public policies.

The single key theme that underlies the results of this study is that individuals' responses to the travel-related strategies analyzed here – many of them directly tied to public policies intended to reduce vehicle travel – are influenced by a large variety of qualitative and experiential variables that are seldom measured and incorporated into demand models. Although there are challenges associated with that measurement and incorporation, those challenges are not insurmountable. Devoting further efforts to understanding the role of these attitudinal, personality, lifestyle, and experience variables will improve our ability to design effective policies and to accurately forecast the response to policy interventions as well as natural trends.

Table ES-1. Summary of the Individual Models (grouped by conceptual bundles)

Dependent Variable / Goodness-of-fit	Travel maintaining/increasing (Low cost)							Travel reducing (Medium cost)				Major location/lifestyle change (high cost)				
	A. Buy a car stereo system	B. Get a mobile phone	C. Get a better car	D. Get a fuel efficient car	E. Change work trip departure time	F. Hire somebody to do house or yard work	G. Adopt flextime	H. Adopt compressed work week	I. Change from driving alone to other means	K. Buy equipment to help work from home	L. Telecommute	M. Change jobs closer to home	N. Move your home closer to work	O. Work part- instead of full-time	P. Start home-based business	Q. Retire or stop working
N	1172	1263	1118	1155	1265	1238	1278	1278	987	1206	1253	1254	1269	1279	1277	1234
MS ρ^2	0.385	0.124	0.039	0.132	0.332	0.219	0.388	0.476	0.443	0.211	0.265	0.302	0.554	0.327	0.318	0.415
ρ^2	0.450	0.202	0.183	0.229	0.438	0.319	0.477	0.547	0.571	0.381	0.430	0.440	0.628	0.403	0.451	0.510
ρ^2 (without the constant term)	0.450	0.191	0.167	0.220	0.415	0.298	0.435	0.510	0.565	0.360	0.418	0.440	0.614	0.354	0.446	0.468
Adjusted ρ^2	0.432	0.184	0.158	0.208	0.421	0.304	0.464	0.534	0.543	0.363	0.414	0.427	0.615	0.392	0.434	0.492
Explanatory Variable																
Objective Mobility																
Frequency of commuting (SD)					+											
Frequency of work/school-related travel (SD)		+														
Frequency of grocery shopping travel (SD)		+			+											
Frequency of entertainment travel (SD)	+															
Frequency of travel taking others where they need to go (SD)		+														

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Frequency of other purpose travel (SD)	+															
Weekly miles in a bus (SD)					+							+				
Weekly miles in a train/BART/light rail (SD)	-															
Total weekly miles (SD)		+		+												
Weekly miles of commuting (SD)								+								
Weekly miles of grocery shopping travel (SD)		-														
Weekly miles to eat a meal (SD)		+	+							+						
Weekly miles of entertainment travel (SD)						+			+							
Weekly miles of travel taking others where they need to go (SD)		-														
Commute time					+											
Commute distance												+				
Number of trips by personal vehicle (LD)										+						
Number of trips by other means (LD)												+				
Sum of log of miles for each trip by personal vehicle (LD)													-			
Sum of log of miles for each trip by air (LD)	-	+														
Log total miles by personal vehicle (LD)											+					
Subjective Mobility																
Commute (SD)							+	+								
Travel for grocery shopping (SD)	+											+				
Travel for eating a meal (SD)															-	
Travel for entertainment (SD)		+														+
Take others where they need to go (SD)			+		+											
Travel by personal vehicle (SD)		+							+							
Travel by train/BART/light rail (SD)				-												
Travel by personal vehicle (LD)				+												
Relative Desired Mobility																
Overall (SD)	-				-											
Commute (SD)											-	-	-			
Work/school-related travel (SD)									-	+						
Travel for grocery shopping (SD)						-										
Travel for eating a meal (SD)												+				
Take others where they need to go (SD)															+	
Travel by bus (SD)			-						+							
Travel by walking/jogging/bicycling (SD)													+			
Travel by air (LD)								+				-				
Travel Liking																
Travel for eating a meal (SD)									+							
Travel for entertainment (SD)			+	+	+											
Travel by personal vehicle (SD)									-							
Travel by train/BART/light rail (SD)															-	

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Overall (LD)			+	+												
Work/school-related travel (LD)																-
Travel for entertainment (LD)																+
Attitudes																
Pro-environmental solutions factor score				+			+	+	+	+				+	+	
Commute benefit factor score					-											
Travel stress factor score												+			+	
Pro-hi density factor score			-	-												
Personality																
Adventure seeker factor score	+				+		+			+	+				+	
Loner factor score									-							-
Calm factor score									-							
Lifestyle																
Frustrated factor score			+	+						+			+		+	
Family & community-oriented factor score								+						+		
Status seeker factor score				-		+										
Workaholic factor score					+											
Excess Travel																
Excess travel indicator													+			
Mobility Constraints																
Limitations on driving during the day	+									+	+					+
Limitations on driving on the freeway		+														
Limitations on flying in an airplane					+						+					
Limitations on riding a bicycle					+									+	+	
Percent of time a vehicle is available							-			-	-				-	
Demographics																
North San Francisco													-			
Time living in the neighborhood									+							
Age	-	-														+
Years lived in the U.S.			-		-	+			-	-	-	-				+
Female	-					+										
Number of vehicles in the household								-	-					+		+
Year of personal vehicle	-		-	-												
Total workers in the household													+			
Household size																-
Anyone in the household needing special care		+					+						+		+	+
Household with single adult			-	-						+						
Household with two or more adults											-					
Household with two or more adults & children							+									
Sales occupation								-								

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Demographics																
Service/repair occupation	+															
Clerical/administrative support occupation														+		
Production/construction/craft occupation						-										
Manager/Administrator occupation											+					
Professional/technical occupation											+					
Full-time worker							+	+			+					
Household income category																+
Personal income category			+			+										
Vehicle type is pickup										+						
Vehicle type is small			+	+												
Strategy Adoption																
Buy a car stereo system	+	+														
Get a mobile phone		-							-							-
Get a better car			-			+										+
Time since getting a better car			+													
Get a fuel efficient car				-												
Time since getting a fuel efficient car				+												
Change work trip departure time					+							+				
Hire somebody to do house or yard work			+			+						-				
Time since hiring domestic help			-			-		-							-	
Adopt flextime							+		+							
Time since adopting flextime							-		-							
Adopt compressed work week	+							+								
Time since adopting compressed work week									+							
Change from driving alone to some other means									+							
Change from another means to driving alone									+					-		
Squared time since changing to driving alone			+													
Buy equipment to help work from home										+	+		+		+	
Telecommute											+					
Change jobs closer to home			+	+			+	+		+					+	
Time since changing jobs closer to home				-												
Move your home closer to work													+			
Work part- instead of full-time														+		
Time since working part-time														-		
Start home-based business						+				+					+	
Retire or stop working																+
Time since retiring or stopping working														+		

SD = Short Distance LD = Long Distance

Table ES-2. Relationships between Former Adoption and Current Consideration of Strategies (grouped by conceptual bundles)

Former Adoption \ Current Consideration	Travel maintaining/increasing (Low cost)							Travel reducing (Medium cost)				Major location/lifestyle change (high cost)				
	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
A. Buy a car stereo system	+	+														
B. Get a mobile phone		-							-							-
C. Get a better car			-			+										+
D. Get a fuel efficient car				-												
E. Change work trip departure time					+							+				
F. Hire somebody to do house or yard work			+			+						-				
G. Adopt flextime							+		+							
J. Change from another means to driving alone									+					-		
H. Adopt compressed work week	+							+								
I. Change from driving alone to some other means									+							
K. Buy equipment to help work from home										+	+		+		+	
L. Telecommute											+					
M. Change jobs closer to home			+	+			+	+		+					+	
N. Move your home closer to work													+			
O. Work part- instead of full-time														+		
P. Start home-based business						+				+					+	
Q. Retire or stop working																+

Table ES-3. Relationships between Former Adoption and Current Consideration of Strategies (grouped by factor-based bundles)

Former Adoption \ Current Consideration	Auto Improvement			Mobile Phone	Work Schedule Change			Hire Domestic Help	Mode Change	Home-based Work			Relocation		Alter Employ-ment	
	A	C	D	B	E	G	H	F	I	K	L	P	M	N	O	Q
A. Buy a car stereo system	+			+												
C. Get a better car		-						+								+
D. Get a fuel efficient car			-													
B. Get a mobile phone				-					-							-
E. Change work trip departure time					+								+			
G. Adopt flextime						+			+							
H. Adopt compressed work week	+						+									
F. Hire somebody to do house or yard work		+						+					-			
I. Change from driving alone to some other means									+							
J. Change from another means to driving alone									+						-	
K. Buy equipment to help work from home										+	+	+		+		
L. Telecommute											+					
P. Start home-based business								+		+		+				
M. Change jobs closer to home		+	+			+	+			+		+				
N. Move your home closer to work														+		
O. Work part- instead of full-time															+	
Q. Retire or stop working																+

Table ES-4. Summary of Hypotheses and Results

Variable type	General hypotheses	Results
Objective mobility	(1) The more individuals travel, the more likely they would be to consider all travel-related strategies, including the travel-maintaining/increasing ones.	(1) Our findings support this hypothesis.
Subjective mobility	(1) A higher subjective mobility is positively associated with the consideration of a wide range of travel-related strategies.	(1) Our findings support this hypothesis, similarly to objective mobility.
Relative desired mobility	Individuals having a higher relative desired mobility are (1) more likely to consider travel-maintaining/increasing strategies, and (2) less likely to consider travel-reducing and major location/lifestyle change strategies.	(1) Our findings are counter to this hypothesis, indicating that these strategies are more favored by those wanting to decrease their travel (perhaps to lighten the burden of undesired but necessary travel); (2) Our findings provide some support for this hypothesis. However, competing preferences may affect the direction of an individual's consideration (*e.g.*, those wanting more travel are more inclined to consider commute-reduction strategies).
Travel liking	The more individuals like travel, (1) the more likely they would be to consider travel-maintaining/increasing strategies, and (2) the less likely they would be to consider travel-reducing and major location/lifestyle changing strategies.	(1) Our findings provide some support for this hypothesis; (2) Our findings do not strongly support this hypothesis, perhaps again due to competing preferences.
Travel attitudes	(1) Individuals with attitudes favoring travel would be more likely to consider travel-maintaining/increasing strategies, while (2) those with attitudes not favoring travel would be more likely to consider travel-reducing and major location/lifestyle change strategies.	(1)(2) Our findings provide support for these hypotheses although some travel attitude factors do not often appear in the models, and others do not appear at all.
Personality	(1) The adventure seeker factor is positively associated with the consideration of most travel-related strategies.	(1) Our findings support this hypothesis.
Lifestyle	(1) The family/community-oriented factor is positively associated with the consideration of travel-reducing and major location/life style change strategies; (2) Being frustrated is positively related to considering a wide range of travel-related strategies; (3) A positive score on the workaholic factor positively affects the consideration of the strategies beneficial to work; (4) Status seekers may be more inclined to consider strategies involving material acquisition.	(1) Our findings provide some support for this hypothesis; (2) Our findings support this hypothesis; (3) Our findings fail to support this hypothesis, except for changing work trip departure time; (4) Our findings provide limited support for this hypothesis.
Excess travel	(1) Excess travel plays an important role in the consideration of a wide range of travel-related strategies.	(1) Our findings fail to support this. However, the effects of the excess travel indicator may be captured by the adventure seeker factor and the mobility variables.

(Table ES-4. Continued)

Variable type	General hypotheses	Results
Mobility constraints	(1) Mobility constraints positively affect the consideration of a variety of travel-related strategies	(1) Our findings support this hypothesis.
Demographic	(1) Females are more likely to consider the more costly, travel-reducing and major location/lifestyle change strategies; (2) Those in upper income categories are more able and therefore more likely to consider a wide range of travel-related strategies.	(1) Our findings fail to support this hypothesis, although gender effects may be partly captured by other variables in the models; (2) Our findings offer mixed (direct and indirect) support for this hypothesis.
Strategy adoption	(1) The former adoption of a strategy could be either *positively or negatively* associated with the consideration of *other* strategies; (2) The former adoption of a strategy *positively* affects the consideration of the *same* strategy; (3) The time since adoption of a strategy is positively related to its reconsideration.	(1) Our findings support this hypothesis; (2) Our findings generally support this hypothesis although the effects of three strategies are counter to it (for logical reasons) and the effect of one strategy is not significant; (3) Our findings fail to support this hypothesis. Conversely, we found that the time since adoption of a strategy appears with the opposite sign to that of its former adoption.

1. INTRODUCTION

It is well known that congestion has become a major problem for urban and suburban residents. The estimated annual cost of time lost due to congestion in the U. S. was put at $48 billion in the mid-1990s (Arnott and Small, 1994). Beyond the loss of time, congestion has serious consequences for energy consumption and the environment. Governments have been adopting a wide range of policies to alleviate congestion. During the past two decades, Transportation Demand Management (TDM) strategies, such as increasing the cost of operating a private vehicle, promoting public transit ridership, enhancing accessibility, advocating telecommunication alternatives and so on, have been a centerpiece of public policy. However, these strategies have been of limited effectiveness. Most policies are focused on reducing vehicle miles traveled (VMT) at peak periods, and policy makers assume that individuals will actively respond to these policies in a manner that minimizes social costs. In reality, however, individuals tend to behave in a way that minimizes their personal costs (Salomon and Mokhtarian, 1997). This gap between the assumptions on which policies are based and the behaviors with which individuals respond to policy measures greatly affects the effectiveness of such strategies.

The dynamic nature of the individual's response to congestion further exacerbates the discrepancy between assumption and reality. A previous empirical study directed by the second author found that an individual first tends to consider or adopt lower-impact, short-term strategies (such as buying a more comfortable car or changing work trip departure time), before moving to higher-impact and/or longer-term ones (such as changing mode, telecommuting, or relocating). There was also evidence that if dissatisfaction persists or returns an iterative process is involved in the consideration of some strategies, with cycling back to the same or lower-impact strategies often occurring (Raney, Mokhtarian, and Salomon, 2000). Since it is the higher-impact strategies that are often the focus of public policy, this pattern suggests that generally individuals do not behave as policy makers expect. Moreover, the personal impacts and distributional inequities of such strategies may make them less attractive, even criticized. Therefore, for policy makers and plannners, understanding the determinants of the adoption and consideration of travel-related strategies may contribute to improved predictions of the effectiveness of proposed policies, and the design of more effective policies.

This study continues to explore the consideration of 17 specific alternatives. All of them may be (but are not necessarily) adopted in response to congestion and all of them have travel implications. It is part of the sequel to the previous study (Mokhtarian, Raney, and Salomon, 1997; Salomon and Mokhtarian, 1997; Raney, *et al*., 2000) of a similar set of alternatives placed in a questionnaire focused on telecommuting attitudes, preferences, and choices. The current study has adopted several suggestions that the previous study offered for further research (see Section 4, Clay and Mokhtarian (2002) for details).

The first report in the current series (Clay and Mokhtarian, 2002) presented a descriptive analysis of relationships between the adoption or consideration, respectively, of each strategy in turn and a variety of other variables. The key purpose of this report is to develop behavioral models (specifically, binary logit models) for the consideration of each strategy and examine any patterns that emerge across models. Although we collected data on both adoption and consideration, we use "consideration" rather than adoption of a strategy as the dependent variable due to the cross-sectional nature of the available data. As described further in Section 2, the survey used in this study obtained data on an individual's past adoption of strategies, current

consideration of strategies, mobility-related variables, travel attitudes, personality, lifestyle, demographics and other variables expected to affect congestion response. However, current measures of attitudes, mobility, and the other variables are not necessarily appropriate indicators of past adoption. Using them to estimate the models may either inappropriately reverse the roles of cause and effect, or provide little explanatory power. Analysis of pairwise associations (Clay and Mokhtarian, 2002) confirms that the plausible direction of causality is often ambiguous with respect to adoption. For consideration, by contrast, it is reasonable to expect current measurements to help explain the likelihood of current consideration of various strategies.

One specific aspect of the key purpose of this study is to explore the relationship between the prior adoption of a strategy and its reconsideration. The earlier empirical study suggested that the previous adoption of some strategies would reduce the probability of considering the strategies in the same bundle (Raney, *et al*., 2000). In the present study, we wish to know whether the previous adoption of a strategy is more likely to exclude its reconsideration or not, and how the time since adoption of the strategy affects its reconsideration. Specifically, we examine the role that previous adoption of a strategy plays in its reconsideration by developing individual models of the consideration of each strategy, having its adoption and time since adoption as explanatory variables among others. This exploration will help us to better understand the dynamic nature of individuals' behavior in this context.

The organization of this report is as follows. The next section will describe the data and variables used in this analysis. Section 3 presents and interprets the binary logit models of consideration of each individual travel-related strategy. Section 4 provides an overview of the individual models and discusses some general conclusions based on the results.

2. THE DATA AND VARIABLES

2.1 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. For this study, we chose to focus on commuting workers since they will contribute most heavily to peak-period congestion, and are likely to be the most active in the adoption and consideration of travel-related strategies. The subset of 1,283 cases used in this analysis consists of commuting workers with relatively complete responses to key questions.

Table 1 summarizes the sample distribution of key characteristics. The sample is relatively balanced in terms of representation by neighborhood and gender. Higher incomes are overrepresented compared to Census data.

As background to the variables described below, it should be noted that in the cover letter to the survey, travel was defined as "moving any distance by any means of transportation – from walking around the block to flying around the world." In questions relating to the amount of

travel conducted or desired by respondents, they were asked (borrowing wording from the American Travel Survey) to exclude "travel you do as an operator or crew member on a train, airplane, truck, bus, or ship."

Most of the variables measured by the questionnaire can be grouped into 11 categories, which are Objective Mobility, Subjective Mobility, Relative Desired Mobility, Travel Liking, Attitudes, Personality, Lifestyle, Mobility Constraints, Excess Travel, Demographics and Travel-related Strategies. The travel-related strategies, which are the focus of this study, are briefly described in Section 2.2. The other variable categories are the subject of Section 2.3.

Table 1. Demographic Characteristics of Sample Used in This Analysis

		Number	Percent	
Neighborhood	Concord (suburban)	294	22.92%	(n=1,283)
	Pleasant Hill (suburban)	346	26.97%	
	North San Francisco (urban)	643	50.11%	
Gender	Female	651	50.90%	(n=1,279)
	Male	628	49.10%	
Employment status	Full-time worker	1,080	84.18%	(n=1,283)
	Part-time worker	203	15.82%	
Family status	Single	319	24.86%	(n=1,283)
	2+ adults, no children	609	47.47%	
	1 adult, with children	34	2.65%	
	2+ adults, with children	321	25.02%	
Personal income	< $15,000	91	7.25%	(n=1,255)
	$15,000-34,999	266	21.20%	
	$35,000-54,999	386	30.76%	
	$55,000-74,999	229	18.25%	
	$75,000-94,999	126	10.04%	
	> $95,000	157	12.50%	
Age	18-23	42	3.27%	(n=1,283)
	24-40	563	43.88%	
	41-64	640	49.88%	
	> 65	38	2.97%	

2.2 The Travel-related Strategies

2.2.1 Strategy descriptions

Figures 1 and 2 below reproduce the two pages of the survey dealing with the travel-related strategies analyzed in this study. The questions under E1 asked about the adoption, and E2 about the consideration, of 19 options having travel-related implications. The first column of boxes for each question in both sections was coded as a binary variable, equal to 0 if the box was checked (*i.e.*, if the alternative was not adopted or considered), and 1 if one or more reasons for adoption or consideration were checked. The time since adoption was coded as whole years (rounded to the nearest full year, with anything less than 6 months coded as zero).

Figure 1. Section E1 (Adoption) from the Survey

PART E: YOUR TRAVEL-RELATED CHOICES

A number of choices can be made that affect the amount and nature of people's travel. We are interested in knowing some of the choices you have made or may be considering making. *"How long ago"* refers to the most recent time you made that choice.

1. First, we are interested in knowing which of the following you have already done **and why**.

		Not done or not applicable	*Done: How long ago?*	*Why? (CHECK ALL THAT APPLY)* *Personal*	*Family related*	*Work related*	*Reducing or easing travel*	*Other*
a.	Buy a car stereo system	☐	____yrs	☐	☐	☐	☐	☐
b.	Get a mobile phone	☐	____yrs	☐	☐	☐	☐	☐
c.	Get a better car	☐	____yrs	☐	☐	☐	☐	☐
d.	Get a fuel efficient car	☐	____yrs	☐	☐	☐	☐	☐
e.	Change work trip departure time	☐	____yrs	☐	☐	☐	☐	☐
f.	Hire someone to do house or yard work	☐	____yrs	☐	☐	☐	☐	☐
g.	Adopt flextime	☐	____yrs	☐	☐	☐	☐	☐
h.	Adopt compressed work week (such as a "9/80" schedule)	☐	____yrs	☐	☐	☐	☐	☐
i.	Change from driving alone to work, to some other means	☐	____yrs	☐	☐	☐	☐	☐
j.	Change from another means of getting to work, to driving alone	☐	____yrs	☐	☐	☐	☐	☐
k.	Buy equipment/services to help you work from home	☐	____yrs	☐	☐	☐	☐	☐
l.	Telecommute (part- or full-time)	☐	____yrs	☐	☐	☐	☐	☐
m.	Change jobs...closer to home	☐	____yrs	☐	☐	☐	☐	☐
	...farther from home	☐	____yrs	☐	☐	☐	☐	☐
n.	Move your home...closer to work	☐	____yrs	☐	☐	☐	☐	☐
	...farther from work	☐	____yrs	☐	☐	☐	☐	☐
o.	Work part- instead of full-time	☐	____yrs	☐	☐	☐	☐	☐
p.	Start home-based business or put more effort into an existing one	☐	____yrs	☐	☐	☐	☐	☐
q.	Retire or stop working	☐	____yrs	☐	☐	☐	☐	☐

Figure 2. Section E2 (Consideration) from the Survey

2. *Now, even if you have already made some of these choices,* you could be thinking about making a similar change again, or considering new options. For this question we are interested in which of the following you have been considering **and why**.

	Not seriously considering	*Seriously considering: Why? (CHECK ALL THAT APPLY)*				
		Personal	*Family related*	*Work related*	*Reducing or easing travel*	*Other*
a. Buy a car stereo system	☐	☐	☐	☐	☐	☐
b. Get a mobile phone	☐	☐	☐	☐	☐	☐
c. Get a better car	☐	☐	☐	☐	☐	☐
d. Get a fuel efficient car	☐	☐	☐	☐	☐	☐
e. Change work trip departure time	☐	☐	☐	☐	☐	☐
f. Hire someone to do house or yard work	☐	☐	☐	☐	☐	☐
g. Adopt flextime	☐	☐	☐	☐	☐	☐
h. Adopt compressed work week (such as a "9/80" schedule)	☐	☐	☐	☐	☐	☐
i. Change from driving alone to work, to some other means	☐	☐	☐	☐	☐	☐
j. Change from another means of getting to work, to driving alone	☐	☐	☐	☐	☐	☐
k. Buy equipment/services to help you work from home	☐	☐	☐	☐	☐	☐
l. Telecommute (part- or full-time)	☐	☐	☐	☐	☐	☐
m. Change jobs...closer to home	☐	☐	☐	☐	☐	☐
...farther from home	☐	☐	☐	☐	☐	☐
n. Move your home...closer to work	☐	☐	☐	☐	☐	☐
...farther from work	☐	☐	☐	☐	☐	☐
o. Work part-time instead of full-time	☐	☐	☐	☐	☐	☐
p. Start home-based business or put more effort into an existing one	☐	☐	☐	☐	☐	☐
q. Retire or stop working	☐	☐	☐	☐	☐	☐

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Questions "m" and "n" had two parts each: "Change jobs . . . closer to home" and ". . . farther from home" (referred to as "m1" and "m2," respectively), and "Move your home . . . closer to work" and ". . . farther from work" ("n1" and "n2"). The format for these two questions, shown in Figures 1 and 2, was designed to economize on vertical space. Unfortunately, it had the

unanticipated effect of confusing many respondents (apparently leading them to think that they needed to respond to only one member of each pair) and resulted in a disproportionately high number of non-responses, particularly on the second half of each question. Given that 28.8% of the sample was missing at least one of the four responses to the adoption and consideration questions for the m2 and n2 alternatives, these variables were not used to screen out cases with missing data, nor did we attempt to fill any missing data for them.

In previous analyses of these data, cases with missing responses on a number of key variables were either removed or filled; this resulted in 1,904 cases containing relatively complete data for variables other than the travel-related strategies. For this study, any case missing more than two out of the 17 responses for either the adoption or consideration of the travel-related strategies was removed, and stochastic data filling was used for the remaining missing responses (see Section 3, Clay and Mokhtarian (2002) for details). Finally, consistent with the focus of previous analyses of these data on commuting workers (in view of the observation that they tend to have different travel patterns and attitudes than non-commuters or non-workers), cases were removed if the respondent did not report working part- or full-time and commuting to work at least once a month. This reduced the final usable dataset for this analysis to 1,283 cases.

2.2.2 Identification of bundles of strategies

To better understand how these travel-related strategies interact with travel attitudes, demographics and other variables in our analysis, it is useful to group them into bundles based on both conceptual and empirical similarities.

Similar to Mokhtarian, *et al*. (1997), two methods were used to develop bundles of travel-related strategies, with the results shown in Table 2. First, variables were grouped conceptually into three bundles based on the generalized cost (including time, stress, and other impacts as well as monetary cost) and the amount of lifestyle change associated with each travel alternative. Group one includes low cost, travel-maintaining/increasing strategies such as getting a more comfortable car or purchasing a mobile phone. Group two includes more costly, travel-reducing alternatives such as adopting a compressed workweek or telecommuting. The third group consists of major location/lifestyle changes such as quitting work, working part-time instead of full-time, and moving home or work closer to each other.

In the second method, factor analysis of the responses was performed to identify bundle groupings. Factor analysis identifies patterns of common variation among a group of variables (the binary adoption and consideration variables, in this case), and as such groups our alternatives based on the empirical affinities in responses to them. The bundles developed in this analysis are a composite of the results of 36 different factor analyses. Factor analysis was conducted for 3, 4, 5, and 6 factor solutions across the following groups: adoption for the entire sample, adoption for commuters and full-time workers only, adoption for the entire sample (excluding m2 and n2), adoption for commuters and full-time workers (excluding m2 and n2), consideration for the full sample, consideration for commuters and full-time workers only, consideration for the full sample (excluding m2 and n2), consideration for commuters and full-time workers (excluding m2 and n2), and combined adoption and consideration for the entire sample (excluding m2 and n2). The factor-based bundles that appear in Table 2 were the groupings that most commonly appeared across all 36 factor analyses and conceptually made the most sense.

Table 2. Conceptual and Factor-based Bundles of the Travel-related Strategies

Conceptual Bundle Groupings	
Group 1. Travel maintaining/increasing	a. Buy a car stereo system b. Get a mobile phone c. Get a better car d. Get a more fuel efficient car e. Change work trip departure time f. Hire someone to do house or yard work g. Adopt flextime j. Change from another means of getting to work to driving alone
Group 2. Travel reducing	h. Adopt compressed work week (such as a "9/80" schedule) i. Change from driving alone to work to some other means k. Buy equipment/services to help you work from home l. Telecommute (part- or full-time)
Group 3. Major location/lifestyle change	m. Change jobs closer to home n. Move your home closer to work o. Work part-time instead of full-time p. Start home-based business or put more effort into an existing one q. Retire or stop working
Factor-based Bundles	
Group 1. Auto improvement	a. Buy a car stereo system c. Get a better car d. Get a more fuel efficient car
Group 2. Mobile phone	b. Get a mobile phone
Group 3. Work-schedule changes	e. Change work trip departure time g. Adopt flextime h. Adopt compressed work week (such as a "9/80" schedule)
Group 4. Hire someone to do house or yard work	f. Hire someone to do house or yard work
Group 5. Mode change	i. Change from driving alone to work to some other means j. Change from another means of getting to work to driving alone
Group 6. Home-based work	k. Buy equipment/services to help you work from home l. Telecommute (part- or full-time) p. Start home-based business or put more effort into an existing one
Group 7. Residential/employment relocation	m. Change jobs closer to home n. Move your home closer to work
Group 8. Alter employment status	o. Work part-time instead of full-time q. Retire or stop working

Eight bundles were identified from this process. Note that bundles two and four consist of only one strategy each. In the previous related study (Mokhtarian, *et al*., 1997), the strategy "Get a mobile phone" was grouped with the auto improvement bundle. For this analysis it is kept separate based on factor loadings and the conceptual argument that mobile phones represent a unique strategy in comparison to the purely auto-oriented solutions (get a better car, get a more fuel efficient car, and buy a car stereo system).

Bundle four, "Hire someone to do house or yard work," emerged as an independent factor in the earlier study, and remains independent in this analysis for lack of conceptual (or strong empirical) linkage with other bundles in the study.

In a previous portion of this study (Clay and Mokhtarian, 2002), descriptive analyses were conducted for conceptual and factor-based bundles. Specifically, other variables in the dataset were related not only to the adoption and consideration of individual strategies, but also to the adoption and consideration of bundles of strategies. A bundle adoption variable was defined as 1 if any strategy in the bundle had been adopted, and 0 otherwise; bundle consideration was defined similarly. In this study, although we build models for the consideration of individual strategies, to organize the exposition we group the strategies into the factor-based bundles and look for common patterns within each bundle. A parallel analysis (Choo and Mokhtarian, 2003) is estimating models of consideration of a strategy bundle rather than an individual strategy.

2.3 Explanatory Variables

Aside from the strategy adoption variables, the remaining explanatory variables fall into the ten categories mentioned in Section 2.2. In this section we briefly describe each of those categories, together with some hypotheses about their relationships to the consideration of our travel-related strategies.

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. Consistent with the American Travel Survey, long-distance trips were defined as those longer than 100 miles, one way. The short-distance modes measured were: personal vehicle, bus, Bay Area Rapid Transit (heavy rail)/light rail/train, walking/jogging/ bicycling, and other. The short-distance purposes measured were: commuting to work or school, work/school-related, grocery shopping, eating a meal, travel for entertainment, and taking other people where they need to go. Long-distance measures were obtained for the personal vehicle and airplane modes, and for the work/school-related and entertainment/social/recreational purposes.

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". Frequency of trips by mode was not obtained (a conscious design choice, to reduce the burden on the respondent). Respondents were also asked to specify how many miles they traveled each week, in total and by mode and purpose.

On one hand, reported estimations of *typical* travel, such as we obtained here, are not as reliable as travel diary data. On the other hand, travel diaries can be criticized for generally encompassing only a few days of travel and therefore potentially being unrepresentative at the disaggregate level. Of course, these measures are respondents' *reports* of the distance, frequency, and time they are traveling, and hence are "objective" only in the sense of referring to those *externally measurable* quantities (in contrast to the subjective measures of subjective and relative

desired mobility described below), rather than in the sense of *actually* being measured through external observation.

For long-distance trips, pre-testing indicated that respondents would not be able to estimate distances reliably. Thus, respondents were simply asked to tabulate how many trips they made "last year" for each mode-purpose combination (personal vehicle/work, personal vehicle/ entertainment, etc.) to each of nine regions of the world. Those responses indicated number of trips directly, and were also transformed to approximate measures of distance, through judgmental average distances developed between the Bay Area and each of the nine world areas.

Two transformations of the long-distance objective mobility indicators are utilized in this report: the natural log of the total miles plus one ("log of miles"), and the summation of the natural log of miles plus one (to avoid evaluating the log of 0, which is negative infinity) for each purpose/mode combination ("sum of log-miles"). The reason for performing a natural log transformation was to reduce the weight of long trips, under the assumption that each additional mile traveled would have a diminishing marginal impact (*i.e.*, each additional mile does not have as strong an incremental effect as the previous mile). As shown by the example in Section 4.1.1 of Curry (2000), the two transformations differ in that sum of log-miles gives more weight to a larger number of trips but traveling the same amount of miles, compared to log of miles.

The travel-related strategies discussed in this study represent some possible ways to cope with congestion and a higher amount of travel. Thus, we would certainly expect a higher objective mobility to be positively associated with the consideration of the travel-reducing and major location/lifestyle strategies of Table 2. The situation with respect to the travel-maintaining/ increasing strategies is not as clear. On one hand, it is possible that individuals with a higher objective mobility want to cut their travel, and hence are less likely to consider an adjustment that would maintain or increase their travel. However, the descriptive analyses in Clay and Mokhtarian (2002) confirmed that those who actually did a lot of travel were more inclined to consider even the travel-maintaining/increasing strategies (as well as the others), apparently in order to make the travel they must do less costly and/or more productive. Therefore, for the models developed here, it is hypothesized that the more individuals travel, the more likely they would be to consider all these strategies.

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 categories as for objective mobility (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".

Similarly to objective mobility, we hypothesize that individuals perceiving that they do a lot of travel will be more inclined to consider travel-reducing and major location/lifestyle change strategies. With respect to travel-maintaining/increasing strategies, individuals with high subjective mobility may either be less inclined to consider them because they do not *want* to maintain or increase travel, or more inclined to consider them in order to make the extensive travel they *must* do more comfortable or productive. Again, the findings in Clay and Mokhtarian

(2002) support the latter expectation. Thus, we hypothesize that a higher subjective mobility is positively related to considering a wide range of strategies.

Relative Desired Mobility

An individual may consider that she travels "a lot", but want to do even more. Thus relative desired mobility refers to how much a person wants to travel compared to what she is doing now. The structure of this question mirrors the structure for subjective mobility, with respondents rating the amount of travel they want to do (in each category) compared to the present, on a five-point scale from "much less" to "much more".

Individuals having a higher relative desired mobility want to increase their travel, thus they are expected to be more likely to consider travel-maintaining/increasing strategies and less likely to consider travel-reducing and major location/lifestyle change strategies. However, seemingly counterintuitive results may occur for some individual strategies; for example, those desiring more entertainment travel may be more likely to consider some commute-reduction strategies in order to obtain more time for the desired activities.

Travel Liking

Whether a respondent who already travels a lot wants to reduce it or do even more is likely to depend on how much she enjoys traveling. To directly measure the affinity for travel, the question was asked, "How do you feel about *traveling* in each of the following categories? We are *not* asking about the activity at the destination, but about the travel required to get there." Respondents were then asked to rate each of the same categories as subjective mobility on a five-point scale from "strongly dislike" to "strongly like".

Despite our attempt to alert respondents to distinguish the destination activity from the travel, it is likely that even many of those who actually read the instructions (and more of those who did not) were unsuccessful at doing so. Future studies should perhaps make this distinction even more forcefully to the respondent; interactive interviews would be one mechanism for probing answers and helping the participant to separate these components of the utility for travel. Nevertheless, we believe that the responses to this question are essentially measuring the degree of the respondent's affinity for travel for its own sake, even if that measurement is imperfect.

Similar to relative desired mobility, a higher rating for travel liking indicates a positive utility of travel. It is hypothesized that the more an individual likes travel, the more likely she would be to consider travel-maintaining/increasing strategies, and the less likely she would be to consider travel-reducing and major location/lifestyle changing strategies.

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". Factor analysis was then used to extract the relatively uncorrelated fundamental dimensions spanned by these 32 variables. Six underlying dimensions were identified, using principal axis factoring with oblique rotation (see Redmond, 2000 for details):

travel dislike, pro-environmental solutions, commute benefit, travel freedom, travel stress, and pro-high density.

The different travel attitude factors we have measured can affect the consideration of each travel-related strategy differently. Generally, a positive commute benefit or travel freedom factor score indicates a utility of travel or lack of constraints on individuals' travel, respectively, so they are expected to be negatively associated with the consideration of strategies that reduce travel. Conversely, a positive score on the other factors indicates some kind of disutility of travel or anti-travel attitude, thus they are hypothesized to be positively associated with the consideration of travel-reducing and major location/lifestyle change strategies.

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.

Redmond (2001) hypothesized that those with a positive score on the adventure seeker factor enjoy travel for entertainment more than for work, so they may be more likely to change their commuting patterns. Clay and Mokhtarian (2002) found a strong positive association of this factor with a number of different strategies, suggesting that to some extent adventure seekers may value change or variety for its own sake. Thus, this factor is expected to be positively associated with the consideration of most travel-related strategies. The impacts of the other personality factors are less predictable, but we include them to explore the role they may play in the consideration of travel-related strategies.

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.

The family/community oriented factor score is expected to be positively associated with the consideration of travel-reducing and major location/lifestyle change strategies since these strategies could save time for family and community activities. Being frustrated may be positively related to considering a wide range of strategies because such people may believe that a change would bring them greater satisfaction or control. A positive score on the workaholic factor is expected to positively affect the consideration of the strategies beneficial to work, such as telecommuting. Status seekers may be more inclined to consider strategies involving material acquisition, such as getting a better car or a mobile phone.

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. It is hypothesized that the index would play an important role in the consideration of a wide range of strategies.

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 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 (an oppositely-oriented measurement of mobility constraints). Mobility constraints are expected to positively affect the consideration of a variety of strategies.

Demographics

Finally, the survey included an extensive list of demographic variables to allow for comparison to other surveys and to Census data. These variables include neighborhood and vehicle type dummies, gender, age, years in the U.S., education and employment information, household information such as number of people in the household, family status, and personal and household income.

Based on previous findings (Mokhtarian, *et al*., 1997; Clay and Mokhtarian, 2002), females are expected to be more inclined to consider the more costly, travel-reducing and major location/lifestyle change strategies; it is hypothesized that personal and household incomes would be positively associated with consideration of a variety of strategies.

3. MODELS OF CONSIDERATION OF EACH STRATEGY

3.1 General Specification and Interpretation Issues

As illustrated in Figures 1 and 2, when a strategy was adopted or considered, the respondents were asked to "check all [the reasons] that apply". The last five columns of Sections E1 and E2 provide five reasons for making such a decision, of which only one is directly travel-related ("Reducing or easing travel"). Therefore, although each of these strategies has potential travel consequences, all of them could be adopted or considered for reasons unrelated to transportation concerns. For example, there are many possible reasons for taking a new job that just happens to reduce the commute. Clay and Mokhtarian (2002) analyzed the resulting responses and found that changing from driving alone to some other means is the only strategy for which "Reducing or easing travel" is the most commonly cited reason. However, it should be noted that while we deliberately avoided a response bias in favor of the travel reason by placing it fourth (just before "other") in the set of five reasons, there is in fact a response bias in the opposite direction. Although respondents were invited to check as many reasons as applied, many would have stopped after checking the first relevant reason. Even when they were willing to check multiple

reasons, they may not always have realized the importance of transportation to their choices. For example, a respondent could have selected "family related" recalling that the alternative was adopted to allow more time with family, but not immediately recognizing that the additional time with family was obtained by reducing the amount of time spent driving. This logic holds true for many of the reasons selected, given that the list of travel-related alternatives was designed to comprise mostly strategies that could ease or reduce the impact of driving. Thus, the role of transportation in these choices is most likely understated. In any case, whether adopted or considered for transportation reasons or not, it is still worth studying behavior with respect to these strategies since many of them are promoted as transportation policy, and all of them do have travel impacts.

Binary logit models were developed for the consideration of each individual travel-related strategy. Each dependent variable was defined as 1 if the strategy was considered by a respondent and as 0 if not. The explanatory variables were selected from the strategy adoption variables presented in Section 2.2.1 and the variables described in Section 2.3. In all, more than 180 variables were considered to potentially have some explanatory power in the models. The logistic regression function of SPSS was used to estimate the models, due to its automated specification refinement capabilities. In particular, the forward likelihood ratio method was adopted to refine the initial experimental specifications in which all explanatory variables were allowed to enter. Generally, the significance level 0.05 was used to incorporate or release variables in the final "best" model. However, a few marginally significant variables were kept in the final models when they provided some interesting or insightful information. Conversely, in several cases, explanatory variables had to be excluded from the specification due to their appearance with counterintuitive signs.

A critical survey design feature affected model development for several of the travel-related strategies. As explained in Section 2.2.1, respondents were asked in Question 1 of Part E of the survey to indicate which alternatives they had adopted, and in Question 2 (after stating "*even if you have already made some of these choices*, you could be thinking about making a similar change again, or considering new options") to indicate which they were seriously considering. For reference later on, Table 3 presents the corresponding distribution of former adoption and current consideration of each strategy. This design leaves two serious ambiguities. First, some respondents who had adopted, and were still engaged in, a particular strategy (such as telecommuting), may have felt uncomfortable indicating they "were not seriously considering" something they were in fact actually doing. On the other hand, we have no way of ascertaining whether a strategy such as telecommuting, once adopted, remained in place or not – it is well-established that many telecommuting engagements are temporary (Varma, *et al*., 1998).

The result of these two situations is that when someone who has previously adopted a certain strategy indicates she is currently considering it, we are not certain whether she is actually currently doing it, or whether she has previously discontinued the strategy and is now considering it again. Naturally these two groups of people could be quite different in terms of explanatory variables. Similarly, "non-considerers" who have previously adopted a strategy comprise at least two distinct groups: those who are not considering it because their prior adoption is still in force, and those who are not considering it because they have previously discontinued the strategy and do not wish to re-visit it at this time.

Table 3. The Distribution of Former Adoption and Current Consideration of Strategies

Strategy	Consideration: No, Adoption: No	Consideration: No, Adoption: Yes	Consideration: Yes, Adoption: No	Consideration: Yes, Adoption: Yes	Sample size
a. Buy a car stereo system	590 (46.0%)	505 (39.4%)	72 (5.6%)	116 (9.0%)	1,283 (100%)
b. Get a mobile phone	492 (38.4%)	411 (32.0%)	263 (20.5%)	117 (9.1%)	1,283 (100%)
c. Get a better car	252 (19.7%)	552 (43.0%)	181 (14.1%)	298 (23.2%)	1,283 (100%)
d. Get a fuel efficient car	558 (43.5%)	360 (28.0%)	210 (16.4%)	155 (12.1%)	1,283 (100%)
e. Change work trip departure time	704 (54.9%)	353 (27.5%)	88 (6.9%)	138 (10.7%)	1,283 (100%)
f. Hire someone to do house or yard work	753 (58.7%)	233 (18.2%)	138 (10.7%)	159 (12.4%)	1,283 (100%)
g. Adopt flextime	909 (70.9%)	181 (14.1%)	99 (7.7%)	94 (7.3%)	1,283 (100%)
h. Adopt compressed work week (such as a “9/80” schedule)	1,041 (81.1%)	90 (7.0%)	110 (8.6%)	42 (3.3%)	1,283 (100%)
i. Change from driving alone to work, to some other means	955 (74.4%)	183 (14.3%)	93 (7.2%)	52 (4.1%)	1,283 (100%)
j. Change from another means of getting to work, to driving alone	1,081 (84.2%)	142 (11.1%)	42 (3.3%)	18 (1.4%)	1,283 (100%)
k. Buy equipment/services to help you work from home	776 (60.5%)	202 (15.7%)	122 (9.5%)	183 (14.3%)	1,283 (100%)
l. Telecommute (part- or full-time)	931 (72.6%)	88 (6.9%)	148 (11.5%)	116 (9.0%)	1,283 (100%)
m. Change jobs closer to home	772 (60.2%)	268 (20.9%)	174 (13.5%)	69 (5.4%)	1,283 (100%)
m2. Change jobs farther from home	775 (79.9%)	144 (14.9%)	37 (3.8%)	14 (1.4%)	970 (100%)
n. Move your home closer to work	1,015 (79.1%)	149 (11.6%)	91 (7.1%)	28 (2.2%)	1,283 (100%)
n2. Move your home farther from work	930 (88.8%)	77 (7.4%)	31 (3.0%)	9 (0.8%)	1,047 (100%)
o. Work part-time instead of full-time	918 (71.6%)	139 (10.8%)	145 (11.3%)	81 (6.3%)	1,283 (100%)
p. Start home-based business or put more effort into an existing one	990 (77.2%)	62 (4.8%)	148 (11.5%)	83 (6.5%)	1,283 (100%)
q. Retire or stop working	1,081 (84.3%)	23 (1.8%)	166 (12.9%)	13 (1.0%)	1,283 (100%)

In some cases, the nature of the strategy is such that, once it is adopted, it remains in force until it is re-adopted, so to speak. For example, "Changing work trip departure time" cannot be unadopted without effectively re-adopting it. For those strategies, the ambiguities described above are not a problem. For each of the remaining strategies, however, we chose to estimate two models: one on the full dataset, and one on non-adopters only. Specifically, for the following seven strategies, we developed models based on only non-adopter data, as well as on the full dataset: "Hire somebody to do house or yard work", "Adopt flextime", "Adopt compressed work week", "Telecommuting (part- or full-time)", "Work part- instead of full-time", "Start home-based business or put more effort into an existing one", and "Retire or stop working". However, estimating the models with only non-adopters is not an ideal solution either. Analyzing only the non-adopter models would be unsatisfactory since we wish to understand the behavior of adopters as well as non-adopters (particularly since adopters can comprise up to 30.6% of the sample for these strategies). However, we believe that a comparison of the full-data and non-adopter models will be fruitful, with both the similarities and the differences between them being instructive. In such a comparison, it should be kept in mind that, for the non-adopter models (unlike the full-sample models), adoption, time since adoption of the given strategy and its quadratic term must of necessity be excluded as potential explanatory variables.

It is appropriate to comment in general on the inclusion of the adoption and time since adoption variables in the models estimated on the full sample. As mentioned in Section 1, some evidence suggests that individuals first tend to consider or adopt lower-impact strategies, moving to higher-impact ones if dissatisfaction still persists or returns, and there is a weaker tendency for them to cycle back to lower-impact strategies if dissatisfaction recurs after they have adopted a higher-impact one. On the other hand, if the adoption of a strategy has met individuals' needs, its adoption may decrease the probability of considering the other strategies. Therefore, the former adoption of a strategy could be either *positively or negatively* associated with the consideration of *other* strategies. By contrast, for most of the strategies we are studying, we expect that the former adoption of a strategy *positively* affects the consideration of the *same* strategy. Either the individual is enjoying and still wants to enjoy the benefits from the previous adoption, or such strategies are attractive again as circumstances change. Given that they are adopted once, it is natural to expect them to be adopted repeatedly over a person's working life.

Moreover, we initially expected the time since adoption of a strategy to be positively related to its reconsideration. That is, the longer ago an individual adopts a strategy, the more likely she is to consider the same strategy. The time since adoption variable posed a difficulty with respect to the treatment of non-adopters, however. Non-adopters had to be given a value for this variable in order for them (and this variable) to be included in the full-sample models. The standard practice of setting a variable to zero for cases for which it was not applicable was unsatisfying in this situation, however. Setting time since adoption to zero for non-adopters lumped non-adopters together with very recent adopters (having nearly zero time since adoption), whereas in reality, one might expect those two groups to be quite different (perhaps even opposite) in their propensity to consider the same alternative (with non-adopters far more likely to consider a strategy than recent adopters).

To reflect the expectation that consideration of a strategy would generally increase with time since adoption, with non-adopters being most likely of all to consider it, we experimented with a "synthetic" time since adoption variable for each strategy. For non-adopters we set time since adoption of that strategy equal to the longest time since adoption of that strategy found in the

sample, plus an arbitrary inflation factor of 20%. That is, for all non-adopters, time since adoption of a given strategy was defined to be 1.2 times the longest time since adoption in the sample. But the models containing these synthetic variables were unsatisfactory – difficult to interpret and producing coefficients with counterintuitive signs. In retrospect, our hypothesis that the propensity of non-adopters to consider a strategy would be similar to that of a long-ago adopter was probably too simplistic: in many cases individuals may not have adopted a strategy precisely because of a disinclination toward it that still persists and makes them unwilling to consider it.

Ultimately then, we abandoned the synthetic time since adoption variable, and returned to the original variable that was defined as zero for non-adopters. We interpret this variable as the interaction or product of the binary adoption variable and time since adoption, and hence as representing the impact of time since adoption *for adopters*. We also included a squared time since adoption variable for each strategy, to allow for non-linear effects. One could imagine that the propensity to consider a strategy might be highest for intermediate times since adoption: recent adopters of course may be less likely to consider it again, but also, an adoption long ago and *not* more recently may signify rejection of the strategy for whatever reasons (it was not deemed effective, it is no longer deemed appropriate or desirable or available), and hence a lower propensity to consider it.

As a final comment with respect to specification and interpretation, the richness of our set of variables makes it unrealistic to assume them to be totally independent of each other. Depending on the context of a specific model, a certain explanatory variable entering the model may be not only representing itself but also acting as a proxy for other variable(s). For example, the number of vehicles in the household may be an indicator of a mobility constraint and/or income characteristics. This potential multi-faceted nature of the variables made the interpretation process particularly interesting.

The following sections group the 17 individual strategies according to the eight factor-based bundles described in Section 2.2.2. In each section, we first present a table summarizing the directions of effects in each individual model comprising the bundle, and make some observations on the bundle as a whole. We then discuss the individual models in brief, accompanied by tables presenting the actual coefficient estimates and other information. In addition, for the seven strategies mentioned above, the models with only non-adopters will be presented, following the models with all respondents.

3.2 Auto Improvement

The auto improvement bundle contains three low-cost, short-term, and travel-maintaining adjustments: “Buy a car stereo system”, “Get a better car” and “Get a fuel efficient car”. Although individuals cannot reduce their actual amount of travel by adopting these strategies, they can obtain a more comfortable, satisfying and functional travel environment when frustrated by congestion (Salomon and Mokhtarian, 1997). Thus, the likely consequence of these strategies is to reduce the costs of travel without reducing objective mobility. Table 3 shows that auto improvement strategies are extensively accepted by commuters. In this sample, about 82% of respondents have ever adopted one or more of the auto improvement strategies, and about 48% of respondents have been considering one or more strategies in this bundle. Both adoption and consideration of strategies in this bundle rank first among all the bundles discussed in this study.

An intrinsic enjoyment of travel itself and the benefits of commuting may partly explain this popularity. First, travel is not absolutely a derived demand, but sometimes it is desired for its own sake (Mokhtarian and Salomon, 2001). Individuals wanting to travel for its own sake are likely to do a lot of traveling, and therefore likely to want to make that travel even more enjoyable by adopting one or more of these strategies. Thus, as pointed out by Clay and Mokhtarian (2002), these strategies may be both an effect and a cause of a positive utility for travel. Second, commuting is not entirely a waste of time; people may attribute some benefits to commuting. For example, commute time may act as a transition between home and work roles, individuals could conveniently link other errands to the commute trip, and so on. Several studies suggest that people want to engage in some commuting, and that not everyone wants to reduce their current commute time (*e.g.*, Redmond and Mokhtarian, 2001). Therefore, the utility of commuting specifically may further enhance the desirability of these auto improvement strategies. On the other hand, results from Clay and Mokhtarian (2002) suggest that these strategies may also be adopted to ameliorate the burden of travel that *must* be done. Thus, since both likers of travel and dislikers of travel are motivated (for different reasons) to adopt these strategies, their popularity is not surprising.

As shown in Table 4, one variable, year of personal vehicle, is common to all three strategies in this bundle. The higher the model year, of course the newer the vehicle. The possession of a newer personal vehicle suggests that individuals may have already created a relatively comfortable travel environment, and thus will have little motivation to consider further auto improvements. Therefore, it is reasonable that year of personal vehicle is negatively associated with the consideration of each of the auto improvement strategies.

Except for year of personal vehicle, the model of consideration of buying a car stereo system does not share any variable with either that of getting a better car or that of getting a fuel efficient car, while there are seven variables that are common to the latter two models. This suggests that the processes of consideration of getting a better car and of getting a fuel efficient car show substantial commonality. However, it should be kept in mind that the definition of a better car was intentionally left ambiguous, with respondents answering according to their own ideas. Different people could have different criteria for classifying a car as "better", such as being larger, more luxurious or even more fuel efficient, but at a minimum, it is better in some function(s) than their current one. Generally, when individuals consider getting a better/fuel-efficient car, the car could be either a brand new one, or a used one but better (*e.g.* newer) than their current one. Therefore, for either of these two strategies, the perceived benefits could be mainly focused on providing a more comfortable, reliable means of travel, reducing the out-of-pocket costs of travel, and/or improving the environment (since newer, more fuel-efficient cars also generally pollute less).

Individuals liking short-distance travel for entertainment are more likely to get a better/fuel-efficient car. A higher liking of short-distance travel for entertainment is positively associated with doing more, or with the desire to do more, of such travel. Thus, such individuals not only like travel for entertainment, but do a fair amount of it already, and also want to increase it. Therefore it is plausible that they are more likely to consider these two strategies, either for obtaining a more comfortable travel environment or for reducing the costs of such travel, or both. Especially for those who are entertainment-oriented, the vehicle itself may constitute a form of entertainment. It is also noteworthy that a related variable, the actual frequency of short-distance entertainment travel, is positively significant to the consideration of buying a car stereo system.

Table 4. Models of Consideration of Auto Improvement Strategies (Bundle 1)

	Buy a car stereo system	Get a better car	Get a fuel efficient car
N	1172	1118	1155
MS ρ^2	0.385	0.039	0.132
ρ^2	0.450	0.183	0.229
Adjusted ρ^2	0.432	0.158	0.208
Variable			
Objective Mobility			
Frequency of entertainment travel (SD)	+		
Frequency of other purpose travel (SD)	+		
Weekly miles in a train/BART/light rail (SD)	-		
Total weekly miles (SD)			+
Weekly miles to eat a meal (SD)		+	
Sum of log of miles for each trip by air (LD)	-		
Subjective Mobility			
Travel for grocery shopping (SD)	+		
Take others where they need to go (SD)		+	
Travel by train/BART/light rail (SD)			-
Travel by personal vehicle (LD)			+
Relative Desired Mobility			
Overall (SD)	-		
Travel by bus (SD)		-	
Travel Liking			
Travel for entertainment (SD)		+	+
Overall (LD)		+	+
Attitudes			
Pro-environmental solutions factor score			+
Pro-high density factor score		-	-
Personality			
Adventure seeker factor score	+		
Lifestyle			
Frustrated factor score		+	+
Status seeker factor score			-
Mobility Constraints			
Limitations on driving during the day	+		
Demographics			
Age	-		
Female	-		
Year of personal vehicle	-	-	-
Years lived in the U.S.		-	
Household with single adult		-	-
Service/repair occupation	+		
Personal income category		+	
Vehicle type is small		+	+
Strategy Adoption			
Buy a car stereo system	+		
Get a better car		-	
Time since getting a better car		+	
Get a fuel efficient car			-
Time since getting a fuel efficient car			+
Hire somebody to do house or yard work		+	

(Table 4. Continued)

	Buy a car stereo system	Get a better car	Get a fuel efficient car
Strategy Adoption			
Time since hiring domestic help		-	
Adopt compressed work week	+		
Squared time since changing to driving alone		+	
Change jobs closer to home		+	+
Time since changing jobs closer to home			-

SD = Short Distance LD = Long Distance

Similarly, those liking long-distance travel overall are more likely to consider these two strategies. Liking long-distance travel overall is strongly correlated with liking (0.409) and desiring more (0.259) long-distance travel by personal vehicle, although less strongly than its correlation with liking (0.538) and desiring more (0.368) long-distance travel by air. The connection to long-distance vehicle travel is clear: someone liking and desiring more of such travel is inclined to consider a better/fuel-efficient vehicle for making such travel even more enjoyable. The potential connection to long-distance air travel is more subtle, but still plausible. First, even air travel generally involves airport ground access in a personal vehicle, and in any case individuals doing a lot of flying are likely to be doing above-average amounts of traveling in general, and personal vehicle traveling in particular. The person who likes long-distance traveling overall, and wants to do more of it, may be especially motivated to consider a fuel-efficient car, so as to minimize – as far as possible – the environmental impacts of the travel she wants to do. Thus, the liking for long-distance overall travel variable may be a marker for a complex constellation of variables and relationships.

The pro-high density factor score is negatively associated with the consideration of getting a better/fuel-efficient car. This land-use factor is based on attitudes about residential density and about proximity to services, and a positive pro-high density factor score may indicate those who have an aversion to travel by auto and prefer travel by walking or transit (Redmond, 2000). Therefore, those with a higher score for this factor may be less likely to consider getting a car at all (whether better or fuel-efficient or not). Conversely, individuals who are frustrated are more likely to consider these two strategies. Individuals who are frustrated are traveling *less* than others and wanting to travel *more* (Choo, Collantes, and Mokhtarian, 2001), so they are likely to consider getting a better/fuel-efficient car to support increased travel. Also, they may view these two strategies as ways to increase control and/or life satisfaction (through an improved travel environment and/or saved travel costs), or at least to provide a welcome diversion from their difficulties.

Being in a single-adult/no-children household is negatively related to considering getting a better/fuel-efficient car. In this sample, such respondents tend to have much lower household incomes, and tend to live in North San Francisco. Individuals with lower household incomes may be less able to afford a newer car, while residents in an urban area (similarly to the effect of the pro-high density variable) may be less inclined to travel by car in general, in view of the walking and transit options available. In addition, children in the household may trigger one to consider getting a better/fuel-efficient car; however, single respondents obviously lack such motivation. Logically enough, those who currently drive a small car are more likely to consider

getting either a better car to "trade up" to a more comfortable means of travel, or a fuel efficient car to continue saving monetary costs of travel.

Interestingly, the previous adoption of changing jobs closer to home is positively associated with the consideration of getting a better/fuel-efficient car, and the time since changing jobs closer to home decreases the probability of considering getting a fuel efficient car. Although there are many stimuli to affect a change in job, in most cases, such a change involves a higher personal income or a higher status. Therefore, plausibly, individuals are more likely to consider getting a newer car as a symbol of their advancement after they get a better salary or a higher position; the more *recently* they have changed jobs, the *more* likely they are to consider getting a fuel efficient car (that generally replaces an older car). It is noteworthy that the former adoption of each of these two auto improvement strategies affects its reconsideration in the same way: the former adoption of each strategy has a negative impact on the consideration of the same strategy; and the longer ago individuals have adopted each strategy, the more likely they are to reconsider it. The former relationship suggests that the previous adoption may be still in force, and thus individuals are less likely to reconsider it. But the car previously obtained becomes obsolete and/or mechanically unreliable as more time elapses, which would motivate individuals to reconsider getting a newer car. In contrast, the former adoption of buying a car stereo system increases the probability of its reconsideration. The implication is that people generally either never buy a car stereo system or do so repeatedly. Given that it has once been adopted, it is natural to expect that a car stereo system will be reconsidered, especially when individuals are no longer satisfied with their current ones or when they are getting another car.

Adventure seekers are more likely to consider buying a car stereo system, perhaps to enhance the entertainment value of traveling. Similarly, when we developed the model of consideration of getting a fuel efficient car, we found that the adventure seeker factor score is one indicator of liking for long-distance travel overall, and that it is positively associated with the consideration of getting a fuel efficient car. It makes sense that adventure seekers are more likely to consider auto improvement strategies. However, when we tried to include both variables in the specification for the fuel-efficient car model, only the liking for long-distance travel overall was significant. Therefore, we retained it rather than the adventure seeker factor score in the final model.

3.2.1 Buy a car stereo system

The purpose of installing a car stereo system is to make the time spent in the vehicle more enjoyable, or to cater to a certain kind of personality. Table 5 presents the model of consideration of buying a car stereo system. The proportion of information in the data explained by the model, ρ^2, is 0.450. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.385. This means that all explanatory variables other than the constant term only explain 6.5 additional percentage points of information in the data. However, the final model re-estimated with the constant term constrained to equal zero also resulted in a ρ^2 of 0.450 (the difference is extremely small, about 0.00002), meaning that the true variables (all explanatory variables other than the constant term) carry essentially the full explanatory power of the model.

Table 5. Model of Consideration of "Buy a Car Stereo System"

Variable	Estimated coefficient	p-value
Constant	0.282	0.845
Objective Mobility		
Frequency of entertainment travel (SD)	0.0863	0.008
Frequency of other purpose travel (SD)	0.0696	0.018
Weekly miles in a train/BART/light rail (SD)	-0.00346	0.046
Sum of log of miles for each trip by air (LD)	-0.0190	0.016
Subjective Mobility		
Travel for grocery shopping (SD)	0.269	0.008
Relative Desired Mobility		
Overall (SD)	-0.278	0.025
Personality		
Adventure seeker factor score	0.316	0.003
Mobility Constraints		
Limitations on driving during the day	1.689	0.000
Demographics		
Age	-0.404	0.005
Female	-0.456	0.011
Year of personal vehicle	-0.0356	0.009
Service/repair occupation	0.963	0.004
Strategy Adoption		
Buy a car stereo system	0.433	0.015
Adopt compressed work week	0.731	0.004
Number of observations	1172	
Log likelihood at 0 (LL(0))	-812.369	
Log likelihood of market share (MS) model (LL(MS))	-499.215	
Log likelihood at convergence (LL(final))	-446.454	
MS ρ^2 [1 - (LL(MS)/LL(0))]	0.385	
ρ^2 [1 - (LL(final)/LL(0))]	0.450	
ρ^2 (without the constant term)	0.450	
Adjusted ρ^2 {1 - [LL(final)- # of coefficients]/LL(0)}	0.432	

SD = Short Distance LD = Long Distance

Six mobility variables are significant in this model. Both frequency of short-distance travel for entertainment and that of short-distance travel for other purposes are positively associated with the consideration of buying a car stereo system. As mentioned above, individuals could make their travel more pleasant by listening to the radio (or tapes, CDs), and thereby reduce the disutility of travel time. Thus, it makes sense that those who actually engage in a lot of travel are more likely to consider this strategy. Moreover, individuals with a higher frequency of short-distance travel for entertainment may indicate those who enjoy an "audio-rich" environment, and thus are more likely to consider buying a car stereo system. Travel for other purposes means discretionary travel to a great extent; for individuals doing a lot of such travel, a sound system increases the enjoyment of travel itself. Similarly, individuals who perceive that they do a lot of travel for grocery shopping are more likely to consider this strategy, presumably because this strategy could make travel time more tolerable. Also, in this sample, a higher subjective mobility of travel for grocery shopping partly indicates those who have children in the household; such individuals may be more likely to consider buying a car stereo system to cater to diverse

family needs. On the other hand, short-distance weekly miles in a train is negatively associated with the consideration of buying a car stereo system. Individuals traveling longer distances by train presumably spend less time in cars, so it is logical that they are also less likely to consider this strategy. Those who actually do a lot of long-distance travel by air are also less likely to consider this strategy. In this sample, greater distances of or higher frequencies of long-distance travel by air are somewhat associated with disliking travel by personal vehicle (correlation with short-distance travel liking: -0.113; correlation with long-distance travel liking: -0.168) and/or not wanting to do more travel by personal vehicle (correlation with short-distance relative desired mobility: -0.099; correlation with long-distance relative desired mobility: -0.121). Therefore, this relationship is quite plausible. The relative desire for short-distance travel overall has a negative impact on the consideration of buying a car stereo system. Wanting to travel *less* overall short-distance means individuals are burdened by the travel they are currently doing, so they are *more* likely to consider this strategy to make that travel more pleasant.

Individuals having limitations on driving during the day are more likely to consider buying a car stereo system, presumably to mitigate travel stress and make the travel more comfortable. Age negatively affects the consideration of this strategy. It is logical that younger people are more likely to consider installing a sound system in their vehicles. Likewise, men are more likely to consider buying a car stereo system. In this sample, men are significantly associated with a cluster of personality and lifestyle factors; for example, being impatient or aggressive, frustrated, adventure and status seeking. Therefore it is plausible that men are more likely to consider this strategy. Having a service/repair occupation is also positively associated with the consideration of buying a car stereo system, which is natural since such occupations often involve a lot of work-related travel.

Interestingly, the former adoption of a compressed work week is positively associated with the consideration of buying a car stereo system. One purpose of adopting a compressed work week is to reduce the total number of commute trips. A car stereo system serves as a complement of this commute–reduction strategy, making commuting more enjoyable. It is plausible that consideration of such a travel-maintaining strategy would follow the adoption of a travel-reduction strategy, to further ameliorate the disutility of the remaining travel that must be done. Furthermore, for the particular travel-reduction strategy of a compressed work week, a car stereo system may act as a cushion to relieve the incremental stress of the longer workday (9 or 10 hours instead of the usual 8).

3.2.2 Get a better car

In this sample, the consideration rate of getting a better car is 37.3%, the largest among all strategies presented in this study. The personal vehicle is the dominant means of passenger travel in the U. S. The Federal Highway Administration (1997) found that travel by private vehicle accounted for 86% of all person trips and 91% of all person miles in 1995. Therefore, it is natural that the consideration rate of getting a better car ranks first.

Table 6 presents the model of consideration of getting a better car. The proportion of information in the data explained by the model, ρ^2, is 0.183, smallest among all the models. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.039. This means that all explanatory variables other than the constant term explain 14.4 additional

percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.167, meaning that the true variables shoulder 87% of the full explanatory power of the model. In the model, the constant term is positive and significant, meaning that the average impact of the unobserved variables is in the direction of considering getting a better car.

Table 6. Model of Consideration of "Get a Better Car"

Variable	Estimated coefficient	p-value
Constant	6.235	0.000
Objective Mobility		
Weekly miles to eat a meal (SD)	0.0137	0.009
Subjective Mobility		
Take others where they need to go (SD)	0.264	0.000
Relative Desired Mobility		
Travel by bus (SD)	-0.216	0.002
Travel Liking		
Travel for entertainment (SD)	0.269	0.008
Overall (LD)	0.195	0.023
Attitudes		
Pro-high density factor score	-0.244	0.010
Personality		
Frustrated factor score	0.284	0.001
Demographics		
Year of personal vehicle	-0.0957	0.000
Years lived in the U.S.	-0.0149	0.009
Household with single adult	-0.382	0.029
Personal income category	0.247	0.000
Vehicle type is small	0.383	0.020
Strategy Adoption		
Get a better car	-1.048	0.000
Time since getting a better car	0.156	0.000
Hire somebody to do house or yard work	0.438	0.021
Time since hiring domestic help	-0.0988	0.001
Squared time since changing to driving alone	0.0126	0.017
Change jobs closer to home	0.304	0.050
Number of observations	1118	
Log likelihood at 0	-774.939	
Log likelihood of MS model	-744.427	
Log likelihood at convergence	-633.214	
MS ρ^2	0.039	
ρ^2	0.183	
ρ^2 (without the constant term)	0.167	
Adjusted ρ^2	0.158	

SD = Short Distance LD = Long Distance

Weekly miles to eat out is positively related to considering getting a better car. More travel for eating out implies that an individual is social-oriented, with a lifestyle focused outside the home; therefore she is more likely to consider getting a better car to make that "on-the-go" lifestyle more comfortable. Similarly, those perceiving that they do a lot of travel for taking others where

they need to go are more likely to consider this strategy. These individuals tend to be family/community-oriented, and they also like such travel. So their consideration of a better car may imply the desire for a larger, more comfortable car, or a car with more amenities to accommodate their passengers, or the need for a safer, more reliable means of transportation. Logically, those desiring more travel by bus are less likely to consider getting a better car.

Years lived in the U. S., acting as a proxy for age, is negatively associated with the consideration of getting a better car, which is logical since younger people are more likely to be starting out with a lower-end car. Individuals with higher personal incomes are more likely to consider getting a better car, as expected. Interestingly, the previous adoption of hiring domestic help is positively associated with the consideration of getting a better car; the more recently individuals have hired domestic help, the more likely they are to consider this strategy. Individuals hiring domestic help tend to be those who have higher household incomes and personal incomes. Therefore, it is logical that they tend to consider getting a better car. These relationships also suggest that they may want or need to engage in more travel after adopting this time-buying strategy. The squared time since changing from another mode to driving alone positively affects the consideration of getting a better car. That is, the longer ago individuals changed to driving alone, the more likely they are to consider replacing their old cars.

3.2.3 Get a fuel efficient car

Table 7 presents the model of consideration of getting a fuel efficient car. The proportion of information in the data explained by the model, ρ^2, is 0.229. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.132. This means that all explanatory variables other than the constant term explain 9.7 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.220, meaning that the true variables carry 96% of the full explanatory power of the model.

Sixteen variables are significant in the model. Individuals who do a lot of short-distance travel overall are more likely to consider getting a fuel efficient car. Since short-distance total weekly miles is dominated by miles traveled by personal vehicle, it is not surprising that such individuals would want a fuel efficient car, to reduce the costs of travel. For the same reason, those perceiving that they do a lot of long-distance travel by personal vehicle are more likely to consider getting a fuel efficient car. Similar to short-distance weekly miles in a train discussed in Section 3.2.1, individuals perceiving that they do a lot of travel by train tend to be those who are not auto-dependent, so it is plausible that they are less likely to consider getting a fuel efficient car.

Individuals advocating environmental protection are more likely to consider getting a fuel efficient car to reduce their personal energy consumption and impacts on the environment. Status seekers view the automobile as a status symbol. Since most fuel efficient vehicles are compact or small, and since there is a tradeoff between fuel efficiency and engine performance, it is plausible that status seekers are less likely to consider getting a fuel efficient car (or at least a car for which fuel efficiency is stressed as a selling point).

Table 7. Model of Consideration of "Get a Fuel Efficient Car"

Variable	Estimated coefficient	p-value
Constant	4.529	0.000
Objective Mobility		
Total weekly miles (SD)	0.00120	0.001
Subjective Mobility		
Travel by train/BART/light rail (SD)	-0.167	0.019
Travel by personal vehicle (LD)	0.115	0.049
Travel Liking		
Travel for entertainment (SD)	0.203	0.049
Overall (LD)	0.209	0.018
Attitudes		
Pro-environmental solutions factor score	0.470	0.000
Pro-high density factor score	-0.231	0.031
Lifestyle		
Frustrated factor score	0.271	0.002
Status seeker factor score	-0.233	0.013
Demographics		
Year of personal vehicle	-0.0820	0.000
Household with single adult	-0.579	0.001
Vehicle type is small	0.579	0.001
Strategy Adoption		
Get a fuel efficient car	-0.563	0.006
Time since getting a fuel efficient car	0.0968	0.000
Change jobs closer to home	0.780	0.000
Time since changing jobs closer to home	-0.126	0.007
Number of observations	1155	
Log likelihood at 0	-800.585	
Log likelihood of MS model	-694.633	
Log likelihood at convergence	-617.280	
MS ρ^2	0.132	
ρ^2	0.229	
ρ^2 (without the constant term)	0.220	
Adjusted ρ^2	0.208	

SD = Short Distance LD = Long Distance

3.3 Mobile Phone

The mobile phone bundle contains only one individual strategy. Table 8 presents the model of consideration of mobile phones. The proportion of information in the data explained by the model, ρ^2, is 0.202. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.124. This means that all explanatory variables other than the constant term explain 7.8 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.191, meaning that the true variables carry about 95% of the full explanatory power of the model.

A cursory review of the model indicates that the consideration of a mobile phone is greatly affected by objective mobility. Eight objective mobility variables are significant in this model: six with positive signs, and the other two being negatively associated with the consideration of mobile phones. The positive association is quite natural: the more one travels, the more useful it becomes to have mobile communication capabilities. The two negative coefficients relate to weekly miles of grocery shopping travel and taking others where they need to go. In both cases, the *frequency* of travel for that purpose is also in the model, with the expected positive sign. Thus, the negative effect of the distance variables partly modifies the direct positive effect of the frequency variables. Generally, the combined impact of the frequency-distance pair of variables in a given case is still positive. Specifically, the combined impact of frequency and distance for grocery shopping is positive for three-quarters of the sample, and the impact of taking others where they need to go is positive for 57.8% of the sample. In any case, it is plausible that the perceived utility of a mobile phone would be higher for a person making many trips than for one making fewer trips covering the same or longer distance, because of the increased uncertainty and scheduling complexity associated with making many trips.

Table 8. Model of Consideration of "Get a Mobile Phone" (Bundle 2)

Variable	Estimated coefficient	p-value
Constant	-2.341	0.000
Objective Mobility		
Frequency of work/school-related travel (SD)	0.0572	0.004
Frequency of grocery shopping travel (SD)	0.0927	0.002
Frequency of travel taking others where they need to go (SD)	0.0739	0.006
Total weekly miles (SD)	0.00104	0.006
Weekly miles of grocery shopping travel (SD)	-0.0178	0.025
Weekly miles to eat a meal (SD)	0.0185	0.001
Weekly miles of travel taking others where they need to go (SD)	-0.0173	0.002
Sum of log of miles for each trip by air (LD)	0.0122	0.033
Subjective Mobility		
Travel for entertainment (SD)	0.149	0.039
Travel by personal vehicle (SD)	0.158	0.009
Mobility Constraints		
Limitations on driving on the freeway	0.645	0.019
Demographics		
Age	-0.391	0.000
Anyone in household needing special care	0.973	0.004
Strategy Adoption		
Buy a car stereo system	0.284	0.034
Buy a mobile phone	-0.978	0.000
Number of observations	1263	
Log likelihood at 0	-875.445	
Log likelihood of MS model	-766.457	
Log likelihood at convergence	-698.661	
MS ρ^2	0.124	
ρ^2	0.202	
ρ^2 (without the constant term)	0.191	
Adjusted ρ^2	0.184	

SD = Short Distance LD = Long Distance

Similarly, both subjective mobility effects are positive. If individuals perceive that they do a lot of short-distance entertainment travel and travel by personal vehicle, they are more likely to consider mobile phones to utilize their travel time effectively and to coordinate with other people. Individuals having limitations on driving on the freeway are more likely to consider obtaining a mobile phone, perhaps to alleviate higher-than-average fears about safety, or travel stress in general.

Two demographic variables enter the model. The negative sign of the age variable indicates younger people are more likely to consider mobile phones – a logical result for a technological innovation still in its infancy at the time the data were collected (1998). For those who have anyone in the household needing special care, mobile phones could provide direct and timely communications with the family whenever they are working or traveling. Thus, the positive coefficient of this variable is logical.

The former adoption of a car stereo system has a positive impact on the consideration of mobile phones. Both are considered travel-maintaining strategies, and may complement each other. On the other hand, prior adoption of a mobile phone has a strongly negative impact on considering the same strategy, which is natural since the prior adoption is probably still in force.

3.4 Work-Schedule Changes

Three strategies, "Change work trip departure time", "Adopt flextime" and "Adopt compressed work week", were grouped into the bundle of work-schedule changes. These strategies share some common characteristics, such as an adjusted commute schedule, likely avoidance of peak period congestion, possible impacts on the household and so on. However, "Change work trip departure time" is different from the latter two strategies in some important ways. For example, the latter strategies require support from the employer before they can be adopted (Salomon and Mokhtarian, 1997). Perhaps for this reason, the model for "Change work trip departure time" only shares one explanatory variable with the models for the other two strategies, while the latter two models have four common variables.

Table 9 summarizes the individual models in Bundle 3. Four out of the five objective mobility variables appearing in any of these models have positive impacts on the consideration of changing work trip departure time. Higher objective mobility, especially with respect to commuting, exposes an individual to greater travel stress and congestion, and changing work trip departure time is a logical way to try to reduce such exposure. But objective mobility has a weaker role in the consideration of the other two strategies, with only one objective mobility variable significant in the model for compressed work week. This suggests that other factors play a more important role in the consideration of the latter two strategies in this bundle. However, the perceived amount of commuting is significant for the consideration of these two strategies, consistent with expectations.

Table 9. Models of Consideration of Work-Schedule Changes (Bundle 3)

	Change work trip departure time	Adopt flextime	Adopt compressed work week
N	1265	1278	1278
MS ρ^2	0.332	0.388	0.476
ρ^2	0.438	0.477	0.547
Adjusted ρ^2	0.421	0.464	0.534
Variable			
Objective Mobility			
Frequency of commuting (SD)	+		
Frequency of grocery shopping travel (SD)	+		
Weekly miles in a bus (SD)	+		
Weekly miles of commuting (SD)			+
Commute time	+		
Subjective Mobility			
Commute (SD)		+	+
Take others where they need to go (SD)	+		
Relative Desired Mobility			
Overall (SD)	-		
Travel by air (LD)			+
Travel Liking			
Travel for entertainment (SD)	+		
Attitudes			
Pro-environmental solutions factor score		+	+
Commute benefit factor score	-		
Personality			
Adventure seeker factor score	+	+	
Lifestyle			
Family & community-oriented factor score			+
Workaholic factor score	+		
Mobility Constraints			
Limitations on flying in an airplane	+		
Limitations on riding a bicycle	+		
Percent of time a vehicle is available		-	
Demographics			
Number of vehicles in household			-
Years lived in the U.S.	-		
Anyone in household needing special care		+	
Household with two or more adults and children		+	
Sales occupation			-
Full-time worker		+	+
Strategy Adoption			
Change work trip departure time	+		
Time since hiring domestic help			-
Adopt flextime		+	
Time since adopting flextime		-	
Adopt compressed work week			+
Change jobs closer to home		+	+

SD = Short Distance LD = Long Distance

In addition to the subjective amount of commute travel, four other variables are significant in two of the three models in this bundle. Since congestion deteriorates air quality and increases gas consumption, individuals advocating environmental protection are more likely to consider work-schedule changes, specifically the formal employer-based alternatives of flextime and compressed work week. Adventure seekers may be considering adopting work schedule change strategies in order to enjoy higher commute speeds or to save time for more highly desired activities. Generally, full-time workers commute at rush hour every weekday, so they will have more motivation to consider these strategies. It is interesting that adoption of the higher-cost, longer-term strategy of "Change jobs closer to home" is positively associated with the lower-cost employer-based work schedule change strategy. Either the job change did not reduce the commute to a satisfactory level, or the effectiveness of the move diminished over time, either way causing the individual to cycle back to considering lower-cost strategies (Raney, *et al*., 2000). It is also possible that the new employer is more supportive of alternative work schedules than the previous one was.

Consistent with expectation, the previous adoption of each work schedule change strategy is positively associated with the consideration of the same strategy.

3.4.1 Change work trip departure time

Fourteen variables are significant in the model of consideration of "Change work trip departure time". The proportion of information in the data explained by the model, ρ^2, is 0.438. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.332. This means that all explanatory variables other than the constant term explain 10.6 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.415, meaning that the true variables carry about 95% of the full explanatory power of the model.

Similar to objective mobility, higher subjective mobility (for taking others where they need to go, in this case) makes this strategy attractive, therefore an individual is more likely to consider it. Those who like short-distance entertainment travel may consider this strategy to better coordinate their schedule with after-work entertainment activities, or to avoid congestion so as to have more time for such activities. Individuals who desire *less* short-distance travel overall are *more* likely to consider this strategy, presumably also to save travel time and reduce stress by avoiding congestion. Conversely, individuals who enjoy higher benefits of their current commute definitely find this strategy less appealing.

The positive coefficient of the workaholic factor indicates that the more priority an individual gives to work, the more likely she would be to consider this strategy, probably to stay longer at work. This result duplicates a finding in the previous study (Raney, *et al*., 2000).

Mobility constraints on flying or bicycling may indicate individuals who feel anxious about travel or have physical constraints on traveling; this strategy could help them avoid the anxiety experienced during peak period commuting and thus make the commute more comfortable. Years lived in the U.S. acts as a proxy for age. Since older people may be more habituated to their current commute conditions and may have fewer household constraints to manage, it makes sense that years lived in the U.S. has a negative impact on the consideration of this strategy.

Table 10. Model of Consideration of "Change Work Trip Departure Time"

Variable	Estimated coefficient	p-value
Constant	-5.739	0.000
Objective Mobility		
Frequency of commuting (SD)	0.121	0.032
Frequency of grocery shopping travel (SD)	0.107	0.002
Weekly miles in a bus (SD)	0.00243	0.052
Commute time	0.0133	0.001
Subjective Mobility		
Take others where they need to go (SD)	0.221	0.004
Relative Desired Mobility		
Overall (SD)	-0.309	0.012
Travel Liking		
Travel for entertainment (SD)	0.355	0.002
Attitudes		
Commute benefit factor score	-0.302	0.003
Personality		
Adventure seeker factor score	0.342	0.000
Lifestyle		
Workaholic factor score	0.256	0.018
Mobility Constraints		
Limitations on flying in an airplane	0.820	0.016
Limitations on riding a bicycle	0.659	0.001
Demographics		
Years lived in the U.S.	-0.0214	0.001
Strategy Adoption		
Change work trip departure time	0.909	0.000
Number of observations	1265	
Log likelihood at 0	-876.830	
Log likelihood of MS model	-586.032	
Log likelihood at convergence	-492.848	
MS ρ^2	0.332	
ρ^2	0.438	
ρ^2 (without the constant term)	0.415	
Adjusted ρ^2	0.421	

SD = Short Distance LD = Long Distance

3.4.2 Adopt flextime

3.4.2.1 The model with all respondents

Table 11 presents the model of consideration of flextime based on all respondents. The proportion of information in the data explained by the model, ρ^2, is 0.477. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.388. This means that all explanatory variables other than the constant term explain 8.9 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.435, meaning that the true variables carry 91% of the full explanatory power of the model.

Table 11. Model of Consideration of "Adopt Flextime" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-3.694	0.000
Subjective Mobility		
Commute (SD)	0.251	0.001
Attitudes		
Pro-environmental solutions factor score	0.299	0.006
Personality		
Adventure seeker factor score	0.227	0.017
Mobility Constraints		
Percent of time a vehicle is available	-0.00635	0.047
Demographics		
Anyone in household needing special care	0.887	0.015
Household with two or more adults and children	0.635	0.001
Full-time worker	0.782	0.005
Strategy Adoption		
Adopt flextime	1.833	0.000
Time since adopting flextime	-0.0801	0.016
Change jobs closer to home	0.631	0.000
Number of observations	1278	
Log likelihood at 0	-885.842	
Log likelihood of MS model	-542.472	
Log likelihood at convergence	-463.664	
MS ρ^2	0.388	
ρ^2	0.477	
ρ^2 (without the constant term)	0.435	
Adjusted ρ^2	0.464	

SD = Short Distance LD = Long Distance

Ten variables are significant in this model. The relative lack of an available vehicle can require significant schedule adjustments, and conversely *not* having such a mobility constraint will make an individual less likely to consider flextime. Adopting flextime can permit a more elastic schedule, which makes this strategy more attractive to an individual having anyone in the household needing special care. For a family with children, this strategy could give parents more flexibility to take care of the children or cater to school schedules, so they are more likely to consider it.

As mentioned previously, the former adoption of each work schedule change strategy positively affects the consideration of the same strategy. However, here we also found that the longer ago an individual adopted flextime, the less likely she would be to reconsider it. This phenomenon may indicate that generally individuals reconsidering flextime are enjoying the benefits from this strategy but that its utility diminishes as time elapses.

3.4.2.2 The model with only non-adopters

Table 12 presents the flextime consideration model with only non-adopters. Compared to the model based on all respondents, only three variables are common. This suggests that the former

adoption of flextime greatly contributes to the differences between two models. Although the incremental proportion of information explained by this model is small, about 0.045, ρ^2 for the model without the constant term is 0.540, meaning that the true variables shoulder 93% of the full explanatory power of the model. This model captures some interesting relationships. Individuals perceiving that they do a lot of short-distance entertainment travel are less likely to consider adopting flextime. This may initially seem counterintuitive, in that higher mobility is expected to motivate consideration of strategies offering more flexibility. But in this dataset, subjective mobility with respect to short-distance entertainment travel is associated with positive attitudes toward travel. Specifically, these individuals tend to like travel and think their commute travel is beneficial, and have relatively fewer constraints on their travel. Thus, they have fewer motivations to consider flextime to ease travel. Also, this variable partly acts as a proxy for employment status, with higher values on this variable tending to indicate part-time workers. Obviously, part-time workers are less likely to adopt flextime (as further indicated by the positive coefficient for the full-time worker dummy variable), since their schedule already has more flexibility.

Table 12. Model of Consideration of "Adopt Flextime" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-4.222	0.000
Subjective Mobility		
Commute (SD)	0.305	0.002
Travel for entertainment (SD)	-0.313	0.012
Travel by bus (SD)	0.233	0.003
Lifestyle		
Family & community-oriented factor score	0.589	0.000
Demographics		
Manager/administrator occupation	0.495	0.041
Full-time worker	0.844	0.041
Strategy Adoption		
Adopt compressed work week	0.931	0.013
Change jobs closer to home	0.730	0.002
Number of observations	1007	
Log likelihood at 0	-697.999	
Log likelihood of MS model	-323.607	
Log likelihood at convergence	-292.751	
MS ρ^2	0.536	
ρ^2	0.581	
ρ^2 (without the constant term)	0.540	
Adjusted ρ^2	0.568	

SD = Short Distance LD = Long Distance

Being family and community-oriented positively affects the consideration of adopting flextime, as expected. And managers are more likely than other occupations to consider adopting flextime, perhaps because they have more autonomy to do so or find it easier to obtain the employer's approval. Finally, the previous adoption of compressed work week has a positive impact on the consideration of flextime, which may mean that the two work schedule strategies are

complements (the longer workdays of a compressed work week schedule make it natural to seek flexibility in moving the work window around a bit) or substitutes (if the longer workdays of compressed work week have become too burdensome, flextime may be a more desirable form of schedule flexibility).

3.4.3 Adopt compressed work week

As shown in Tables 13 and 14, the two models for consideration of the compressed work week based on all respondents and only non-adopters both have sizable ρ^2 measures (0.547 and 0.604, respectively), accounting for more than 50% of the information in the data. However, since the market shares are relatively unbalanced in both cases (only 11.8% and 9.6% considering, respectively), the incremental contributions of explanatory variables other than the constant term are small (0.071 and 0.059, respectively). But, the all-respondent model re-estimated without the constant term resulted in a ρ^2 of 0.510, meaning that the true variables carry 93% of the full explanatory power of the model. Similarly, ρ^2 for the model based on non-adopters only re-estimated without constant is 0.554, meaning that the true variables shoulder 92% of the full explanatory power of the model. Only four variables are common between the model with all respondents and the model estimated for non-adopters. As with the flextime models, this also suggests that former adoption greatly affects the nature of the consideration process for compressed work week.

3.4.3.1 The model with all respondents

Eleven variables are significant in the model of consideration of the compressed work week, of which three mobility variables positively affect its consideration. A compressed work week could reduce weekly miles of commuting and increase the probability of avoiding peak period commuting (Salomon and Mokhtarian, 1997). Thus, the longer the commute distance is, the more likely an individual would be to consider a compressed work week. As discussed previously, individuals perceiving that they make a lot of commute trips prefer this strategy. If an individual wants to engage in more air travel, a compressed work week can free an additional weekday for the travel no matter whether it is private or business travel.

An individual who is family and community-oriented can gain some time and flexibility for such activities by adopting a compressed work week. To more effectively utilize vehicles, a constraint on vehicle availability may motivate an individual to adopt a compressed work week. Thus an individual having more vehicles in the household is less likely to consider a compressed work week. To cater to their customers' needs, sales persons may either have relatively inflexible work schedules, or at least need to be available during conventional working hours, and hence be less likely to consider a compressed work week.

Interestingly, the time since adoption of hiring somebody to do house or yard work is negatively associated with the consideration of a compressed work week: that is, the more recently domestic help was hired, the more likely the individual is to consider the new alternative. Hiring somebody to do house or yard work is a time-buying strategy (Salomon and Mokhtarian, 1997). In this sample it seems to be the case that, on average, this form of buying time does not fully meet the individual's needs, or the risk it carries was found to exceed its utility (for example, a

housecleaner may threaten the individual's privacy and security), and these considerations leave him searching for further low-cost ways of obtaining more flexibility.

Table 13. Model of Consideration of "Adopt Compressed Work Week" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-4.953	0.000
Objective Mobility		
Weekly miles of commuting (SD)	0.00206	0.003
Subjective Mobility		
Commute (SD)	0.205	0.021
Relative Desired Mobility		
Travel by air (LD)	0.327	0.003
Attitudes		
Pro-environmental solutions factor score	0.304	0.010
Lifestyle		
Family & community-oriented factor score	0.320	0.015
Demographics		
Number of vehicles in household	-0.209	0.037
Sales occupation	-1.553	0.011
Full-time worker	0.841	0.013
Strategy Adoption		
Time since hiring domestic help	-0.0921	0.042
Adopt compressed work week	1.653	0.000
Change jobs closer to home	0.412	0.042
Number of observations	1278	
Log likelihood at 0	-885.842	
Log likelihood of MS model	-464.207	
Log likelihood at convergence	-400.929	
MS ρ^2	0.476	
ρ^2	0.547	
ρ^2 (without the constant term)	0.510	
Adjusted ρ^2	0.534	

SD = Short Distance LD = Long Distance

3.4.3.2 The model with only non-adopters

Table 14 presents the model of consideration of compressed work week based on only non-adopters. Of the 13 variables significant in this model, seven are mobility-related, which suggests that mobility plays a substantial role in considering this strategy. Individuals who actually *do* travel a lot by train may consider a compressed work week to reduce their weekly travel distance. On the other hand, people who *want* to travel more by train are also more likely to consider this strategy, which at first seems contradictory. But a higher relative desired mobility for short-distance travel by train is associated with higher pro-environmental solutions factor scores (correlation: 0.264) and pro-high density factor scores (correlation: 0.265), so an individual desiring more travel by train may be more likely to consider a compressed work week to reduce her personal impact on the environment. Similarly, a higher liking of travel by bus is also correlated with higher pro-environmental solutions factor scores (correlation: 0.288) and pro-high density factor scores (correlation: 0.303), thus individuals enjoying travel by bus are

more likely to consider this strategy. Relative desired mobility and travel liking for long-distance travel by personal vehicle indicates an individual wants and enjoys such travel. Since a compressed work week could extend the weekend by a day, it is natural for such a person to consider this strategy to enhance her long-distance travel. Equally naturally in the opposite direction, an individual enjoying commute benefits would be less likely to consider reducing the commute by adopting a compressed work week.

Table 14. Model of Consideration of "Adopt Compressed Work Week" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-6.493	0.000
Objective Mobility		
Weekly miles in a train/BART/light rail (SD)	0.00387	0.002
Subjective Mobility		
Commute (SD)	0.201	0.035
Relative Desired Mobility		
Travel by train/BART/light rail (SD)	0.280	0.014
Travel by personal vehicle (LD)	0.327	0.029
Travel Liking		
Travel by bus (SD)	0.277	0.015
Travel by personal vehicle (LD)	0.268	0.047
Attitudes		
Commute benefit factor score	-0.329	0.012
Lifestyle		
Family & community-oriented factor score	0.411	0.005
Demographics		
Sales occupation	-1.654	0.023
Strategy Adoption		
Time since hiring domestic help	-0.153	0.030
Time since changing to drive alone	0.127	0.041
Move your home closer to work	0.661	0.013
Work part- instead of full-time	-0.866	0.015
Number of observations	1150	
Log likelihood at 0	-797.119	
Log likelihood of MS model	-362.737	
Log likelihood at convergence	-315.392	
MS ρ^2	0.545	
ρ^2	0.604	
ρ^2 (without the constant term)	0.554	
Adjusted ρ^2	0.587	

SD = Short Distance LD = Long Distance

Compared to full-time workers, part-time workers already have a more flexible work schedule and less work time, thus those who have adopted working part-time are probably both less interested in considering and less able to consider a compressed work week. An individual changing from another commute mode to driving alone shows a tolerance for commuting by auto, and the more recently she adopted this strategy, the less likely she is to consider a compressed work week.

3.5 Hire Somebody to Do House or Yard Work

"Hire somebody to do house or yard work" was classified into an independent bundle. It is a time-buying strategy involving some monetary cost, and it is conceptually different from the other strategies. The descriptive analysis found that many fewer respondents regard reducing or easing travel as the reason to adopt or consider this strategy (Clay and Mokhtarian, 2002). This suggests the strategy has fewer travel implications. In the previous study (Mokhtarian, *et al.*, 1997; Raney, *et al*., 2000), "Hire somebody to do house or yard work" was eliminated from the analysis because in the factor analysis, it oddly loaded on a conceptually inappropriate bundle. Salomon and Mokhtarian (1997) viewed its adoption as one of the potential externalities of travel, and argued that congestion levels can motivate its adoption to some extent. Since there appears to be little further exploration of this strategy in the transportation literature, we believe that modeling its consideration could offer some insightful information.

3.5.1 The model with all respondents

Table 15 presents the model of consideration of "Hire somebody to do house or yard work" based on all respondents. The proportion of information in the data explained by the model, ρ^2, is 0.319. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.219. This means that all explanatory variables other than the constant term explain 10 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.298, meaning that the true variables carry 93% of the full explanatory power of the model.

Two mobility variables are significant in this model, but at least one of them is more an indicator of lifestyle than of mobility, as discussed below. Consistent with the suggestion of the descriptive analysis, factors other than travel seem to dominate the consideration of this strategy.

The model shows that the more one travels (short distance) for entertainment, the more likely the individual is to consider hiring somebody to do house or yard work. This suggests that a higher objective mobility, especially for out-of-home entertainment activities, makes this time-buying strategy attractive. Conversely, desiring more travel for grocery shopping may characterize an individual whose lifestyle is focused on the home, and it is not surprising that such an individual would be less likely to consider outsourcing domestic responsibilities. Also not surprisingly, a status seeker would be more likely to consider this strategy.

Four demographic variables are significant in this model. As the partner typically shouldering the greater share of domestic responsibilities (Turner and Niemeier, 1997; Tingey, *et al.*, 1996), it is logical that females are more likely to consider hiring somebody to do house or yard work. With years lived in the U.S. acting as a proxy for age, it is reasonable that older people may have some physical limitations on doing house or yard work, and hence be more likely to hire outside help. Older workers would additionally tend to have higher incomes, and the model separately shows that, as expected, people with higher incomes are more likely to consider this strategy. The average personal and household incomes of those with production/construction/ craft occupations are significantly smaller than those of the other occupations in this sample, and as such they may be unable to afford or hesitate to prioritize adopting this strategy.

Table 15. Model of Consideration of "Hire Somebody to Do House or Yard Work" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-2.872	0.000
Objective Mobility		
Weekly miles of entertainment travel (SD)	0.00379	0.048
Relative Desired Mobility		
Travel for grocery shopping (SD)	-0.301	0.037
Lifestyle		
Status seeker factor score	0.213	0.017
Demographics		
Female	0.665	0.000
Years lived in the U.S.	0.0205	0.000
Production/construction/craft occupation	-1.228	0.051
Personal income category	0.155	0.009
Strategy Adoption		
Get a better car	0.360	0.034
Hire somebody to do house or yard work	1.408	0.000
Time since hiring domestic help	-0.125	0.000
Start home-based business	0.740	0.000
Number of observations	1238	
Log likelihood at 0	-858.116	
Log likelihood of MS model	-670.343	
Log likelihood at convergence	-584.923	
MS ρ^2	0.219	
ρ^2	0.319	
ρ^2 (without the constant term)	0.298	
Adjusted ρ^2	0.304	

SD = Short Distance LD = Long Distance

The former adoption of a better car tends to increase the probability of considering hiring somebody to do house or yard work. The acquisition of a better car indicates higher income, and hence its effect is consistent with the finding of personal income discussed above. Similar to previous results, the former adoption of hiring somebody to do house or yard work positively affects its reconsideration. And the longer the time since adoption of this strategy, the less likely an individual is to reconsider it. If the strategy is still in force, it may be indicative of a trusted and reliable long-time domestic worker (*i.e.*, the respondent is not considering hiring someone *different*); if the strategy had been discarded at some point, it may indicate habituation to doing the house or yard work oneself over time. The former adoption of a home-based business is positively associated with the consideration of hiring somebody to do house or yard work. It is plausible that someone who already spends much of the time at home working for the business may not want to spend more time at home on domestic duties. Also, in this sample the adoption of a home-based business is marginally associated with higher household incomes, and it makes sense that people with higher household incomes prefer this strategy.

3.5.2 The model with only non-adopters

As shown in Table 16, ten variables are significant in the model of consideration of "Hire somebody to do house or yard work" estimated only for non-adopters. Compared to the all-respondent model, this model contains five common variables. This shows substantial commonality between the models.

Similar to the entertainment objective mobility variable found in the all-respondent model, a higher frequency of travel to eat out implies an individual is social-oriented and less likely to stay at home, thus she would be more likely to consider hiring somebody to do house or yard work. Traveling a lot long distance by modes other than personal vehicle or airplane is indicative of some kind of special circumstance; at a minimum, it suggests being far away from home a great deal (unlike the previous variable, which involves short-term, local absences from home), which may reduce both the need for a housecleaner, and the ability to monitor one. On the other hand, for those who perceive that they do a lot of airplane travel, this time-buying strategy can help compensate for time lost during trips.

Table 16. Model of Consideration of "Hire Somebody to Do House or Yard Work" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-5.827	0.000
Objective Mobility		
Frequency of travel to eat a meal (SD)	0.0759	0.042
Log of sum of miles for each trip by other means (LD)	-0.146	0.019
Subjective Mobility		
Travel by air (LD)	0.319	0.001
Lifestyle		
Status seeker factor score	0.340	0.010
Mobility Constraints		
Limitations on driving on the freeway	0.890	0.009
Demographics		
North San Francisco	-0.501	0.021
Female	0.800	0.000
Years lived in the U.S.	0.0261	0.001
Personal income category	0.263	0.002
Strategy Adoption		
Start home-based business	0.898	0.002
Number of observations	851	
Log likelihood at 0	-589.868	
Log likelihood of MS model	-368.875	
Log likelihood at convergence	-327.618	
MS ρ^2	0.375	
ρ^2	0.445	
ρ^2 (without the constant term)	0.383	
Adjusted ρ^2	0.426	

SD = Short Distance LD = Long Distance

Limitations on freeway driving may be physical or psychological. If the latter, domestic help may be a useful stress-reduction strategy; if the former, physical limitations may make domestic help an attractive alternative for maintaining the household.

Homes and yards (when present) in urban North San Francisco are smaller on average than those of the suburban residents in this sample. Therefore, it is not surprising that the urban residents are less likely to hire somebody to do house or yard work.

3.6 Mode Change

The mode change bundle contains two strategies: "Change from driving alone to work to some other means" and "Change from another means of getting to work to driving alone", which are theoretically opposite in terms of the direction of respondents' behavior. The diversion from driving alone to other, more efficient, means of travel is the general goal that many public policies addressing congestion intend to achieve. However, the growth in automobile ownership and vehicle miles traveled is well documented by sources such as Hu and Young (1999); among all modes, driving alone accounted for 79.6% of commuting trips in 1995. Changing from driving alone to work to some other means is beneficial to society since it reduces individuals' contributions to congestion, and it could offer some benefits to the individual in time savings, monetary cost savings, and stress reduction. But at the same time the change may be at the cost of individuals' increased inconvenience and loss of time control, which may be their main concerns about such a choice. Thus, changing from driving alone to some other means is likely to be considered primarily when congestion frustrates the driver deeply *and* an alternative means of travel is competitive in time and cost to the automobile. However, if such a mode change turns out not to afford the expected benefit in terms of time, cost and stress (for example, the alternative means of travel encounters the same congestion as the automobile, or the service is perceived as too costly, unreliable, or unsafe), some individuals would cycle back to driving alone to enjoy the increased flexibility. Of course, except in the case of free flow conditions, other users in the transportation system will suffer an additional time and cost penalty when changes (back) to the drive alone mode are made.

Individuals should consider changing from driving alone to some other means only when they currently drive alone, so the model of consideration of such a mode change should be based on the respondents whose commute modes are driving alone. Similarly, the model of consideration of changing from another means to driving alone should be based on the respondents whose commute modes are means other than driving alone. However, we cannot completely differentiate respondents' commute modes using the data in the survey, which measured weekly miles traveled by mode and by purpose separately, but not (in order to ease the response burden) by all purpose-mode combinations. Nevertheless, we were able to impute the primary commute mode for each respondent, by comparing reported weekly miles traveled by each mode to the fraction of weekly miles traveled for commuting. The assignment of primary commute mode was made with 100% confidence for 13.5% (single-mode users) of the sample of 1,357 commuting workers, with a high degree of confidence for an additional 55.6% (those whose miles of travel by a single mode exceeded half their commute miles traveled, with travel by all other modes summing to less than half the commute miles), and with moderate confidence for the remaining 30.9% (by identifying the mode used for the greatest proportion of total weekly distance traveled). The five modes for which weekly miles traveled were reported, and hence

which constituted the possible commute mode categories, were personal vehicle/motorcycle, bus/ferry, train/BART/light rail, walking/jogging/bicycling, and other (two airplane commuters).

Importantly, then, we have no way of distinguishing driving alone from carpooling; both would fall under the first category. However, selecting just the first category as the subsample on which to estimate the model for considering changing from driving alone to some other means, ensures that the estimation sample is much closer to the desired group (solo drivers only) than if we were to use the entire sample. Thus, that model is estimated for the 1,015 personal vehicle/motorcycle commute mode users (987 in the final model due to missing data).

Estimating the model for the other direction of change, from another means to driving alone, proved to be problematic. Using only the subsample of 268 cases in the remaining four commute mode categories is not entirely appropriate, since an unknown number of those in the first category, personal vehicle commuters, are carpoolers and thus also belong in the estimation sample. Further, the market shares in the subsample are extremely unbalanced, with only 16 (6%) considering a change to driving alone. (This is an interesting finding in its own right, however, suggesting that public transit users in this sample are relatively loyal, whether from satisfaction or from necessity, or both.) Conversely, however, using the full sample is also not appropriate, since it will contain many solo drivers who should not, legitimately, be considering changing *to* driving alone. Further, the market shares are even more unbalanced in the full sample, with only 60 (4.7%) out of 1,283 considering the change.

Substantial effort on both the subsample and full sample failed to produce a satisfactory model for the consideration of changing to driving alone from other means of commuting (*i.e.*, a model with conceptually appropriate variables and signs, and reasonable goodness of fit), and in view of the sample definition and unbalanced market share issues described above, this is not surprising. Thus, in the remainder of this section we discuss the results for the single model of considering changing from driving alone to another means of commuting.

Table 17 presents the model of consideration of changing from driving alone to work to some other means. The proportion of information in the data explained by the model, ρ^2, is 0.571. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.443. This means that all explanatory variables other than the constant term explain 12.8 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.565, meaning that the true variables carry 99% of the full explanatory power of the model.

Table 17. Model of Consideration of "Change from Driving Alone to Some Other Means" (personal vehicle/motorcycle commute mode users)

Variable	Estimated coefficient	p-value
Constant	-2.778	0.004
Objective Mobility		
Weekly miles of entertainment travel (SD)	0.00641	0.006
Subjective Mobility		
Travel by personal vehicle (SD)	0.404	0.001
Relative Desired Mobility		
Work/school-related travel (SD)	-0.305	0.047
Travel by bus (SD)	0.302	0.012
Travel Liking		
Travel for eating a meal (SD)	0.550	0.001
Travel by personal vehicle (SD)	-0.585	0.000
Attitudes		
Pro-environmental solutions factor score	0.431	0.004
Personality		
Loner factor score	-0.372	0.002
Calm factor score	-0.333	0.018
Demographics		
Time living in the neighborhood	0.00265	0.020
Number of vehicles in the household	-0.276	0.025
Years lived in the U.S.	-0.0298	0.002
Strategy Adoption		
Get a mobile phone	-0.468	0.047
Adopt flextime	1.160	0.000
Time since adopting flextime	-0.144	0.006
Time since adopting compressed work week	0.142	0.008
Change from driving alone to some other means	0.884	0.000
Change from another means to driving alone	0.780	0.003
Number of observations	987	
Log likelihood at 0	-684.136	
Log likelihood of MS model	-380.774	
Log likelihood at convergence	-293.432	
MS ρ^2	0.443	
ρ^2	0.571	
ρ^2 (without the constant term)	0.565	
Adjusted ρ^2	0.543	

SD = Short Distance

As shown in Table 17, the more one travels (short distance) for social/recreation/entertainment purposes, the more likely she is to consider changing from driving alone to some other means. In the estimation sample of personal vehicle/motorcycle commuters, weekly distance traveled for short-distance entertainment activities is significantly positively correlated with distance traveled for most means of travel presented in this study: personal vehicle, train, walking/jogging/ bicycling and other means. This suggests that short-distance travel for leisure purposes intrinsically involves diverse means of travel for this sample. In the 1995 Nationwide Personal Transportation Survey, the average vehicle occupancy for the social/recreational purpose was 2.04 persons per vehicle, which ranks first among all the purposes presented (Hu and Young,

1999). This indicates that leisure travel is most susceptible to the use of means of travel other than driving alone. Further, alcohol drinking is associated with many entertainment activities, which would make driving alone undesirable. Based on these and other considerations, we speculate that individuals who actually do a lot of travel for social/recreation/entertainment may be (1) more socially-oriented to start with, and thus more open to shared forms of commute transportation; (2) younger and therefore more receptive to change; (3) more likely to chain social/recreation/ entertainment trips to the commute. Such people are likely, in association with the commute, to want to be traveling with other companions, to be drinking alcohol and thus not wanting to drive alone, and/or to be walking/bicycling/jogging for recreation. Any or all of these factors could influence the individual to consider changing commute mode from driving alone. Similarly, those liking short-distance travel for eating out are more susceptible to such a mode change.

The relative desired mobility for short-distance work/school-related travel is negatively associated with the consideration of changing from driving alone to some other means. The distance traveled for short-distance work/school-related activities is strongly correlated (0.49) with the distance traveled by personal vehicle; and the relative desire for short-distance work/school-related travel is also positively correlated (0.13) with that for personal vehicle travel. Both facts indicate that short-distance work/school-related travel is heavily associated with personal vehicle travel in these respondents' minds and experiences. Therefore, it is plausible that those wanting more short-distance work/school-related travel are less likely to consider such a mode change. Logically, those wanting more travel by bus are more inclined to consider traveling by a mode other than driving alone, and those who perceive that they do a lot of travel by personal vehicle are more likely to consider changing from driving alone to some other means, to reduce the travel by personal vehicle. Conversely, however, individuals *liking* travel by personal vehicle are *less* likely to consider alternative means of travel.

Individuals advocating environmental protection are more likely to consider changing from driving alone to more socially beneficial means of travel, presumably because they wish to reduce their personal energy consumption and impacts on the environment. Since loners like to be alone and like being independent, they are naturally less likely to consider changing from driving alone to a mode that will involve being around (and dependent on) others. The calm factor score is negatively associated with the consideration of changing from driving alone to some other means. Individuals scoring highly on this factor tend to be those who are patient, neither aggressive nor restless, and hence are less likely to be irritated by congestion than others. Therefore, they would be less motivated to consider this strategy.

Logically, individuals having *fewer* vehicles in the household are *more* likely to seek some other means of travel. The longer one has lived in the neighborhood, the more likely she is to consider changing from driving alone to some other means. Time living in the neighborhood is an indicator of familiarity with the neighborhood. It is natural that those familiar with the neighborhood, including its transportation alternatives, are more likely to consider such a mode change. In contrast, however, years lived in the U. S., acting as a proxy for age, is negatively related to considering changing from driving alone to some other means, consistent with several studies. The Royal Automobile Club (1995, as cited in Curtis and Headicar, 1997) pointed out that commitment to car use increases with age, being particularly strong with the oldest drivers (65+). Curtis and Headicar (1997) also found that older people (50+) appear to be less likely to have considered changing from car to other transport for the journey to work.

The previous adoption of a mobile phone decreases the probability of considering changing from driving alone to some other means. At the time the data were collected (1998), those acquiring a mobile phone tended to be those with a high value of time and those whose jobs required a lot of travel, so they would be less inclined to change to a mode that would be slower and for which they would lose some scheduling control. Further, travel by a means other than driving alone would eliminate the privacy of mobile phone conversations while traveling, and hence reduce the appeal of such an alternative.

The former adoption of flextime is positively associated with the consideration of changing from driving alone to some other means; the more recently individuals adopted flextime, the more likely they are to consider this strategy. This suggests that a relatively unrestricted work schedule makes changing to some other means of travel (which generally involves additional time restrictions) more feasible. Conversely, the time since adopting a compressed work week is positively associated with the consideration of changing from driving alone to some other means. Although adopting flextime and adopting a compressed work week are in the same factor-based bundle, they are in different conceptual bundles. Adopting flextime is a travel-maintaining strategy, while both adopting a compressed work week and changing from driving alone to some other means are travel-reducing strategies. Such a difference results in different impacts on the consideration of changing from driving alone to some other means. It is plausible that individuals intend to switch to another strategy in the same bundle (specifically, changing from driving alone to some other means) when the utility of having adopted a compressed work week is exhausted. Similar to previous results, the former adoption of changing from driving alone to some other means positively affects its reconsideration. Interestingly, the former adoption of changing from another means to driving alone is also positively associated with the consideration of changing from driving alone to some other means. At first glance this may seem inevitable (even tautological), since only those who are currently driving alone can be considering changing *from* driving alone. However, given that some (probably many) solo drivers have never used another commute mode, and given that many solo drivers are not considering changing, this variable is not a perfect predictor of change. But individuals who have adopted changing from another means to driving alone are clearly aware of the advantages and disadvantages of the alternative means of travel. Thus, when circumstances change or dissatisfaction recurs, they are more likely to consider cycling back to the alternative means of travel. Taken together, the presence of both mode change adoption variables suggests that some individuals are mode-flexible, switching back and forth between driving alone and shared-ride modes as circumstances warrant. It may also be the case that some respondents currently use a combination of driving alone and other commute modes, and may be considering both directions of change simultaneously – either to all driving alone or all shared-ride.

3.7 Home-based Work

The home-based work bundle comprises three individual strategies: “Buy equipment/services to help you work from home”, “Telecommute (part- or full-time)” and “Start home-based business or put more effort into an existing one”. These three home-based work strategies could reduce the cost and stress of commute travel, offer a relatively flexible schedule, and provide more contact with the family. Also, they may involve some monetary costs (for example, if equipment/services have to be provided by the individual) and potential negative impacts on the household (for example, space constraints may inconvenience other household members).

However, there are still some important differences among the three strategies in this bundle. For example, telecommuting (and sometimes "Buy equipment/services to help you work from home") requires managerial approval; starting a home-based business could not only avoid commute congestion, but also involve considerable financial risk (and hence perhaps increase stress on net, rather than reduce it).

Table 18 summarizes the individual models of consideration of strategies in Bundle 6. The adventure seeker factor score appears in every model, with a positive impact on considering home-based work. Adventure seekers are those who tend to seek variety and dislike a habit-oriented life. With a personality geared toward change, they seem to be more likely than others to adopt or consider most of these travel-related strategies. Also, the adventure-seeking factor obtained in this study is partly based on a trait of liking to travel at high speeds. It is likely that home-based work could reduce the need for congested travel at peak periods, allowing these individuals to enjoy moving at higher speeds during off-peak periods.

Home-based work strategies could be used to lower the obstacles posed by mobility constraints; for example, telecommuting may provide virtual accessibility to work for people having mobility limitations (Hesse, 1995). In all three models, lower vehicle availability increases the consideration of home-based work. Consistent with expectation, consideration of each strategy in this bundle is also positively associated with one or more other mobility constraints (limitations on driving during the day, flying in an airplane and riding a bicycle).

The previous adoption of "Buy equipment/services to help you work from home" also has a positive impact on considering each of the home-based work strategies. Obviously, the purchase of support equipment/services is generally a prerequisite of starting home-based work. Similar to previous results, the previous adoption of each strategy in this bundle is positively associated with the consideration of the same strategy.

Years lived in the U.S., acting as a proxy for age, is negatively related to the consideration of "Buy equipment/services to help you work from home" and telecommuting. This suggests that older people are less likely to consider these telework-based strategies. Older workers may be more habituated to current commute conditions, more aversive to change in general and more reluctant to tackle the information technology challenges associated with remote work.

Table 18. Models of Consideration of Home-based Work (Bundle 6)

	Buy equipment to help work from home	Telecommute	Start home-based business
N	1206	1253	1277
MS ρ^2	0.211	0.265	0.318
ρ^2	0.381	0.430	0.451
Adjusted ρ^2	0.363	0.414	0.434
Variable			
Objective Mobility			
Weekly miles to eat a meal (SD)	+		
Number of trips by personal vehicle (LD)	+		
Log total miles by personal vehicle (LD)		+	
Subjective Mobility			
Travel for eating a meal (SD)			-
Relative Desired Mobility			
Commute (SD)		-	
Work/school-related travel (SD)	+		
Take others where they need to go (SD)			+
Travel Liking			
Travel by train/BART/light rail (SD)			-
Attitudes			
Pro-environmental solutions factor score	+		+
Travel stress factor score			+
Personality			
Adventure seeker factor score	+	+	+
Lifestyle			
Frustrated factor score	+		+
Mobility Constraints			
Limitations on driving during the day	+	+	
Limitations on flying in an airplane		+	
Limitations on riding a bicycle			+
Percent of time a vehicle is available	-	-	-
Demographics			
Years lived in the U.S.	-	-	
Anyone in household needing special care			+
Household with single adult	+		
Household with two or more adults		-	
Manager/Administrator occupation		+	
Professional/technical occupation		+	
Vehicle type is pickup	+		
Full-time worker		+	
Strategy Adoption			
Time since hiring domestic help			-
Buy equipment to help work from home	+	+	+
Telecommute		+	
Change jobs closer to home	+		+
Start home-based business	+		+

SD = Short Distance LD = Long Distance

Four variables have common positive impacts on the consideration of "Buy equipment/services to help you work from home" and "Start home-based business or put more effort into an existing one". Those advocating environmental protection are more likely to consider both home-based work strategies, as a means of decreasing vehicular travel and thus reducing their personal energy consumption and impacts on the environment. Frustrated people indicate those who are dissatisfied with their life and feel a lack of control (Redmond, 2000). They may view working at home as a way to increase control and life satisfaction (through reduced stress and commute time savings), and hence be more likely to consider these strategies. Similar to the discussion in Section 3.4, the high-cost strategy of "Changing job closer to home" is positively associated with the home-based work strategies; it is possible that a still unsatisfactory commute or a diminished utility of the relocation causes the individual to seek other alternatives. As mentioned above, the previous adoption of starting a home-based business positively affects its reconsideration, and it also affects the consideration of "Buy equipment/services to help you work from home" in the same direction. This is plausible since the home-based business will need to replace equipment or services from time to time.

3.7.1 Buy equipment/services to help you work from home

In the previous study (Raney, *et al.*, 2000), this strategy and telecommuting were classified into the remote work tier in view of their shared characteristics. Table 19 presents the model of consideration of "Buy equipment/services to help you work from home". The proportion of information in the data explained by the model, ρ^2, is 0.381. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.221. This means that all explanatory variables other than the constant term explain 16 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.360, meaning that the true variables carry 94% of the full explanatory power of the model.

Three mobility variables are positively associated with the consideration of buying equipment/ services to help one work from home. That is reasonable since this strategy may save time or provide convenience for individuals with a higher objective mobility. The specific variables related to travel for eating out and long-distance travel by personal vehicle may be indicators of high overall objective mobility that the individual wishes to reduce, or indicators of particular lifestyle choices that the individual wishes to maintain by saving time in other ways (*i.e.*, reducing the commute). Similarly, those desiring more work/school-related travel (as opposed to commute travel per se) could obtain time benefits by adopting this strategy.

Being single is positively associated with the consideration of "Buy equipment/services to help you work from home". Compared to other family status groups, the single adult may have a greater ability to adopt this strategy – for example, fewer space constraints and fewer disturbances from others. The pickup truck vehicle type variable is probably an indicator of "blue-collar" home-based businesses such as plumbers and electricians, who are more likely to drive a pickup for their business.

Table 19. Model of Consideration of "Buy Equipment/Services to Help You Work from Home"

Variable	Estimated coefficient	p-value
Constant	-4.188	0.000
Objective Mobility		
Weekly miles to eat a meal (SD)	0.0188	0.001
Number of trips by personal vehicle (LD)	0.0156	0.010
Relative Desired Mobility		
Work/school-related travel (SD)	0.246	0.034
Attitudes		
Pro-environmental solutions factor score	0.374	0.000
Personality		
Adventure seeker factor score	0.262	0.005
Lifestyle		
Frustrated factor score	0.191	0.050
Mobility Constraints		
Limitations on driving during the day	2.016	0.000
Percent of time a vehicle is available	-0.00674	0.025
Demographics		
Years lived in the U.S.	-0.0168	0.008
Household with single adult	0.477	0.008
Vehicle type is pickup	0.774	0.004
Strategy Adoption		
Buy equipment to help work from home	1.828	0.000
Change jobs closer to home	0.384	0.026
Start home-based business	0.781	0.000
Number of observations	1206	
Log likelihood at 0	-835.936	
Log likelihood of MS model	-659.440	
Log likelihood at convergence	-517.243	
MS ρ^2	0.211	
ρ^2	0.381	
ρ^2 (without the constant term)	0.360	
Adjusted ρ^2	0.363	

SD = Short Distance LD = Long Distance

3.7.2 Telecommuting

3.7.2.1 The model with all respondents

Table 20 presents the model of consideration of telecommuting based on the full sample. The proportion of information in the data explained by the model, ρ^2, is 0.430. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.265. This means that all explanatory variables other than the constant term explain 16.5 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.418, meaning that the true variables carry 97% of the full explanatory power of the model.

Table 20. Model of Consideration of "Telecommute" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-3.530	0.000
Objective Mobility		
Log total miles by personal vehicle (LD)	0.0579	0.043
Relative Desired Mobility		
Commute (SD)	-0.224	0.029
Personality		
Adventure seeker factor score	0.293	0.002
Mobility Constraints		
Limitations on driving during the day	1.198	0.013
Limitations on flying in an airplane	0.914	0.014
Percent of time a vehicle is available	-0.0110	0.000
Demographics		
Years lived in the U.S.	-0.0180	0.005
Household with two or more adults	-0.432	0.008
Manager/Administrator occupation	0.797	0.001
Professional/technical occupation	0.587	0.006
Full-time worker	0.820	0.003
Strategy Adoption		
Buy equipment to help work from home	1.152	0.000
Telecommute	1.446	0.000
Number of observations	1253	
Log likelihood at 0	-868.513	
Log likelihood of MS model	-638.475	
Log likelihood at convergence	-495.295	
MS ρ^2	0.265	
ρ^2	0.430	
ρ^2 (without the constant term)	0.418	
Adjusted ρ^2	0.414	

SD = Short Distance LD = Long Distance

Thirteen variables are significant in the model, including two mobility variables. The interpretation of the positive effect of the long-distance miles by personal vehicle variable is in some ways similar to that of the related variable in the previous model. Whether the long-distance travel by personal vehicle is by choice or by necessity, telecommuting could represent a commute-reducing compensation effect. In this model, there is the additional possibility that the respondent could be confounding home-based telecommuting with location-independent teleworking, which may be compatible/synergistic with long-distance personal vehicle travel. With respect to the relative desired mobility variable, it is obvious that individuals desiring *less* short-distance commute travel would be *more* likely to consider telecommuting.

Empirical studies have found that single female professionals without space constraints, and respondents with small children present, are more likely to prefer/choose telecommuting (Yap and Tng, 1990; Mannering and Mokhtarian, 1995). Interestingly, here we found that living in a household with two or more adults and no children is negatively associated with considering telecommuting. This result is consistent with those earlier findings.

Managers and professionals are more likely to consider telecommuting. They may regard work productivity as one of the most important motivations to adopt telecommuting (Mokhtarian, Bagley, and Salomon, 1998). Just as importantly, they have greater job suitability and/or autonomy to consider telecommuting than those with other occupations. Being a full-time worker is positively related to considering telecommuting. Logically, having a more frequent and thus more onerous commute is likely to motivate full-time workers to consider telecommuting. Also, it is likely that part-time workers have already obtained the flexibility they sought (by choosing part-time work), and because they are already only in the office part-time, further absence due to remote work may not be feasible or favored by management.

3.7.2.2 The model with only non-adopters

As shown in Table 21, eleven variables are significant in the model of consideration of telecommuting estimated only for non-adopters, of which seven variables are common to the model estimated on all respondents. This shows substantial commonality between the models.

Table 21. Model of Consideration of "Telecommute" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-3.390	0.000
Objective Mobility		
Weekly miles of grocery shopping travel (SD)	0.0183	0.007
Subjective Mobility		
Travel by bus (SD)	0.298	0.000
Relative Desired Mobility		
Commute (SD)	-0.315	0.009
Mobility Constraints		
Limitations on flying in an airplane	1.008	0.009
Demographics		
Years lived in the U.S.	-0.0282	0.000
Household with two or more adults	-0.415	0.038
Manager/administrator occupation	1.193	0.000
Professional/technical occupation	0.837	0.002
Personal income category	0.174	0.024
Strategy Adoption		
Time since changing work trip departure time	0.0725	0.047
Buy equipment to help work from home	1.221	0.000
Number of observations	1038	
Log likelihood at 0	-719.487	
Log likelihood of MS model	-416.119	
Log likelihood at convergence	-353.836	
MS ρ^2	0.422	
ρ^2	0.508	
ρ^2 (without the constant term)	0.493	
Adjusted ρ^2	0.492	

SD = Short Distance LD = Long Distance

Individuals perceiving that they do a lot of travel by bus are more likely to consider telecommuting. To the extent that bus is considered a more onerous commute mode than auto, telecommuting may be an attractive commute-reduction alternative for those people in particular. Conversely, longer weekly miles of grocery shopping may characterize an individual whose lifestyle is focused on the home, and it is not surprising that such an individual would be more likely to consider telecommuting, obtaining more time at home or for domestic support activities such as grocery shopping.

As expected, personal income is positively related to considering telecommuting. It is roughly consistent with a previous empirical finding that income per capita in the household is positively related to choosing both occasional and frequent telecommuting (Mannering and Mokhtarian, 1995). Higher personal incomes tend to be associated with managerial and professional jobs having enough seniority and autonomy to permit the choice of telecommuting. Interestingly, the time since changing work trip departure time positively affects the consideration of telecommuting. As mentioned previously, "Change work trip departure time" cannot be unadopted without effectively re-adopting it. Thus, the time since adoption of this strategy may indicate an underlying and increasing dissatisfaction with the commute and some mismatches between the time commitments required for work versus non-work activities (Mannering and Mokhtarian, 1995). This relationship is logical since telecommuting could resolve this dilemma either frequently or occasionally.

3.7.3 Start home-based business or put more effort into an existing one

In the previous study (Mokhtarian, *et al*., 1997), starting a home-based business was grouped with high-cost, long-term strategies, but here it is classified into the middle-cost home-based work bundle. It is noteworthy that mobility conditions may not be a direct reason to motivate an individual to adopt this strategy; there may be some other reasons (for example, earning money) dominating its adoption and consideration, but mobility conditions could certainly contribute to such a decision (Salomon and Mokhtarian, 1997). Moreover, starting a home-based business may not necessarily reduce vehicle miles traveled; it is possible that this strategy even increases travel for business activities, but this strategy could reduce travel at congested periods and locations.

As shown in Tables 22 and 23, fourteen and thirteen variables are significant in the models estimated on the full sample and only non-adopters, respectively. Five variables are common to both models: travel stress factor score, adventure seeker factor score, frustrated factor score, the previous adoption of buying equipment and changing job closer to home. This suggests that the former adoption greatly affects consideration of starting a home-based business – or, importantly, expanding an existing one. It may be that many of the differences between the two models relate to the difference between starting a new business (which all respondents could do) and expanding a current one (which only adopters could do).

3.7.3.1 The model with all respondents

Table 22 presents the model of consideration of starting a home-based business based on the full sample. The proportion of information in the data explained by the model, ρ^2, is 0.451. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.318.

This means that all explanatory variables other than the constant term explain 23.1 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.446, meaning that the true variables carry 99% of the full explanatory power of the model.

Table 22. Model of Consideration of "Start Home-based Business or Put More Effort into an Existing One" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-1.711	0.004
Subjective Mobility		
Travel for eating a meal (SD)	-0.246	0.031
Relative Desired Mobility		
Take others where they need to go (SD)	0.283	0.019
Travel Liking		
Travel by train/BART/light rail (SD)	-0.207	0.019
Attitudes		
Pro-environmental solutions factor score	0.333	0.002
Travel stress factor score	0.313	0.005
Personality		
Adventure seeker factor score	0.607	0.000
Lifestyle		
Frustrated factor score	0.364	0.000
Mobility Constraints		
Limitations on riding a bicycle	0.449	0.031
Percent of time a vehicle is available	-0.00663	0.027
Demographics		
Anyone in household needing special care	0.672	0.073
Strategy Adoption		
Time since hiring domestic help	-0.0902	0.020
Buy equipment to help work from home	0.391	0.027
Change jobs closer to home	0.400	0.025
Start home-based business	2.201	0.000
Number of observations	1277	
Log likelihood at 0	-885.149	
Log likelihood of MS model	-603.695	
Log likelihood at convergence	-486.242	
MS ρ^2	0.318	
ρ^2	0.451	
ρ^2 (without the constant term)	0.446	
Adjusted ρ^2	0.434	

SD = Short Distance LD = Long Distance

The negative impact of subjective mobility for eating out contrasts with, and further illuminates, the positive impact of its objective mobility counterpart on the consideration of buying equipment for home-based work. As discussed in Section 3.7.1, having a higher objective mobility for eating out associated with greater consideration of home-based work could either indicate a desire to maintain that activity or a desire to reduce it. Here, having a high subjective mobility for eating out associated with *lower* consideration of a home-based business suggests

that the former explanation is the stronger one. Individuals perceiving that they do a lot of travel to eat out indicate those who are social-oriented and hence less likely to want to stay at home for long periods of time. The previous model suggests that they are open to working at home occasionally to save time (perhaps through part-time telecommuting or overtime work at home), but this model suggests they are less likely to make it a pervasive lifestyle.

Conversely, individuals desiring more travel for taking others where they need to go are family-oriented, and hence are more likely to adopt this strategy for its potential flexibility in taking care of the family. Individuals enjoying travel by train are less likely to consider starting a home-based business. A higher liking for short-distance travel by train is significantly associated with positive travel attitudes in this sample; specifically, such individuals like travel and think that the commute is beneficial, thus it is logical that they do not prefer this strategy. The travel stress factor score is positively associated with the consideration of starting a home-based business. This is logical because, at a minimum, this strategy could reduce traveling at peak periods when stress is highest, although it may not necessarily reduce vehicular travel overall.

The time since hiring domestic help negatively affects the consideration of starting a home-based business; that is, the more *recently* an individual hired somebody to do house or yard work, the *more* likely she is to consider this strategy. It is quite plausible that in some cases these two variables are complementary: domestic help was obtained precisely to free the individual to start a home-based business. It may also indicate a continued searching for more flexibility after one strategy to buy time was not as effective as desired. Also relating to a need for flexibility, those having anyone in the household needing special care are more likely to start a home-based business.

3.7.3.2 The model with only non-adopters

Table 23 presents the model of consideration of starting a home-based business estimated only for non-adopters. Similar to the model for considering buying equipment, those who travel more long distance by personal vehicle are more likely to consider starting a home-based business, perhaps due to the greater schedule flexibility offered by this strategy. On the other hand, a higher distance and/or frequency of airplane travel may indicate an individual who does a lot of work-related air travel. Although excess business travel may cause some individuals at the extreme to want to opt out, for many (even despite the acknowledged disadvantages), business air travel is considered a status symbol. Therefore, someone doing a lot of such travel may be more invested in the current job, and less likely to consider a major workstyle/lifestyle change.

Similar to the discussion in the all-respondent model, a higher liking for taking others where they need to go indicates those who are family-oriented; thus it is logical that this variable is positively related to starting a home-based business. Interestingly, individuals enjoying a higher travel freedom have few financial, comfort and flexibility constraints on their travel (Redmond, 2000), and thus would have less of a need to consider this strategy in order to obtain greater freedom.

Individuals living in North San Francisco are also more likely to consider this strategy, perhaps because the higher population and employment densities of an urban location are viewed as offering a stronger potential customer base for the home-based business. Similar to the model for considering buying equipment, single individuals are more likely to consider starting a home-

based business. In addition to perhaps having fewer space constraints and family distractions, it may also be easier to bear the financial risk of starting a business without having family dependents. This may also partly explain the North San Francisco variable as well, since North San Francisco residents have smaller households on average than do the suburban residents in this sample.

Table 23. Model of Consideration of "Start Home-based Business" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-3.709	0.000
Objective Mobility		
Log of sum of miles for each trip by personal vehicle (LD)	0.0683	0.039
Sum of log of miles for each trip by air (LD)	-0.0175	0.050
Travel Liking		
Take others where they need to go (SD)	0.293	0.013
Attitudes		
Travel stress factor score	0.342	0.009
Travel freedom factor score	-0.272	0.045
Personality		
Adventure seeker factor score	0.579	0.000
Lifestyle		
Frustrated factor score	0.313	0.007
Demographics		
North San Francisco	0.562	0.005
Female	-0.507	0.010
Household with single adult	0.523	0.012
Strategy Adoption		
Buy equipment to help work from home	0.648	0.001
Change jobs closer to home	0.534	0.008
Work part- instead of full-time	0.587	0.015
Number of observations	1129	
Log likelihood at 0	-782.563	
Log likelihood of MS model	-436.668	
Log likelihood at convergence	-389.595	
MS ρ^2	0.442	
ρ^2	0.502	
ρ^2 (without the constant term)	0.455	
Adjusted ρ^2	0.484	

SD = Short Distance LD = Long Distance

It is interesting that women in this sample are less likely to consider starting a home-based business than men are. Some studies (*e.g.*, Deming, 1994) have shown that home-based workers are somewhat *more* likely to be women, so the fact that the variable only appears in the non-adopter model is important: women *who have not previously adopted* the home-based business strategy are less likely to consider it than men who have not previously adopted it. In this sample, women are less risk-taking than men (with respective means of 2.77 and 3.00 on a 5-point scale), and this is also true for non-adopters of this strategy (2.75 versus 2.98); women describe themselves as being a little less ambitious than men do (3.48 versus 3.58), and this is

also true for non-adopters of this strategy (3.45 versus 3.57). These may be reasons for the relative reticence of women to consider the risky strategy of starting their own business.

The previous adoption of working part- instead of full-time is positively associated with the consideration of starting a home-based business, indicating a logical linkage between these two forms of workstyle flexibility.

3.8 Residential/Employment Relocation

The residential/employment relocation bundle involves two strategies: "Change jobs closer to home" and "Move your home closer to work". Both strategies are high-cost, long-term adjustments, and involve risk to the individual (for example, dissatisfaction with the new residential/employment location). However, the impacts of each strategy on the household may be different. When residential relocation takes place, all household members may have to alter previous habit patterns and adapt to the new environment; during this process, dissatisfaction and tension may occur. Moreover, the commuting time of other household members may increase when the relocation was made to ease the commute for only one household member (Salomon and Mokhtarian, 1997). On the contrary, except for a possible salary change or a significant change in stress levels or in time available for household activities, the impacts of employment relocation are mainly focused on the individual making the change. This difference may result in significantly different models of consideration of these two strategies. Perhaps for this reason, these two models only share one variable: relative desired mobility for commuting. It is logical that those desiring *less* commute travel are *more* likely to consider either of these two strategies in order to reduce their commute.

Similar to previous results, the former adoption of "Move your home closer to work" positively affects the consideration of the same strategy, but the consideration of changing jobs closer to home does not exhibit that pattern. As can be seen from Table 3, the prior adoption rates for this strategy are similar between considers and non-considerers, indicating that in this case consideration is independent of adoption.

Table 24. Models of Consideration of Residential/Employment Relocation (Bundle 7)

	Change jobs closer to home	Move your home closer to work
N	1254	1269
MS ρ^2	0.302	0.554
ρ^2	0.440	0.628
Adjusted ρ^2	0.427	0.615
Variable		
Objective Mobility		
Weekly miles in a bus (SD)	+	
Commute distance	+	
Number of trips by other means (LD)	+	
Sum of log of miles for each trip by personal vehicle (LD)		-
Subjective Mobility		
Travel for grocery shopping (SD)	+	
Relative Desired Mobility		
Commute (SD)	-	-
Travel for eating a meal (SD)	+	
Travel by walking/jogging/bicycling (SD)		+
Travel by air (LD)	-	
Attitudes		
Travel stress factor score	+	
Lifestyle		
Frustrated factor score		+
Excess Travel		
Excess travel indicator		+
Demographics		
North San Francisco		-
Total workers in the household		+
Years lived in the U.S.	-	
Anyone in the household needing special care		+
Strategy Adoption		
Change work trip departure time	+	
Hire somebody to do house or yard work	-	
Buy equipment to help work from home		+
Move your home closer to work		+

SD = Short Distance LD = Long Distance

3.8.1 Change jobs closer to home

Table 25 presents the model of consideration of "Changing jobs closer to home". The proportion of information in the data explained by the model, ρ^2, is 0.440. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.302. This means that all explanatory variables other than the constant term explain 13.8 additional percentage points of information in the data. However, the final model re-estimated without the constant term resulted in a ρ^2 of 0.440, meaning that the true variables carry essentially the full explanatory power of the model.

Table 25. Model of Consideration of "Changing Jobs Closer to Home"

Variable	Estimated coefficient	p-value
Constant	-0.420	0.536
Objective Mobility		
Weekly miles in a bus (SD)	0.00201	0.049
Commute distance	0.00181	0.003
Number of trips by other means (LD)	0.0947	0.013
Subjective Mobility		
Travel for grocery shopping (SD)	0.311	0.002
Relative Desired Mobility		
Commute (SD)	-1.021	0.000
Travel for eating a meal (SD)	0.461	0.005
Travel by air (LD)	-0.217	0.031
Attitudes		
Travel stress factor score	0.227	0.022
Demographics		
Years lived in the U.S.	-0.0229	0.000
Strategy Adoption		
Change work trip departure time	0.734	0.000
Hire somebody to do house or yard work	-0.388	0.038
Number of observations	1254	
Log likelihood at 0	-869.207	
Log likelihood of MS model	-606.433	
Log likelihood at convergence	-486.412	
MS ρ^2	0.302	
ρ^2	0.440	
ρ^2 (without the constant term)	0.440	
Adjusted ρ^2	0.427	

SD = Short Distance LD = Long Distance

All three objective mobility variables that are significant in the model are positively related to considering changing jobs closer to home. It is logical that those who actually do a lot of travel, especially commuting either by auto or by bus, are more inclined to consider changing jobs closer to home in order to reduce the commute. Also, a higher frequency of long-distance trips by modes other than personal vehicle or airplane may be indicative of some kind of special circumstance in which the individual wishes to maintain that travel by saving time in other ways (*i.e.*, reducing the commute). As discussed in Section 3.5.1, desiring more travel for grocery shopping may indicate those whose lifestyles are focused on home. Here, individuals perceiving that they do a lot of travel for grocery shopping are more likely to consider changing jobs closer to home. This may suggest that they wish to save time in this way to maintain or even increase the time they can devote to cooking and entertaining at home. On the other hand, those who want to do more travel for eating out could also save time to engage in such travel by adopting this strategy. Individuals desiring *less* long-distance air travel may indicate those who are experiencing too much travel stress altogether, and thus be *more* likely to consider this strategy to reduce the commute. Similarly, a higher travel stress factor score is positively associated with the consideration of changing jobs closer to home. This is reasonable since this strategy could reduce the commute, and thus greatly decrease travel stress.

Years lived in the U. S., acting as a proxy for age, has a negative impact on considering this strategy. This is plausible since older people may be more habituated to their current commute conditions (and hence less likely to reduce the commute), and more firmly entrenched in their current jobs (not wishing, for example, to lose retirement benefits by changing jobs too close to retirement). The former adoption of "Change work trip departure time" positively affects the consideration of changing jobs closer to home. It is plausible that an individual tends to seek a higher-cost strategy to ease travel after she has adopted a lower-cost one (change work trip departure time, in this case) but dissatisfaction still persists or recurs. Interestingly, the former adoption of hiring domestic help is negatively related to considering this strategy. Individuals could obtain time benefits by adopting this time-buying strategy, and thus would have less motivation to consider reducing the commute by changing jobs.

3.8.2 Move your home closer to work

As shown in Table 26, the proportion of information in the data explained by the model of consideration of "Move your home closer to work", ρ^2, is 0.628, largest among all the models. Due to relatively unbalanced market shares, the proportion of information in the data explained by the market share model, MS ρ^2, is also quite large, about 0.554, meaning that the incremental proportion of information explained by the true variables is only 0.074. However, the final model re-estimated without the constant term resulted in a ρ^2 of 0.614, meaning that the ten true variables carry virtually the full explanatory power of the model.

Ten variables are significant in this model. Higher frequency and distance of long-distance travel by personal vehicle are negatively associated with this strategy through the sum of log-miles variable (see Section 2.3). In this sample, individuals who travel more long-distance by personal vehicle tend to be those who like long-distance travel by personal vehicle; this may suggest that they are more habituated to travel by auto, and thus they may find this commute-reduction strategy unattractive or unnecessary. Individuals desiring more travel for walking/jogging/bicycling are more likely to consider moving their home closer to work. This makes sense since this strategy could reduce the commute and thus save time for such activities – even allowing a bicycle or walk commute. As mentioned in Section 2.3, the excess travel indicator may represent a preference for discretionary travel, which may be negatively related to mandatory travel such as commuting. Thus it is plausible that the excess travel indicator is positively associated with this commute-reduction strategy, to allow more time for the desired discretionary travel.

Being frustrated makes individuals more likely to consider moving their home. Individuals may expect to feel more satisfied and/or in control after they move to a new environment. Residents living in North San Francisco are less likely to consider moving their home closer to work. In this sample, the commutes of North San Francisco residents are much shorter than those of the other two suburban residents (10.34 miles versus 17.59 miles), which is not surprising in view of their more central location. Therefore, it is plausible that urban residents are less likely to consider moving their home. Those having anyone in the household needing special care are more likely to consider this strategy, presumably because it offers time and flexibility benefits by reducing the commute. The total workers in the household variable is positively associated with

considering moving the home. This may seem to be counterintuitive since more workers may mean more constraints on residential relocation. However, the more workers there are in the household, the more likely that the residential location has been optimized for *a different* worker's job location, and thus that the respondent has a longer-than-desired commute and is "agitating" to move closer. An alternative explanation is that an individual may have been responding with respect to moving her home closer to *another household member's* work. Either way, the more workers, the more difficult it is to optimize home location, and the more likely that changes would be considered. Also, in this sample, a higher number of workers in the household indicates those who have higher household incomes, which is an indicator of greater residential mobility. In addition, since having more workers in the household is marginally associated with being a suburban resident, consistent with the previous result, suburban residents are more likely to consider moving.

Table 26. Model of Consideration of "Move Your Home Closer to Work"

Variable	Estimated coefficient	p-value
Constant	-2.979	0.000
Objective Mobility		
Sum of log of miles for each trip by personal vehicle (LD)	-0.0654	0.007
Relative Desired Mobility		
Commute (SD)	-0.891	0.000
Travel by walking/jogging/bicycling (SD)	0.333	0.011
Lifestyle		
Frustrated factor score	0.326	0.009
Excess Travel		
Excess travel indicator	0.129	0.000
Demographics		
North San Francisco	-0.745	0.001
Anyone in the household needing special care	0.985	0.014
Total workers in the household	0.293	0.017
Strategy Adoption		
Buy equipment to help work from home	0.776	0.000
Move your home closer to work	0.729	0.005
Number of observations	1269	
Log likelihood at 0	-879.604	
Log likelihood of MS model	-392.621	
Log likelihood at convergence	-327.211	
MS ρ^2	0.554	
ρ^2	0.628	
ρ^2 (without the constant term)	0.614	
Adjusted ρ^2	0.615	

SD = Short Distance LD = Long Distance

Interestingly, the former purchase of equipment to support working at home increases the possibility of considering residential relocation. Individuals may have saved time by buying equipment and working at home, but the benefit may not have fully met their needs, leaving them more likely to consider this commute-reduction strategy in order to save yet more time.

Shifting to more home-based work may have also highlighted a need for more space (or a different arrangement of space) at home, promoting consideration of other residential alternatives.

3.9 Alter Employment Status

The alter employment status bundle contains two high-impact, long-term adjustments: "Work part- instead of full-time" and "Retire or stop working". In general, retiring or stopping working is a more radical response than working part- instead of full-time, and thus has more important impacts on the individual and the household. These two strategies involve significant monetary costs, but both could obtain considerable time benefits. These two strategies could reduce or even avoid the stress of commuting; however, they may induce some other stress (for example, household financial burdens), which may be much greater than the reduced commute stress (Salomon and Mokhtarian, 1997). Therefore, reducing or easing travel could be one of the reasons to consider altering employment status, but it may not be the predominant one. Table 27 summarizes the model of consideration of each strategy in this bundle. Only one mobility-related variable (a mobility constraint) was found to be significant in the model of consideration of working part- instead of full-time. This is consistent with the expectation that influences other than travel (especially commuting) dominate such a decision.

As shown in Table 27, the models for each strategy are quite different, and only one variable, number of vehicles in the household, is common, suggesting that although these two strategies may have similar transportation-related consequences, they are affected by different factors in the individual's response process. More vehicles in the household tend to indicate those who have higher household incomes. It is obvious that they are more able to afford the monetary costs of altering employment status compared to those with lower household incomes, and hence would be more likely to consider such strategies. In addition, this variable is positively associated with total workers in the household. For the household with more workers, it may not have too great a negative impact that only one member changes her employment status; on the contrary, such an adjustment may offer some benefits to other household members (for example, a greater devotion to cooking for the household).

Mobility constraints increase the probability of considering altering employment status. This is plausible since both strategies in this bundle could reduce or even eliminate the need to commute at peak periods. In addition, the limitation on riding a bicycle is significantly associated with the older workers in this sample. Compared to younger people, older people are more likely to consider working part-time in order to reduce the stress of commuting, or as a transition into eventual full retirement.

Similar to previous results, the former adoption of each strategy in this bundle positively affects the consideration of the same strategy.

Table 27. Models of Consideration of Altering Employment Status (Bundle 8)

	Work part- instead of full-time	Retire or stop working
N	1279	1234
MS ρ^2	0.327	0.415
ρ^2	0.403	0.510
Adjusted ρ^2	0.392	0.493
Variable		
Subjective Mobility		
Travel for entertainment (SD)		+
Travel Liking		
Work/school-related travel (LD)		-
Travel for entertainment (LD)		+
Attitudes		
Pro-environmental solutions factor score	+	
Personality		
Loner factor score		-
Lifestyle		
Family & community-oriented factor score	+	
Mobility Constraints		
Limitations on driving during the day		+
Limitations on riding a bicycle	+	
Demographics		
Age		+
Number of vehicles in the household	+	+
Years lived in the U.S.		+
Household size		-
Anyone in household needing special care		+
Clerical/administrative support occupation	+	
Household income category		+
Strategy Adoption		
Buy a mobile phone		-
Get a better car		+
Change from another means to driving alone	-	
Work part- instead of full-time	+	
Time since working part-time	-	
Retire or stop working		+
Time since retiring or stopping working	+	

SD = Short Distance LD = Long Distance

3.9.1 Work part- instead of full-time

Working part- instead of full-time is an important work or lifestyle change. An individual may be retained by the current employer with such a change, or it may involve a certain amount of effort to find an appropriate part-time job. The part-time work may not shorten the commute in terms of one-way distance. However, part-time workers could reduce the stress and time of commuting either by working fewer than eight hours a day (thus avoiding commuting at peak periods), or by working fewer than five days a week (thus reducing the frequency of commuting), or by combining both means.

3.9.1.1 The model with all respondents

Table 28 presents the model of consideration of working part- instead of full-time based on the full sample. The proportion of information in the data explained by the model, ρ^2, is 0.403. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.327. This means that all explanatory variables other than the constant term explain 7.6 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.354, meaning that the true variables carry 88% of the full explanatory power of the model.

Table 28. Model of Consideration of "Work Part- instead of Full-time" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-2.785	0.000
Attitudes		
Pro-environmental solutions factor score	0.286	0.005
Lifestyle		
Family & community-oriented factor score	0.429	0.000
Mobility Constraints		
Limitations on riding a bicycle	0.421	0.025
Demographics		
Number of vehicles in the household	0.154	0.032
Clerical/administrative support occupation	0.924	0.000
Strategy Adoption		
Change from another means to driving alone	-0.594	0.023
Work part- instead of full-time	1.582	0.000
Time since working part-time	-0.0855	0.012
Time since retiring or stopping working	0.421	0.000
Number of observations	1279	
Log likelihood at 0	-886.535	
Log likelihood of MS model	-596.466	
Log likelihood at convergence	-529.3965	
MS ρ^2	0.327	
ρ^2	0.403	
ρ^2 (without the constant term)	0.354	
Adjusted ρ^2	0.392	

As mentioned previously, the only mobility-related variable in this model is a mobility constraint, making it unique among all the models presented in this study for not having any objective mobility, subjective mobility, relative desired mobility, or travel liking variables. Those advocating environmental protection are more likely to consider working part-time. This is plausible because they tend to reduce their personal energy consumption and impacts on the environment by reducing the commute. Individuals who are family and community-oriented are more likely to consider working part-time, perhaps because they obtain more, and more flexible, time to take care of family or participate in community activities by adopting this strategy. Clerical workers are more likely to consider working part-time. There may be several reasons for this: clerical/administrative work may lend itself better than professional or managerial work

to being split among two or more part-time workers rather than a single full-time worker; hence there are likely to be more opportunities for part-time work in clerical occupations; the routine nature of much clerical work may not generate an emotional attachment to the job, and may make doing it full-time more burdensome than for less routine jobs.

Individuals who have changed from another commute mode to driving alone show a tolerance for commuting by auto; they may not think the reduction of commuting is attractive or necessary. Therefore they are less likely to consider working part-time. The former adoption of working part-time is positively associated with its reconsideration; the more *recently* one adopts this strategy, the *more* likely she would be to reconsider it. This could represent people who are still working part-time indicating they are considering it (see Section 3.1 for a discussion of this general response pattern), or it could distinguish lifestyles in which part-time work is either chosen repeatedly in response to various circumstances (such as when the next child is born), or not at all. Interestingly, the longer ago individuals adopt retiring or stopping working, the more likely they are to consider working part-time. This could indicate, say, people easing back into the workforce after quitting to raise children, or people who retire for a while but eventually tire of the "idle" life and seek new work to enrich their lives.

3.9.1.2 The model with only non-adopters

As shown in Table 29, ten variables are significant in the model of consideration of working part- instead of full-time estimated only for non-adopters. Four of those variables are common to the model with all respondents: family and community-oriented factor score, change from another commute mode to drive alone, time since retiring or stopping work and clerical/administrative occupation. Thus, those factors seem especially important to this decision. Unlike the model on the full sample, three relative desired mobility variables are significant in this model. Those desiring more long-distance work/school-related travel are less likely to consider working part-time. This is natural since opportunities for such travel are generally associated with full-time employment status. In this sample of commuting workers, the distance that individuals actually traveled by air is extremely strongly correlated (0.92) with that of long-distance work/school-related travel, and the relative desire for long-distance air travel is also significantly positively correlated with the desire for long-distance work/school-related travel (0.24). Both facts indicate that long-distance travel is heavily associated with work/school-related travel in these respondents' minds and experiences. Therefore, it is logical that those desiring more long-distance air travel would also be less likely to consider working part-time. Conversely, long-distance overall relative desired mobility is *positively* associated with the consideration of working part-time. The implication of this relationship together with the other two relative desired mobility variables is that individuals wanting more time for long-distance recreational and/or personal vehicle travel are more likely to consider working part-time – again a natural choice especially for workers nearing retirement age.

As the partner still typically carrying the greater share of domestic responsibilities (Turner and Niemeier, 1997; Tingey, *et al.*, 1996), it is logical that the female is more likely to consider working part- instead of full-time, gaining more time to take care of the family.

The former adoption of "Move your home closer to work" decreases the probability of considering working part-time. These two strategies are high-impact ones. It is very likely that the adoption of residential relocation has met individuals' needs, or that their dissatisfaction has

not increased to the extent that another major long-term adjustment is necessary. Therefore, it is plausible that they are less likely to consider working part-time. On the contrary, the former adoption of starting a home-based business positively affects the consideration of working part-time. Home-based businesses theoretically allow individuals to choose how much they work (by the freedom to accept or decline new clients), and hence may naturally lend themselves to the consideration of part-time work. In reality, however, many home-based businesses can be even more demanding and time-consuming than a salaried job – which may itself motivate individuals to consider a part-time option even if only as an elusive ideal.

Table 29. Model of Consideration of "Work Part- instead of Full-time" (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-2.022	0.000
Relative Desired Mobility		
Overall (LD)	0.386	0.003
Work/school-related travel (LD)	-0.257	0.024
Travel by air (LD)	-0.276	0.016
Lifestyle		
Family & community-oriented factor score	0.673	0.000
Demographics		
Female	0.452	0.022
Clerical/administrative support occupation	0.855	0.001
Strategy Adoption		
Change from another means to driving alone	-0.834	0.017
Move your home closer to work	-0.844	0.014
Start home-based business	0.638	0.025
Time since retiring or stopping work	0.467	0.001
Number of observations	1063	
Log likelihood at 0	-736.815	
Log likelihood of MS model	-423.484	
Log likelihood at convergence	-377.400	
MS ρ^2	0.425	
ρ^2	0.488	
ρ^2 (without the constant term)	0.474	
Adjusted ρ^2	0.473	

LD = Long Distance

3.9.2 Retire or stop working

Retiring or stopping working is also a major work or lifestyle change. As mentioned above, many stimuli other than commuting can motivate individuals to consider this strategy. At the extreme, however, people who are severely frustrated by the stress of commuting may consider quitting work for transportation reasons. Salomon and Mokhtarian (1997) suggested that some individuals adopting this strategy might think that the overall costs of congestion have surpassed the benefits of work and the net benefits that other responses have to offer.

3.9.2.1 The model with all respondents

Table 30 presents the model of consideration of retiring or stopping working based on the full sample. The proportion of information in the data explained by the model, ρ^2, is 0.510. The proportion of information in the data explained by the market share model, MS ρ^2, is 0.415. This means that all explanatory variables other than the constant term explain 9.5 additional percentage points of information in the data. The final model re-estimated without the constant term resulted in a ρ^2 of 0.468, meaning that the 14 true variables carry 92% of the full explanatory power of the model.

Table 30. Model of Consideration of "Retire or Stop Working" (all respondents)

Variable	Estimated coefficient	p-value
Constant	-7.795	0.000
Subjective Mobility		
Travel for entertainment (SD)	0.236	0.019
Travel Liking		
Work/school-related travel (LD)	-0.439	0.000
Travel for entertainment (LD)	0.300	0.005
Personality		
Loner factor score	-0.269	0.008
Mobility Constraints		
Limitations on driving during the day	1.333	0.002
Demographics		
Age	0.669	0.003
Number of vehicles in the household	0.245	0.009
Years lived in the U.S.	0.0259	0.015
Household size	-0.221	0.021
Anyone in household needing special care	0.938	0.020
Household income category	0.209	0.004
Strategy Adoption		
Buy a mobile phone	-0.618	0.002
Get a better car	0.456	0.037
Retire or stop working	1.003	0.023
Number of observations	1234	
Log likelihood at 0	-855.344	
Log likelihood of MS model	-500.160	
Log likelihood at convergence	-419.497	
MS ρ^2	0.415	
ρ^2	0.510	
ρ^2 (without the constant term)	0.468	
Adjusted ρ^2	0.492	

SD = Short Distance LD = Long Distance

Several mobility-related variables are significant in this model. Subjective mobility for short-distance entertainment travel is positively associated with the consideration of quitting work. A higher perceived mobility for short-distance entertainment travel is significantly correlated (0.15) with liking for such travel; that is, those perceiving that they do a lot of travel for short-distance

entertainment still like such travel. Therefore, it is plausible that they are more likely to consider quitting work, perhaps in order to obtain more time to maintain such travel. Logically, individuals liking long-distance work/school-related travel are less likely to consider quitting work. On the other hand, since engaging in a lot of long-distance recreation travel will conflict with a conventional work schedule, individuals favoring long-distance travel for entertainment are more likely to consider quitting work to obtain more time for such activities.

The loner factor score is negatively related to the consideration of quitting work. In this sample, a positive loner factor score indicates younger respondents and single respondents. Obviously, younger people are just starting their careers, and thus are less likely to consider quitting work. Also, it is plausible that single respondents are less likely to consider quitting work since they have to make a living. Age and years lived in the U. S. (acting as a proxy for age) are positively related to considering quitting work, a natural result. Those having more household members are less likely to consider this strategy. In this sample, a larger household size is significantly associated with having children or teenagers living at home. Thus it may be important to work to support the current and future (*e.g.*, college) needs of the family. Individuals having anyone in the household needing special care are more likely to consider quitting work, perhaps because they could thereby obtain more time for dependent care. People with higher *household* incomes are also more likely to consider this strategy. This is reasonable since high-income households would be more able to afford having one household member quit working.

The previous adoption of "Get a mobile phone" decreases the probability of considering quitting work. Individuals acquiring a mobile phone may be relatively work-oriented (this variable has a significant correlation of 0.11 with the workaholic factor score) since a mobile phone facilitates productive work while traveling, and schedule coordination for the frequent traveler. Also, getting a mobile phone is significantly correlated with being in a managerial position (0.10) or having children in the household (0.15). It is logical that such people are less likely to consider quitting work. The former adoption of a better car is positively associated with the consideration of quitting work. Since this variable is positively correlated with personal income and age variables, getting a better car may suggest some career advancement, which would bring one closer to retirement considerations.

3.9.2.2 The model with only non-adopters

Thirteen variables are significant in the model of consideration of quitting work estimated only for non-adopters, of which eleven are common to the model based on the full sample. This shows quite substantial commonality between the two models, which is not surprising since 97% of the full sample are non-adopters.

The number of long-distance trips by modes other than personal vehicle or airplane is positively associated with the consideration of quitting work. Frequent long-distance travel by modes other than personal vehicle or airplane (such as train or ship) is indicative of some kind of special circumstance; at a minimum, it suggests being far away from the office relatively often. A conventional job may be a major obstacle for frequent long-distance travel by unusual modes, so individuals would be more likely to consider this strategy in order to maintain such travel.

The square of the time since changing from driving alone to another commute mode is positively associated with considering quitting work. In this sample, changing from driving alone to some

other means is the only strategy for which "Reducing or easing travel" is the most commonly cited reason (Clay and Mokhtarian, 2002). Therefore, evidently this kind of mode change is helpful for coping with congestion and reducing travel stress. The longer ago individuals change from driving alone to some other means, the more likely they are to consider quitting work. This may suggest that the effectiveness of the mode change strategy has worn off over time with continuously deteriorating congestion, and that individuals are eventually led to consider this more radical decision. It may also simply be another indicator of age since this variable is significantly (although not highly) correlated with the age category (0.10) and years lived in the U. S. (0.07). Although the age category variable and years lived in the U. S. are also in the model, neither are perfect measures of the respondents' true age, and thus multiple indicators may be required to more completely capture this effect.

Table 31. Model of Consideration of "Retire or Stop Working " (only non-adopters)

Variable	Estimated coefficient	p-value
Constant	-8.506	0.000
Objective Mobility		
Number of trips by other means (LD)	0.0449	0.042
Subjective Mobility		
Travel for entertainment (SD)	0.255	0.013
Travel Liking		
Work/school-related travel (LD)	-0.466	0.000
Travel for entertainment (LD)	0.279	0.010
Personality		
Loner factor score	-0.214	0.038
Mobility Constraints		
Limitations on driving during the day	1.525	0.001
Demographics		
Age	0.663	0.005
Years lived in the U.S.	0.0294	0.007
Anyone in household needing special care	0.926	0.021
Household income category	0.233	0.001
Strategy Adoption		
Buy a mobile phone	-0.557	0.006
Get a better car	0.555	0.015
Squared time since changing to other means	0.00447	0.032
Number of observations	1193	
Log likelihood at 0	-826.925	
Log likelihood of MS model	-470.205	
Log likelihood at convergence	-399.937	
MS ρ^2	0.431	
ρ^2	0.516	
ρ^2 (without the constant term)	0.469	
Adjusted ρ^2	0.499	

SD = Short Distance LD = Long Distance

4. SUMMARY AND CONCLUSIONS

4.1 Overview of the Models

In this study, we developed binary logit models for the consideration of each of 16 individual travel-related strategies (for a 17th strategy, changing from some other means of travel to work to driving alone, the applicable subsample and its share of consideration were too small to support a viable model). Table 32 summarizes the variables significant in each model, with positive and negative signs indicating the direction of effect for each variable. We have discussed the models of consideration of each of the travel-related strategies within a given factor-based bundle in Section 3; here the summary table is grouped according to the conceptual bundle classification (see Section 2.2.2 for a discussion of the two bundle classification systems). Except for the model of consideration of changing from driving alone to some other means, which is based on personal vehicle/motorcycle commute mode users, all other models presented in this summary are estimated on the full sample. ρ^2 and adjusted ρ^2 are used to measure the goodness of fit of these models. The ρ^2 s range from 0.183 for the model of consideration of getting a better car, to 0.628 for the model of consideration of "Move your home closer to work". The adjusted ρ^2 s for the models range from 0.158 to 0.615.

Since in many cases the shares of consideration and non-consideration are quite unbalanced, the market share (MS) ρ^2 (the ρ^2 for the model containing only a constant term, whose predicted probability of consideration of a given alternative is simply the sample share considering that alternative) is relatively high, with the full model ρ^2 not much higher. To measure the explanatory contribution of the true variables to the models, we re-estimated the final models with the constant term fixed to zero and computed the ρ^2 s again. The comparison between ρ^2 s for models with and without the constant term shows that the true variables in the model always account for at least 87% of the information explained by the full model, and carry at least 95% of the explanatory power of the model in more than half of the cases. Thus, even when the MS ρ^2 is already high due to unbalanced shares, we contend that the full model is still useful, since it provides behavioral insight into *why* the market shares are so unbalanced. Such a model is more robust, and transferable to contexts having different market shares, than a model containing only a constant term and hence incapable of providing that behavioral insight.

In the following subsection we provide an overview of the relationships of consideration to the contemporaneous explanatory variables. The relationships of consideration to the prior adoption and time since adoption variables are reserved for discussion in the succeeding subsection.

Table 32. Summary of the Individual Models (grouped by conceptual bundles)

Dependent Variable / Goodness-of-fit	Travel maintaining/increasing (Low cost)							Travel reducing (Medium cost)				Major location/lifestyle change (high cost)				
	A. Buy a car stereo system	B. Get a mobile phone	C. Get a better car	D. Get a fuel efficient car	E. Change work trip departure time	F. Hire somebody to do house or yard work	G. Adopt flextime	H. Adopt compressed work week	I. Change from driving alone to other means	K. Buy equipment to help work from home	L. Telecommute	M. Change jobs closer to home	N. Move your home closer to work	O. Work part- instead of full-time	P. Start home-based business	Q. Retire or stop working
N	1172	1263	1118	1155	1265	1238	1278	1278	987	1206	1253	1254	1269	1279	1277	1234
MS ρ^2	0.385	0.124	0.039	0.132	0.332	0.219	0.388	0.476	0.443	0.211	0.265	0.302	0.554	0.327	0.318	0.415
ρ^2	0.450	0.202	0.183	0.229	0.438	0.319	0.477	0.547	0.571	0.381	0.430	0.440	0.628	0.403	0.451	0.510
ρ^2 (without the constant term)	0.450	0.191	0.167	0.220	0.415	0.298	0.435	0.510	0.565	0.360	0.418	0.440	0.614	0.354	0.446	0.468
Adjusted ρ^2	0.432	0.184	0.158	0.208	0.421	0.304	0.464	0.534	0.543	0.363	0.414	0.427	0.615	0.392	0.434	0.492
Explanatory Variable																
Objective Mobility																
Frequency of commuting (SD)					+											
Frequency of work/school-related travel (SD)		+														
Frequency of grocery shopping travel (SD)		+			+											
Frequency of entertainment travel (SD)	+															
Frequency of travel taking others where they need to go (SD)		+														

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Frequency of other purpose travel (SD)	+															
Weekly miles in a bus (SD)					+							+				
Weekly miles in a train/BART/light rail (SD)	-															
Total weekly miles (SD)		+		+												
Weekly miles of commuting (SD)								+								
Weekly miles of grocery shopping travel (SD)		-														
Weekly miles to eat a meal (SD)		+	+							+						
Weekly miles of entertainment travel (SD)						+			+							
Weekly miles of travel taking others where they need to go (SD)		-														
Commute time					+											
Commute distance												+				
Number of trips by personal vehicle (LD)										+						
Number of trips by other means (LD)												+				
Sum of log of miles for each trip by personal vehicle (LD)													-			
Sum of log of miles for each trip by air (LD)	-	+														
Log total miles by personal vehicle (LD)											+					
Subjective Mobility																
Commute (SD)							+	+								
Travel for grocery shopping (SD)	+											+				
Travel for eating a meal (SD)															-	
Travel for entertainment (SD)		+														+
Take others where they need to go (SD)			+		+											
Travel by personal vehicle (SD)		+							+							
Travel by train/BART/light rail (SD)				-												
Travel by personal vehicle (LD)				+												
Relative Desired Mobility																
Overall (SD)	-				-											
Commute (SD)											-	-	-			
Work/school-related travel (SD)									-	+						
Travel for grocery shopping (SD)						-										
Travel for eating a meal (SD)												+				
Take others where they need to go (SD)															+	
Travel by bus (SD)			-						+							
Travel by walking/jogging/bicycling (SD)													+			
Travel by air (LD)								+				-				
Travel Liking																
Travel for eating a meal (SD)									+							
Travel for entertainment (SD)			+	+	+											
Travel by personal vehicle (SD)									-							
Travel by train/BART/light rail (SD)															-	

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Overall (LD)			+	+												
Work/school-related travel (LD)																-
Travel for entertainment (LD)																+
Attitudes																
Pro-environmental solutions factor score				+			+	+	+	+				+	+	
Commute benefit factor score					-											
Travel stress factor score												+			+	
Pro-hi density factor score			-	-												
Personality																
Adventure seeker factor score	+				+		+			+	+				+	
Loner factor score									-							-
Calm factor score									-							
Lifestyle																
Frustrated factor score			+	+						+			+		+	
Family & community-oriented factor score								+						+		
Status seeker factor score				-		+										
Workaholic factor score					+											
Excess Travel																
Excess travel indicator													+			
Mobility Constraints																
Limitations on driving during the day	+									+	+					+
Limitations on driving on the freeway		+														
Limitations on flying in an airplane					+						+					
Limitations on riding a bicycle					+									+	+	
Percent of time a vehicle is available							-			-	-				-	
Demographics																
North San Francisco													-			
Time living in the neighborhood									+							
Age	-	-														+
Years lived in the U.S.			-		-	+			-	-	-	-				+
Female	-					+										
Number of vehicles in the household								-	-					+		+
Year of personal vehicle	-		-	-												
Total workers in the household													+			
Household size																-
Anyone in the household needing special care		+					+						+		+	+
Household with single adult			-	-						+						
Household with two or more adults											-					
Household with two or more adults & children							+									
Sales occupation								-								

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
Demographics																
Service/repair occupation	+															
Clerical/administrative support occupation														+		
Production/construction/craft occupation						-										
Manager/Administrator occupation											+					
Professional/technical occupation											+					
Full-time worker							+	+			+					
Household income category																+
Personal income category			+			+										
Vehicle type is pickup										+						
Vehicle type is small			+	+												
Strategy Adoption																
Buy a car stereo system	+	+														
Get a mobile phone		-							-							-
Get a better car			-			+										+
Time since getting a better car			+													
Get a fuel efficient car				-												
Time since getting a fuel efficient car				+												
Change work trip departure time					+							+				
Hire somebody to do house or yard work			+			+						-				
Time since hiring domestic help			-			-		-							-	
Adopt flextime							+		+							
Time since adopting flextime							-		-							
Adopt compressed work week	+							+								
Time since adopting compressed work week									+							
Change from driving alone to some other means									+							
Change from another means to driving alone									+					-		
Squared time since changing to driving alone			+													
Buy equipment to help work from home										+	+		+		+	
Telecommute											+					
Change jobs closer to home			+	+			+	+		+					+	
Time since changing jobs closer to home				-												
Move your home closer to work													+			
Work part- instead of full-time														+		
Time since working part-time														-		
Start home-based business						+				+					+	
Retire or stop working																+
Time since retiring or stopping working														+		

SD = Short Distance LD = Long Distance

4.1.1 Overview of relationships of consideration to the contemporaneous explanatory variables

Consistent with expectation, objective mobility variables are generally positively associated with the consideration of the travel-related strategies presented in this study. Interestingly, the *frequencies* of short-distance travel for all the purposes presented in Table 32 positively affect, and only affect, the consideration of the travel-maintaining/increasing strategies. As shown by the shaded rows in Table 32, the majority of the weekly *distances* of short-distance travel by mode and by purpose have positive impacts on the consideration of the travel-related strategies in all three categories, but they are most likely to affect the consideration of the travel-maintaining/increasing strategies. Clearly then, the more an individual travels for short distance, the more likely she is to consider the low-cost travel-maintaining/increasing strategies. Whether the large amount of short-distance travel is by necessity or by choice, the low-cost travel-maintaining/increasing strategies offer appealing options for making that travel more pleasant or productive. While both frequency and distance of short-distance travel influence the consideration of the lower-cost strategies, it is logically enough not the frequency but the distance of short-distance travel that has a more important impact on the consideration of the medium- or high-cost travel-reduction strategies. The appearance of long-distance objective mobility variables in the model of consideration of the travel-related strategies is not as frequent as that of short-distance objective mobility variables, which is not surprising since the strategies are oriented toward short-distance travel (mainly commuting). However, the presence of long-distance variables in several models suggests a carryover effect from the long-distance to the short-distance realm.

Generally, short-distance subjective mobility variables are positively associated with the consideration of the travel-related strategies, and they follow the same pattern as weekly distance for short-distance travel discussed above. This suggests that the effect of subjective mobility on the consideration of the travel-related strategies is quite similar to that of objective mobility. This result is not surprising since the amount of travel that individuals actually do heavily affects their subjective assessment of mobility (Collantes and Mokhtarian, 2002).

The negative association of the relative desired mobility variables with the consideration of the travel-maintaining/increasing strategies was counter to our initial expectation (see Section 2.3): we thought that the more people want to increase their travel, the more likely they would be to consider strategies that support traveling equal or greater amounts. Instead, these strategies appear to be more desirable to those who want to *decrease* their travel, as a way of making their undesired (but perhaps necessary) current travel more palatable. On the other hand, both effects may be at work and cancel each other out in many cases, which may explain why only a few relative desired mobility variables are significant in this group of models. By contrast, the effects of the relative desired mobility variables on the consideration of the travel-reducing and major location/lifestyle change strategies are bi-directional; that is, they may positively or negatively affect the consideration. However, the positive coefficients of these variables indicate competing preferences – the adoption of the strategies in these two bundles would decrease the amount of commute travel, so as to be able to increase the amount of time devoted to the desired activity/travel. Worth noting is that individuals wanting *less* commuting are *more* likely to seek medium- and high-cost adjustments (telecommuting, residential and employment relocation in this case) to reduce the commute.

With respect to the travel liking block of variables, the most prominent result is that liking short-distance travel for entertainment and liking long-distance travel overall increase the probability of considering the travel-maintaining/increasing strategies. This is consistent with expectation. It is striking, however, that liking for short-distance personal vehicle travel is significant in only one model (negatively associated with consideration of commute modes other than driving alone, naturally enough), and liking for long-distance personal vehicle travel does not appear at all. In general, the relative absence of travel liking variables from these models is noteworthy. At least with respect to the travel-maintaining/increasing strategies, the same explanation may apply as for the relative desired mobility variables: both those who like travel and those who dislike it may consider ways of making it more pleasant.

The attitude, personality and lifestyle factors that most commonly affect the consideration of the travel-related strategies are pro-environmental solutions (attitude), adventure seeker (personality) and frustrated (lifestyle). All three of these are consistently positively associated with the consideration of the travel-related strategies. The pro-environmental solutions factor score affects the consideration of seven strategies studied, of which five are medium- or high-cost ones involving commute reduction or usage of travel means other than driving alone. This suggests, not surprisingly, that individuals advocating environmental protection are more likely than others to consider reducing their commute and/or minimizing solo driving to decrease their personal energy consumption and impacts on the environment. Also, they are more likely to consider getting a fuel efficient car to decrease their fuel consumption, a natural result. Compared to other travel attitude factors, this factor appeared much more frequently in the models. This suggests that such individuals are more susceptible to a change. The adventure seeker factor score influences the consideration of six strategies. Given that adventure seekers have high objective and subjective mobilities (Redmond and Mokhtarian, 2001; Collantes and Mokhtarian, 2002) and tend to be variety-seeking, it is quite natural that this factor has a positive impact on the consideration of several different strategies in all three conceptual categories. The excess travel indicator, which captures many of the characteristics of the adventure seeker factor (correlation: 0.35), is significant and positive for a seventh strategy. The frustrated factor score is significant in five models. Individuals who are frustrated may view travel-related strategies as potentially one way to increase their control and/or life satisfaction.

It was expected that the commute benefit and travel stress factor scores would often be significant in the models of consideration of the travel-related strategies. However, the commute benefit factor score is significant only for one model, and the travel stress factor only affects the consideration of two strategies. In view of their pervasive correlations with mobility-related variables, we believe that the effects of these two factors are generally accounted for through those variables that do appear in the models.

Mobility constraints increase the probability of considering the travel-related strategies in all three conceptual bundles. It is noteworthy that limitations on driving during the day and vehicle availability are each significant in four models, and that these two constraints are more likely to affect the consideration of the workstyle adjustments. This suggests that a desire to shorten the commute is an important motivation for individuals with such constraints to consider these travel-related strategies.

Among the demographic variables, age-related variables (age category and years lived in the U. S.) appear most commonly in the models. Their generally negative effects indicate that older

people are less likely to consider most of these strategies, perhaps because they are more habituated to their current travel conditions and more resistant to change in general. In these models, year of personal vehicle is only (and, logically, negatively) associated with the auto improvement strategies. The natural implication is that, to the extent that an aging vehicle is a problem needing a solution (that is, a stimulus promoting consideration of a change), it is a problem that is solved by an auto improvement strategy, not by some more costly or indirect strategy such as residential relocation. The presence of anyone in the household needing special care is consistently positively associated with the consideration of five strategies. This is natural since individuals having such dependents would be more inclined to acquire additional temporal and/or spatial flexibility to better provide the necessary care.

The effects of personal and household incomes on the consideration of the travel-related strategies are interesting to note. These two variables could be expected to greatly affect consideration, however, they collectively enter only three different models. There are several possible explanations for this. First, several of the strategies do not involve a significant financial investment (such as flextime, or even changing jobs), and hence income is more or less irrelevant to their consideration. Second, even though respondents were asked to indicate only strategies they were "*seriously*" considering, they may not have felt constrained by the realities of whether they could afford such a strategy in their response. In their descriptive analysis of these strategies, Clay and Mokhtarian (2002) also found that income was much more strongly related to adoption than to consideration. Finally, it may well be that the effects of income in some cases are being captured by other variables that are correlated with income (such as the former adoption of getting a better car or hiring domestic help, number of vehicles in the household, household information and so on). This reflects the subtle interconnectedness between the explanatory variables as mentioned in Section 3.1.

4.1.2 Overview of relationships of consideration to prior adoption

It is of particular interest to analyze the effects of former adoption variables on the consideration of each strategy studied. Apart from "Change jobs closer to home", the former adoption of each of the remaining 15 individual strategies significantly affects the consideration of the same strategy, as shown by the shaded cells in Table 32. On one hand, among the 15 strategies, the former adoption of getting a mobile phone, getting a better car, and getting a fuel efficient car are negatively associated with their respective reconsiderations. In these three cases, the nature of the strategy is such that, once it is adopted, it is less likely to be reconsidered *in the short term* because its repetition does not substantially improve the benefits of the previous adoption. Further, the relatively high costs of getting a newer car may decrease the probability of its reconsideration in the short term. Therefore, this relationship generally implies that the former adoption is still in force and the individual is enjoying the utility of such an adoption. On the other hand, the former adoption of each of the other 12 strategies has a positive impact on its reconsideration. As discussed in Section 3.1, either the individual is enjoying and still wants to enjoy the benefits from the former adoption, or such strategies are attractive again as circumstances change. Given that these strategies are adopted once, it is natural that they would be adopted repeatedly over a person's working life.

Interestingly, whenever time since adoption of a strategy is significant to the reconsideration of the same strategy (specifically, for the five strategies C, D, F, G, and O), it appears with the opposite sign to that of the binary former adoption variable. Given the nature of the time since

adoption variable, this actually means reinforcement rather than counteraction of the former adoption variable. If the former adoption of a strategy is negatively associated with its reconsideration (as for the strategies of getting a better or fuel efficient car), the more *recently* an individual adopts this strategy, the *less* likely she is to reconsider it. This suggests that the recent previous adoption of such a strategy, which is still in force, inhibits its reconsideration. Conversely, if the former adoption of a strategy is positively associated with its reconsideration (as for the hiring domestic help, adopting flextime, and changing to part-time work strategies), the more *recently* an individual adopts this strategy, the *more* likely she is to reconsider it. This further implies that individuals who are enjoying the benefits from the former adoption of a strategy still want to enjoy such benefits. Therefore, the effects of the time since adoption of a strategy on its reconsideration are supportive to the arguments mentioned above.

In addition, the effects of three pairs of former adoption variables on the consideration of another strategy (specifically, the binary adoption and time since adoption of strategies F on C, M on D, and G on I) follow the same pattern as those of former adoption variables on the consideration of the same strategy. That is, the former adoption of a strategy (binary variable) is positively associated with the consideration of the other strategy; *and*, the more *recently* an individual adopts this strategy (time since adoption variable), the *more* likely she is to consider the other strategy. This indicates that the adoption of one strategy is more likely to trigger the consideration of the other related strategy in the short term.

To more clearly illustrate relationships among the various strategies, Table 33 presents the effects for just the binary former adoption variables. As shown in the off-diagonal blocks of Table 33, when the former adoption of a strategy is significant, its dominant effect on the consideration of another strategy is positive: the former adoption of strategy *i* increases the probability of considering strategy *j*. It is very likely that frustrating situations still persist although a travel-related strategy was adopted; or as circumstances change and/or the utility of the adoption is exhausted, dissatisfaction recurs; or the reduction of frustration from one source leads to increased dissatisfaction from another source (*e. g.* a change in work trip departure time adopted by one household member may require her partner to shoulder more household responsibilities). In view of all these possibilities, it is perhaps natural to view the individual as being frequently in search of new solutions, with a state of some dissatisfaction being more common than one of complete satisfaction. The few negative influences of former adoption all occur when the former adoption of low-cost strategies reduces the likelihood of considering medium- and high-cost strategies, for a variety of reasons discussed in Sections 3.6, 3.8.1, 3.9.1.1, and 3.9.2.1.

Additional insights emerge when the strategies are grouped by factor-based bundle, as shown in Table 34. Complementary effects are obviously exhibited in the home-based work bundle, which is consistent with the previous study of a similar set of strategies (Raney, *et al*., 2000). The former adoption of each of the strategies in the alter employment bundle does not affect the consideration of any other strategies studied here. This suggests that working part-time and quitting work are likely to be the most radical and exhaustive changes to cope with congestion. Although not as radical, mode change strategies are also isolated in their nearly complete lack of influence on the consideration of other strategies (with the exception, ironically, that changing to driving alone has a negative influence on the consideration of changing to part-time work).

Table 33. Relationships between Former Adoption and Current Consideration of Strategies (grouped by conceptual bundles)

Former Adoption \ Current Consideration	Travel maintaining/increasing (Low cost)							Travel reducing (Medium cost)				Major location/lifestyle change (high cost)				
	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
A. Buy a car stereo system	+	+														
B. Get a mobile phone		-							-							-
C. Get a better car			-			+										+
D. Get a fuel efficient car				-												
E. Change work trip departure time					+							+				
F. Hire somebody to do house or yard work			+			+						-				
G. Adopt flextime							+		+							
J. Change from another means to driving alone									+					-		
H. Adopt compressed work week	+							+								
I. Change from driving alone to some other means									+							
K. Buy equipment to help work from home										+	+		+		+	
L. Telecommute											+					
M. Change jobs closer to home			+	+			+	+		+					+	
N. Move your home closer to work													+			
O. Work part- instead of full-time														+		
P. Start home-based business						+				+					+	
Q. Retire or stop working																+

Table 34. Relationships between Former Adoption and Current Consideration of Strategies (grouped by factor-based bundles)

Former Adoption \ Current Consideration	Auto Improvement			Mobile Phone	Work Schedule Change			Hire Domestic Help	Mode Change	Home-based Work			Relocation		Alter Employ-ment	
	A	C	D	B	E	G	H	F	I	K	L	P	M	N	O	Q
A. Buy a car stereo system	+			+												
C. Get a better car		-						+								+
D. Get a fuel efficient car			-													
B. Get a mobile phone				-					-							-
E. Change work trip departure time					+								+			
G. Adopt flextime						+			+							
H. Adopt compressed work week	+						+									
F. Hire somebody to do house or yard work		+						+					-			
I. Change from driving alone to some other means									+							
J. Change from another means to driving alone									+						-	
K. Buy equipment to help work from home										+	+	+		+		
L. Telecommute											+					
P. Start home-based business								+		+		+				
M. Change jobs closer to home		+	+			+	+			+		+				
N. Move your home closer to work														+		
O. Work part- instead of full-time															+	
Q. Retire or stop working																+

Also ironically, although the former adoption of changing jobs closer to home does not significantly affect its reconsideration (the only such case out of the 16 models developed), it frequently appears with a positive coefficient in models of the consideration of other strategies – in fact it is the adoption variable appearing most often across the 16 models (significant to the consideration of six strategies, while most other prior adoptions influenced the consideration of only one or two strategies besides its own). Conversely, the former adoption of "Move your home closer to work", which is in the same bundle as the employment relocation, is only significant in the model of its own reconsideration. This may imply that, in contrast to a new residential location, some aspects of a new job (*e. g.* a higher salary, increased flexibility) offer individuals an opportunity to seek other kinds of changes, which, of course, may not only be for transportation reasons.

4.2 Comparison between Hypotheses and Results

The overview of the models discussed in the subsections above provides evidence in support of our initial hypotheses. A more detailed comparison of some of these hypotheses and results is summarized in Table 35. Although a few unexpected relationships emerged and there are cases in which our findings failed to support some hypotheses, the results were generally consistent with our prior expectations.

Table 35. Summary of Hypotheses and Results

Variable type	General hypotheses	Results
Objective mobility	(1) The more individuals travel, the more likely they would be to consider all travel-related strategies, including the travel-maintaining/increasing ones.	(1) Our findings support this hypothesis.
Subjective mobility	(1) A higher subjective mobility is positively associated with the consideration of a wide range of travel-related strategies.	(1) Our findings support this hypothesis, similarly to objective mobility.
Relative desired mobility	Individuals having a higher relative desired mobility are (1) more likely to consider travel-maintaining/increasing strategies, and (2) less likely to consider travel-reducing and major location/lifestyle change strategies.	(1) Our findings are counter to this hypothesis, indicating that these strategies are more favored by those wanting to decrease their travel (perhaps to lighten the burden of undesired but necessary travel); (2) Our findings provide some support for this hypothesis. However, competing preferences may affect the direction of an individual's consideration (*e.g.*, those wanting more travel are more inclined to consider commute-reduction strategies).
Travel liking	The more individuals like travel, (1) the more likely they would be to consider travel-maintaining/increasing strategies, and (2) the less likely they would be to consider travel-reducing and major location/lifestyle changing strategies.	(1) Our findings provide some support for this hypothesis; (2) Our findings do not strongly support this hypothesis, perhaps again due to competing preferences.
Travel attitudes	(1) Individuals with attitudes favoring travel would be more likely to consider travel-maintaining/increasing strategies, while (2) those with attitudes not favoring travel would be more likely to consider travel-reducing and major location/lifestyle change strategies.	(1)(2) Our findings provide support for these hypotheses although some travel attitude factors do not often appear in the models, and others do not appear at all.
Personality	(1) The adventure seeker factor is positively associated with the consideration of most travel-related strategies.	(1) Our findings support this hypothesis.
Lifestyle	(1) The family/community-oriented factor is positively associated with the consideration of travel-reducing and major location/life style change strategies; (2) Being frustrated is positively related to considering a wide range of travel-related strategies; (3) A positive score on the workaholic factor positively affects the consideration of the strategies beneficial to work; (4) Status seekers may be more inclined to consider strategies involving material acquisition.	(1) Our findings provide some support for this hypothesis; (2) Our findings support this hypothesis; (3) Our findings fail to support this hypothesis, except for changing work trip departure time; (4) Our findings provide limited support for this hypothesis.
Excess travel	(1) Excess travel plays an important role in the consideration of a wide range of travel-related strategies.	(1) Our findings fail to support this. However, the effects of the excess travel indicator may be captured by the adventure seeker factor and the mobility variables.
Mobility constraints	(1) Mobility constraints positively affect the consideration of a variety of travel-related strategies.	(1) Our findings support this hypothesis.

(Table 35. Continued)

Variable type	General hypotheses	Results
Demographic	(1) Females are more likely to consider the more costly, travel-reducing and major location/lifestyle change strategies; (2) Those in upper income categories are more able and therefore more likely to consider a wide range of travel-related strategies.	(1) Our findings fail to support this hypothesis, although gender effects may be partly captured by other variables in the models; (2) Our findings offer mixed (direct and indirect) support for this hypothesis.
Strategy adoption	(1) The former adoption of a strategy could be either *positively or negatively* associated with the consideration of *other* strategies; (2) The former adoption of a strategy *positively* affects the consideration of the *same* strategy; (3) The time since adoption of a strategy is positively related to its reconsideration.	(1) Our findings support this hypothesis; (2) Our findings generally support this hypothesis although the effects of three strategies are counter to it (for logical reasons) and the effect of one strategy is not significant; (3) Our findings fail to support this hypothesis. Conversely, we found that the time since adoption of a strategy appears with the opposite sign to that of its former adoption.

4.3 General Conclusions and Policy Implications

As one of a series of research documents produced by an ongoing study of individuals' adoption and consideration of travel-related strategies, this study developed behavioral models for the consideration of each strategy and examined some patterns that emerge across models as well as the relationships between former adoption and current consideration of the strategies.

It should be kept in mind that, as stressed in this report and in previous related studies (Raney, *et al.*, 2000; Clay and Mokhtarian, 2002), there can be a lot of reasons other than transportation motivations prompting the consideration of each strategy, although each strategy has transportation implications. It is even possible that the adoption or consideration of a strategy has nothing to do with transportation issues, especially for the high-cost strategies. However, the transportation perspective taken by this study does provide plausible explanations for many if not most of the relationships appearing in the models, while recognizing that 37-82% of the information represented by the consideration responses remains unexplained by the variables available in this research.

The consideration of travel-related strategies is affected not only by the amounts of travel that individuals actually did, but also by their subjective assessments, desires, and affinities with respect to travel. Generally, objective mobility is positively associated with the consideration of these strategies, and the effects of subjective mobility on the consideration are similar to those of objective mobility. However, the influences of relative desired mobility and travel liking are somewhat more complex. In contrast to objective mobility, relative desired mobility tends to negatively affect the consideration of these strategies in general, but there still exist some plausible positive effects on consideration (referred to as competing preferences, meaning that the desire for more travel in one category motivates consideration of a strategy that will reduce another kind of travel, namely commuting – presumably to make more time for the desired type of travel). The influences of travel liking seem to be diverse although it consistently positively affects the consideration of low-cost strategies. In a word, this study helps us further understand the influences of these mobility-related variables on the consideration of each strategy. However,

the effects of objective mobility, subjective mobility, relative desired mobility and travel liking are always intertwined in individuals' choice processes, which contributes to the substantial diversity of their responses. Further, since it is objective mobility that is often the basis of public policy, these relationships imply that individuals may not respond to public policies designed to adjust their behaviors in the way that policy makers expected.

An individual's travel attitudes, personality, and lifestyle play an important role in her consideration of travel-related strategies. The frequent appearances of these factors further illustrate how different people respond to congestion, and hence provide helpful information to better understand individuals' diverse behaviors. However, it is difficult for policy makers to acquire such information. For one thing, qualitative indicators such as personality are "fuzzy" by nature, which poses certain measurement challenges. Thus, compared to objective variables such as vehicle type, it involves more effort to collect and analyze measures of such attributes. Further, an individual's nature changes over time as circumstances change (either endogenously or exogenously), and there is very little experience with forecasting or modeling these internal changes, compared to changes in external demographic characteristics.

An individual's past experience greatly affects her consideration of travel-related strategies. A previous study (Raney, *et al*., 2000) found that an individual first tends to consider or adopt lower-impact, short-term strategies, then moving to higher-impact, long-term ones, and if dissatisfaction persists or returns, an iterative process is involved in the consideration of some strategies, with cycling back to the same or lower-impact strategies often occurring. In the current study, there is evidence that (1) the former adoption of a strategy, and sometimes the time since adoption as well, has an important impact on the consideration of the same strategy, with a positive association dominating; and (2) the adoption of one strategy sometimes triggers the consideration of another related change *in the short term*. These findings suggest that the effectiveness of public policies is impacted by individuals' past experiences.

Finally, demographic characteristics may affect the response to public policies. The overview of the individual models indicates that older people are generally more resistant to the consideration of travel-related strategies, which may suggest that older people are more likely to be indifferent to public policies to some extent. On the other hand, higher personal and household incomes either directly or indirectly have a positive impact on the consideration of travel-related strategies. This implies that low-income people have a more constrained choice set than do high-income people – an unsurprising distributional effect on individuals' behaviors (see Salomon and Mokhtarian (1997) for further discussion of distributional effects).

The single key theme that underlies the results of this study is that individuals' responses to the travel-related strategies analyzed here – many of them directly tied to public policies intended to reduce vehicle travel – are influenced by a large variety of qualitative and experiential variables that are seldom measured and incorporated into demand models. Although there are challenges associated with that measurement and incorporation, those challenges are not insurmountable. Devoting further efforts to understanding the role of these attitudinal, personality, lifestyle, and experience variables will improve our ability to design effective policies and to accurately forecast the response to policy interventions as well as natural trends.

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REFERENCES

Arnott, Richard and Kenneth Small (1994) The economics of traffic congestion. *American Scientist* 82 (September – October), 446-455.

Choo, Sangho, Collantes, Gustavo, and Mokhtarian, Patricia L. (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 www.its.ucdavis.edu/publications/2001/RR-01-13.pdf.

Choo, Sangho and Mokhtarian, Patricia L. (2003) *Modeling Individuals' Consideration of Travel-related Strategy Bundles*. Research Report UCD-ITS-RR-03-xx, Institute of Transportation Studies, University of California, Davis, June.

Clay, M. J. and Mokhtarian, P. L. (2002) *The Adoption and Consideration of Commute-oriented Travel Alternatives.* Research Report UCD-ITS-RR-02-04, Institute of Transportation Studies, University of California, Davis, September. Available at www.its.ucdavis.edu/publications/2002/RR-02-04.pdf.

Collantes, Gustavo and Mokhtarian, Patricia L. (2002) *Determinants of the Subjective Assessment of Individual Mobility*. Research Report UCD-ITS-RR-02-11, Institute of Transportation Studies, University of California, Davis, August.

Curry, Richard (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. Research Report UCD-ITS-RR-00-06, Institute of Transportation Studies, University of California, Davis. Available at www.its.ucdavis.edu/publications/2000/RR-00-06.pdf.

Curtis, Carey and Headicar, Peter (1997) Targeting travel awareness campaigns: Which individuals are more likely to switch from car to other transport for the journey to work? *Transport Policy* 4 (1), 51-65.

Deming, William G. (1994) Work at home: Data from the CPS. *Monthly Labor Review* (February), 14-20.

Federal Highway Administration (1997) *Our Nation's Travel: 1995 NPTS Early Results Report*, Report No. FHWA-PL-97-028.

Hesse, B. W. (1995) Curb cuts in the virtual community: Telework and persons with disabilities. Proceedings of the 28th Meeting of the Hawaii International Conference on System Sciences, Vol. 4, 418-425.

Hu, P. S. and Young, J. R. (1999) *Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey.* Prepared for U. S. Department of Transportation, Federal Highway Administration. Report No. FHWA-PL-00-006. Available at www-cta.ornl.gov/npts/1995/Doc/ trends_report.pdf, accessed on September 11, 2002.

Mannering, J. S. and Mokhtarian, P. L. (1995) Modeling the choice of telecommuting frequency in California: A exploratory analysis. *Technological Forecasting and Social Change* 49, 49-73.

Mokhtarian, P. L., Bagley, M. N., and Salomon, I. (1998) The impact of gender, occupation and presence of children on telecommuting motivations and constraints. *Journal of the American Society for Information Science* 49 (12), 1115-1134.

Mokhtarian, P. L., Raney, E. A., and Salomon, I. (1997) Behavioral responses to congestion: Identifying patterns and socio-economic differences in adoption. *Transportation Policy* 4 (3), 147-160.

Mokhtarian, Patricia L. and Ilan Salomon (2001) How derived is the demand for travel? Some conceptual and measurement considerations. *Transportation Research A* 35 (8), 695-719.

Raney, E. A., Mokhtarian, P. L., and Salomon, I. (2000) Modeling individuals' consideration of strategies to cope with congestion. *Transportation Research F* 3 (3), 141-165.

Redmond, Lothlorien 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 www.its.ucdavis.edu/publications/2000/RR-00-08.pdf.

Redmond, Lothlorien S. and Patricia L. Mokhtarian (2001) The positive utility of the commute: Modeling ideal commute time and relative desired commute amount. *Transportation* 28 (2) (May), 179-205.

Redmond, L. S. and Mokhtarian, P. L. (2001) *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 repositories.cdlib.org/itsdavis/UCD-ITS-RR-01-09.

Royal Automobile Club (RAC) Foundation for Motoring and the Environment (1995) *Car Dependence.* RAC.

Salomon, I. and Mokhtarian, P. L. (1997) Coping with congestion: understanding the gap between policy assumptions and behavior. *Transportation Research D* 2 (2), 107-123.

Tingey, H., Kiger, G., and Riley, P. J. (1996) Juggling multiple roles: Perceptions of working mothers. *The Social Science Journal* 33 (2), 183-191.

Turner, Tracy and Niemeier, Debbie (1997) Travel to work and household responsibility: New evidence. *Transportation* 24, 397-419.

Varma, K. V., Ho, C., Stanek, D. M., and Mokhtarian, P. L. (1998) Duration and frequency of telecenter use: once a telecommuter, always a telecommuter? *Transportation Research C* 6 (1-2), 47-68.

Yap, Chee Sing and Tng, Helen (1990) Factors associated with attitudes towards telecommuting. *Information & Management* 19, 227-235.