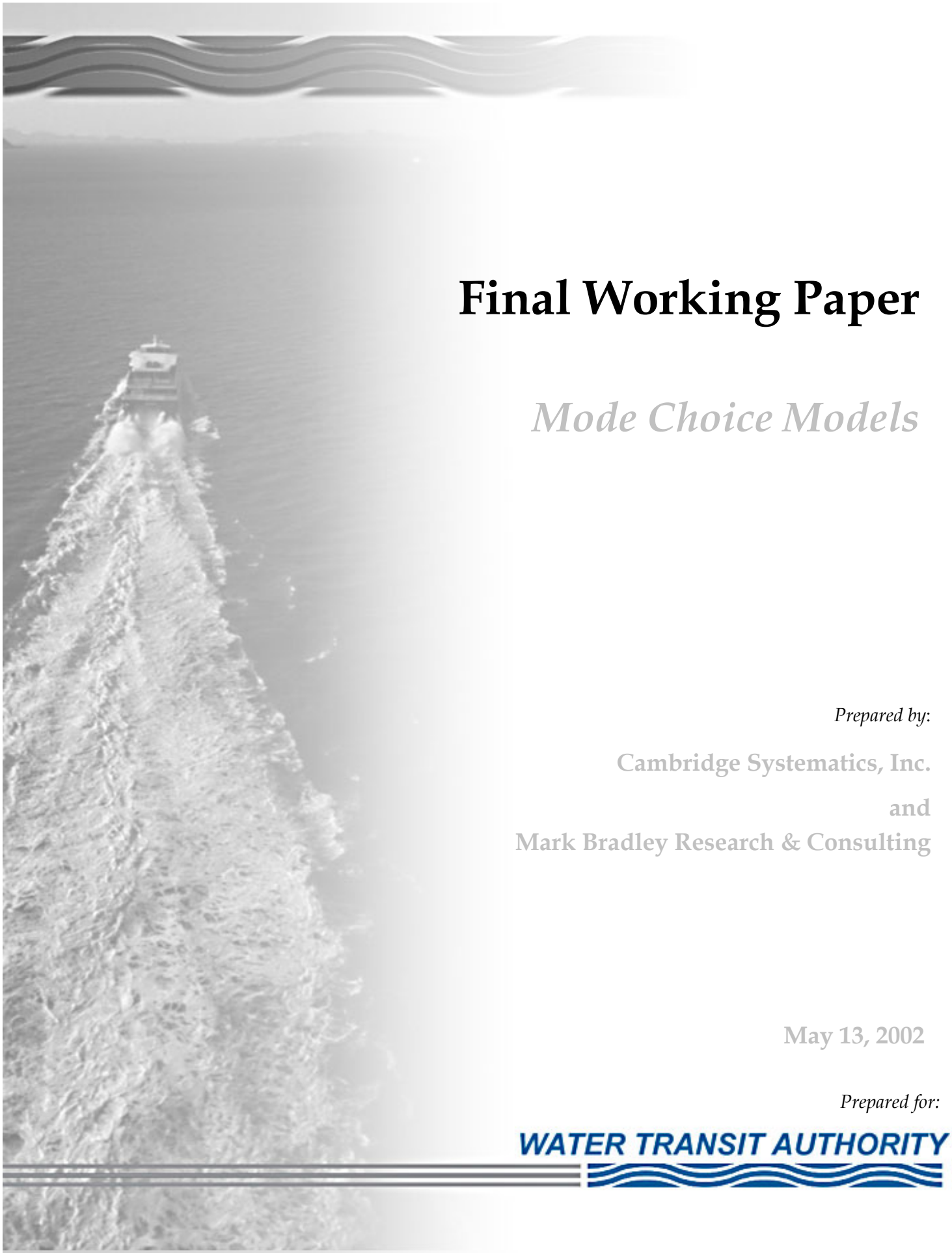

Final Working Paper

Mode Choice Models

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WATER TRANSIT AUTHORITY

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Mode Choice Models

Overview

The mode choice models developed for the San Francisco Bay Area Water Transportation Authority (WTA) determine the mode of travel in the SF Bay Area. These models are then applied within the MTC modeling framework for the nine-county region. In all, three models, namely, home-based work (HBW), home-based shop/other (HBSh/Oth) and home-based recreation (HBRec) are estimated using a 2001 household survey in combination with a survey of residents' preferences and attitudes towards different travel options.

Estimation Data

For comparative purposes, two sets of models were developed – revealed-preference (RP) and stated-preference (SP) mode choice models. In order to accomplish this, several data sets were required for model estimation – household surveys, preferences and attitudes surveys, and ferry on-board surveys.

For the RP model estimation, household and ferry on-board survey data are used in combination with skim data from the MTC model. In all, four utility equations are specified – drive alone, carpool, bus/rail, and ferry. Separate skims are used for auto modes, bus/rail (constrain ferry) and ferry (force ferry) modes. Table 1 shows a tabulation of observed trips by mode for survey respondents. This table reveals that there are a significant number of bus/rail trips but very few ferry trips. In order to estimate robust models, we need to have a good sample size for all the modes of travel. Thus, the ferry on-board survey is combined with the household survey data resulting in a significant number of ferry observations.

For SP model estimation, household survey data combined with preferences and attitudes of travelers were used. Owing to a larger SP sample size, 14 modal alternatives defined by modes of access and egress was specified in the mode choice models. Table 2 tabulates the frequency distribution of these 14 alternatives by trip purpose. The ferry on-board survey observations were not included in the estimation of SP models, because the travel preferences and attitudinal data were collected separately for these respondents.

Table 1. Observed Trips by Mode from the Household Survey

Mode	Home-Based Work	Home-Based Shop/Other	Home-Based Recreation	Total
Drive alone	148	116	67	**331**
Carpool	112	94	99	**305**
Bus/rail	75	40	58	**173**
Ferry	7	2	0	**9**
Other	3	0	2	**5**
Subtotal	345	252	226	**823**
Ferry onboard observations	981	122	150	**1,253**
Total				**2,124**

Table 2. Stated-Preference Trips by Trip Purpose, Mode, and Access/Egress Mode from the Household Survey

Mode	Home-Based Work	Home-Based Shop/Other	Home-Based Recreation	Total
Drive alone	439	464	328	**1,231**
Carpool	260	171	293	**724**
Bus/rail				
Walk access/walk egress	85	43	27	**155**
Walk access/transit egress	30	15	8	**53**
Transit access/walk egress	32	26	31	**89**
Transit access/transit egress	35	18	18	**71**
Car access/walk egress	214	84	67	**365**
Car access/transit egress	74	56	24	**154**
Ferry				
Walk access/walk egress	42	15	13	**70**
Walk access/transit egress	12	10	6	**28**
Transit access/walk egress	8	5	16	**29**
Transit access/transit egress	17	11	12	**40**
Car access/walk egress	52	22	15	**89**
Car access/transit egress	46	35	15	**96**
Total	**1,346**	**975**	**873**	**3,194**

Note: Total observations = 3404, out of which are 84 non-home based trips, 88 school trips, and 38 undefined mode trips. These trips are not included in this analysis.

Note that each transit mode maintains the access and egress mode observed in the data, because the mode choice models are estimated using origin-destination trip records. The modes are listed above in the following manner: access mode, transit mode, and egress mode.

Mode Choice Estimation Results – Revealed Preference

In all, three RP models are estimated in a multinomial logit form and presented in Tables 3 through 5. The home-based work model (HBW) includes all the commute trips, home-based shopping/other model (HBSh/Oth) includes shopping, work-related, personal business and other trips, and home-based recreation model (HBRec) includes all the recreational trips. School trips and non-home based trips are not modeled in this study owing to their small sample size. The originally estimated alternative-specific constants are given, as well as summary statistics describing goodness-of-fit. For each estimated coefficient, the t-statistic (the coefficient value divided by the standard error) is given.

- RP models are primarily estimated to test the explanatory power of various levels of service (LOS) and socioeconomic variables in different purpose-specific models. These models are then used as a reference while estimating behaviorally sound SP models.

- All the LOS variable coefficients have the correct sign in all the three models. Time-related LOS variables are significant at 90 percent confidence level but the cost-related variables are not very significant.

- In all the three models, only one coefficient is estimated for travel cost specific to all modes and is found to be significant at 90 percent confidence level in the home-based work model.

- As expected, the time-related LOS variables are larger in the home-based work model when compared to the home-based shop/other and the home-based social/recreation models.

- Number of vehicles per household is tested both as a continuous and a discrete variable in the RP models. As expected, in the home-based work model, number of vehicles has a significant negative impact on transit utility suggesting an inclination towards auto modes in the event of a larger vehicle ownership. It is found to be insignificant in the home-based shop/other model but significant at the 95 percent confidence level in the home-based social/recreation model. The discrete variables were not included in the final version of the model, as they did not have the correct sign.

- Household income has the correct sign and is significant in the home-based social/recreation model indicating that higher income group households have an inclination towards auto modes.

Table 3. HBW Trip Mode Choice Model Estimation Results – RP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-1.32732	-3.72
Transit (bus/rail)	Transit	1.004293	1.40
Park n' ride	Transit	-0.98613	-2.30
BART path	Transit	0.729895	1.78
Rail path	Transit	-0.79009	-1.06
Ferry	Transit	11.12901	4.27
Level of service	Submodes		
Total cost	All modes	-0.00269	-1.73
In-vehicle time	Auto	-0.06876	-6.27
In-vehicle time	Bus/rail	-0.03394	-3.63
In-vehicle time	Ferry	-0.12583	-3.05
Out-of-vehicle time	Bus/rail	-0.04408	-2.03
Out-of-vehicle time	Ferry	-0.19377	-2.50
Socioeconomic data	Submodes		
Vehicles per household	Drive alone	0.061778	0.48
Vehicles per household	Bus/rail	-0.29759	-1.90
Vehicles per household	Ferry	-0.31674	-1.18
Summary Statistics			
Log-likelihood at convergence	-325.8071		
Rho-squared with respect to zero	0.5641		
Rho-squared with respect to constants	0.4126		
Bus/rail out-of-vehicle time/in-vehicle time	1.30		
Ferry out-of-vehicle time/in-vehicle time	1.54		
Auto – value of time	$15.34		
Bus/rail – value of time	$7.57		
Ferry – value of time	$28.07		

Table 4. HBSh/Oth Mode Choice Model Estimation Results – RP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-0.21083	-0.44
Transit (bus/rail)	Transit	1.567449	1.22
Park n' ride	Transit	-1.10473	-1.45
BART path	Transit	0.895414	1.46
Rail path	Transit	0.338064	0.32
Ferry	Transit	3.697901	0.94
Level of service	Submodes		
Total cost	All modes	-0.00337	-1.45
In-vehicle time	Auto	-0.03321	-2.27
In-vehicle time	Bus/rail	-0.03037	-1.72
In-vehicle time	Ferry	-0.02846	-0.50
Out-of-vehicle time	Bus/rail	-0.07588	-1.60
Out-of-vehicle time	Ferry	-0.02872	-0.19
Socioeconomic data	Submodes		
Vehicles per household	Drive alone	0.13212	0.95
Vehicles per household	Bus/rail & ferry	0.098516	0.50
Household income	Drive alone	2.18E-06	0.56
Household income	Bus/rail & ferry	4.75E-07	0.09
Autos < workers – dummy	Drive alone	-0.14289	-0.26
Autos < workers – dummy	Bus/rail & ferry	0.262106	0.40
Summary statistics			
Log-likelihood at convergence	-226.7436		
Rho-squared with respect to zero	0.2194		
Rho-squared with respect to constants	0.1599		
Bus/rail out-of-vehicle time/in-vehicle time	2.50		
Ferry out-of-vehicle time/in-vehicle time	1.01		
Auto – value of time	$5.91		
Bus/rail – value of time	$5.41		
Ferry – value of time	$5.07		

Table 5. HBRec Trip Mode Choice Model Estimation Results – RP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-1.39477	-2.51
Transit (bus/rail)	Transit	0.962558	0.85
Park n' ride	Transit	-0.21539	-0.41
BART path	Transit	0.830704	1.37
Ferry path	Transit	5.345733	7.08
Level of service	Submodes		
Total cost	All modes	-0.00082	-0.63
In-vehicle time	Auto	-0.02206	-1.55
In-vehicle time	All transit	-0.01793	-2.78
Out-of-vehicle time	All transit	-0.05378	
Socioeconomic data	Submodes		
Vehicles per household	Carpool	0.392552	2.24
Vehicles per household	All transit	-0.40581	-1.24
Household income	Carpool	9.05E-06	2.18
Household income	All transit	-8.7E-06	-1.29
Summary statistics			
Log-likelihood at convergence	-177.8626		
Rho-squared with respect to zero	0.3433		
Rho-squared with respect to constants	0.3309		
Bus/rail out-of-vehicle time/in-vehicle time	3.00		
Ferry out-of-vehicle time/in-vehicle time	–		
Auto – value of time	$16.15		
Bus/rail – value of time	$13.13		
Ferry – value of time	–		

- A dummy variable where the number of vehicles is less than number of workers in a household is also tested, and was found insignificant though it had the correct sign in the home-based shop/other model.

- The ratio between out-of-vehicle and in-vehicle time is found to be reasonable in the home-based work and home-based shop/other models. However, in the home-based social/recreation model, the transit out-of-vehicle time was found to be less than in-vehicle time and hence it was constrained to be three times that of transit in-vehicle time.

- On average, the value of time is found to be the highest for the home-based work model and the least for the home-based shop/other model.

Mode Choice Estimation Results – Stated Preference

In all, three SP models are estimated in multinomial logit form and presented in Tables 6 through 8. The purposes are defined the same way as they were in the RP models – home-based work, home-based shop/other, and home-based social/recreation. Due to larger sample size and rich attitudinal data, 14 alternatives were specified and estimated in each of three mode choice models. It was also intended to incorporate market segment-related LOS variables, and, hence, more detail in the specification of the modes was warranted. The alternatives are two auto modes (drive alone and carpool), six bus/rail modes differentiated based on access/egress modes, and six ferry modes differentiated based on access/egress modes.

- Travel costs and in-vehicle travel times are modeled specific to three main modes – auto, bus/rail, and ferry. These are found to be significant at the 95 percent confidence level and have the correct sign.

- Out-of-vehicle travel times are differentiated across two general modes – auto and transit. The auto out-of-vehicle time captures the walk time to parking lot and waiting for carpool and is found to be significant in the home-based work model but not in the home-based shop/other and home-based social/recreation models. The ratio of out-of-vehicle time to in-vehicle time is greater than one for home-based work and HBSH/Oth models indicating the reasonableness of the coefficients. However, this ratio is less than one in the home-based social/recreation model. The transit (bus/rail and ferry) out-of-vehicle time is a combination of access and egress walk times and is found to be very significant in all the three models. The ratio between out-of-vehicle and in-vehicle times is greater than one for home-based work and HBSH/Oth models and closer to one for the home-based social/recreation model.

- Car access and bus/rail access time coefficients are also estimated and are found to be negative and significant. These variables are not included in in-vehicle times in order to isolate the effect of travel times of main modes from submodes.

Table 6. HBW Trip Mode Choice Model Estimation Results – SP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-0.2085101	-0.60
BART	Transit	1.861703	3.37
Other rail	Transit	0.5900163	0.99
Bus	Transit	0.9602115	1.66
Ferry	Transit	0.0184942	0.03
Drive access	Auto	-1.6825113	-4.21
Transit Access/Egress	Transit	-0.683682	-3.65
Level of service	***Submodes/market segments***		
Total cost	Rail/bus	-0.0038383	-5.40
	Ferry	-0.0031572	-3.52
	Auto	-0.0012912	-4.95
In-vehicle time	Auto	-0.0367257	-8.49
	Rail/bus	-0.0233347	-5.95
	Ferry	-0.0241803	-3.59
Walk time	Transit	-0.0297759	-6.75
Transit access/egress time	Transit	-0.0602804	-4.91
Drive access time	Transit	-0.01077	-0.62
Out-of-vehicle time	Auto	-0.0431927	-2.10
Total travel time	**Time-sensitive market segments***	**-0.00776316**	**-2.14**
Socioeconomic data	***Submodes***		
Household income	Drive alone	4.464E-06	1.69
	Rail/bus drive access	7.063E-06	2.30
	Ferry drive access	1.467E-05	3.86
	Rail/bus walk/transit access	-2.15E-07	-0.06
	Ferry walk/transit access	7.404E-06	1.83
Vehicles per household	Drive alone	0.1358595	1.70
	Rail/bus walk/transit access	-0.6047203	-4.05
	Ferry walk/transit access	-0.4965095	-3.01
	Rail/bus drive access	0.0257747	0.27
	Ferry drive access	-0.2805015	-2.17

Table 6. HBW Trip Mode Choice Model Estimation Results – SP (continued)

Constants	Modes	Coeff	t-stat
Additional constants	***Market segment***		
Auto modes	Stress-related market segments**	-0.00307112	-0.02
Ferry modes	Stress-related market segments**	0.12487234	0.54
Summary statistics			
Log-likelihood at convergence	-1754.4966		
Rho-squared with respect to zero	0.3278		
Rho-squared with respect to constants	0.1187		
Other statistics			
Auto out-of-vehicle time/in-vehicle time	1.18		
Bus/rail out-of-vehicle time/in-vehicle time	1.28		
Ferry out-of-vehicle time/in-vehicle time	1.23		
Auto – value of time	$17.07		
Bus/rail – value of time	$3.65		
Ferry – value of time	$4.60		

* Time-sensitive market segments are Calm Charger, Frazzled Flyer, Relaxed Runabout, and Tense Trekker.

** Stress-related market segments are Anxious Ambler, Frazzled Flyer, Reserved Recycler, and Tense Trekker.

Table 7. HBSh/Oth Trip Mode Choice Model Estimation Results – SP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-0.3319733	-0.76
BART	Transit	1.3173711	1.91
Other rail	Transit	0.6385499	0.88
Bus	Transit	-0.1090708	-0.15
Ferry	Transit	0.235847	0.29
Drive access	Auto	-1.4432361	-2.76
Transit access/egress	Transit	-0.2864258	-1.23
Level of service	***Submodes***		
Total cost	Rail/bus	-0.00269143	-2.96
	Ferry	-0.00128043	-1.14
	Auto	-0.00069627	-2.42
In-vehicle time	Auto	-0.02475934	-4.04
	Rail/bus	-0.01563535	-2.98
	Ferry	-0.01737577	-1.96
Walk time	Transit	-0.02299232	-3.82
Transit access/egress time	Transit	-0.04809983	-3.15
Drive access time	Transit	-0.0689959	-2.83
Out-of-vehicle time	Auto	-0.03866268	-1.47
Total travel time	**Time-sensitive market segments***	**-0.00940449**	**-2.12**
Socioeconomic data	***Submodes***		
Household income	Drive alone	-9.2905E-07	-0.30
	Rail/bus drive access	7.09797E-06	1.68
	Ferry drive access	-2.1269E-06	-0.45
	Rail/bus walk/transit access	-5.2727E-07	-0.12
	Ferry walk/transit access	-1.1588E-05	-2.17
Vehicles per household	Drive alone	0.419937362	3.69
	Rail/bus walk/transit access	-0.34657663	-1.76
	Ferry walk/transit access	-0.12818506	-0.58
	Rail/bus drive access	0.305691624	2.23
	Ferry drive access	0.416390546	2.86

Table 7. HBSh/Oth Trip Mode Choice Model Estimation Results – SP (continued)

Constants	Modes	Coeff	t-stat
Additional constants	***Market Segment***		
Auto modes	Stress-related market segments**	1.06684314	4.81
Ferry modes	Stress-related market segments**	0.75732604	2.45
Summary statistics			
Log-likelihood at convergence	-1115.5829		
Rho-squared with respect to zero	0.3926		
Rho-squared with respect to constants	0.0928		
Other Statistics			
Auto out-of-vehicle time/in-vehicle time	1.56		
Bus/rail out-of-vehicle time/in-vehicle time	1.47		
Ferry out-of-vehicle time/in-vehicle time	1.32		
Auto – value of time	$21.34		
Bus/rail – value of time	$3.49		
Ferry – value of time	$8.14		

* Time-sensitive market segments are Calm Charger, Frazzled Flyer, Relaxed Runabout, and Tense Trekker.

** Stress-related market segments are Anxious Ambler, Frazzled Flyer, Reserved Recycler, and Tense Trekker.

Table 8. HBRec Trip Mode Choice Model Estimation Results – SP

Constants	Modes	Coeff	t-stat
Carpool	Auto	-1.447213826	-2.98
BART	Transit	2.17482287	2.26
Other rail	Transit	1.514266417	1.47
Bus	Transit	1.275634559	1.31
Ferry	Transit	-0.652326016	-0.62
Drive access	Auto	0.014167153	0.02
Transit access/egress	Transit	-0.548316871	-1.64
Level of service	***Submodes***		
Total cost	Rail/Bus	-0.00632738	-4.58
	Ferry	-0.002562977	-1.70
	Auto	-0.00149512	-3.94
In-vehicle time	Auto	-0.046030143	-5.52
	Rail/Bus	-0.038985866	-5.08
	Ferry	-0.029137563	-2.75
Walk time	Transit	-0.027510761	-4.22
Transit access/egress time	Transit	-0.062080621	-3.04
Drive access time	Transit	-0.061131751	-1.95
Out-of-vehicle time	Auto	-0.025036967	-0.95
Total travel time	**Time-sensitive market segments***	**-0.005606918**	**-1.02**
Socioeconomic data	***Submodes***		
Household income	Drive alone	-6.90225E-06	-2.24
	Rail/bus drive access	-1.68884E-05	-3.59
	Ferry drive access	-1.18528E-05	-2.05
	Rail/bus walk/transit access	-2.38769E-05	-4.30
	Ferry walk/transit access	-1.48901E-05	-2.57
Vehicles per household	Drive alone	0.070404635	0.85
	Rail/bus walk/transit access	0.017849467	0.09
	Ferry walk/transit access	-0.083008831	-0.39
	Rail/bus drive access	0.009960611	0.06
	Ferry drive access	-0.263243571	-1.12

Table 8. HBRec Trip Mode Choice Model Estimation Results – SP (continued)

Constants	Modes	Coeff	t-stat
Additional constants	***Market segment***		
Auto modes	Stress-related market segments**	0.573667438	2.41
Carpool, transit and ferry modes	Pro-environmental market segments***	0.720027848	3.37
Summary statistics			
Log-likelihood at convergence	-780.3198		
Rho-squared with respect to zero	0.4575		
Rho-squared with respect to constants	0.1112		
Auto out-of-vehicle time/in-vehicle time	0.54		
Bus/rail out-of-vehicle time/in-vehicle time	0.71		
Ferry out-of-vehicle time/in-vehicle time	0.94		
Auto – value of time	$18.47		
Bus/rail – value of time	$3.70		
Ferry – value of time	$6.82		

* Time-sensitive market segments are Calm Charger, Frazzled Flyer, Relaxed Runabout, and Tense Trekker.

** Stress-related market segments are Anxious Ambler, Frazzled Flyer, Reserved Recycler, and Tense Trekker.

*** Pro-Environmental Market Segments are Green Cruiser, Reserved Recycler, Relaxed Runabout, and Tense Trekker.

- In all, seven mode choice constants are estimated with drive alone constant as the reference. Initially, carpool 2 and carpool 3+ constants were estimated separately, but later combined to make the model application process more simplistic. Three bus/rail constants are estimated based on the transit type; namely, BART, bus, and rail (AMTRAK/CalTrain). Two additional constants are also estimated based on the access/egress modes – car access and transit access/egress. For all the six ferry submodes, a single ferry constant is specified and estimated.

- Household income is found to have a significant impact on various modal alternatives in the home-based work model. The household income coefficients specific to drive alone, car access-bus/rail and car access-ferry modes are positive indicating that commuters with higher household income are more inclined to drive alone and access transit stations by auto modes. The coefficient specific to walk access-bus/rail mode is negative suggesting that lower income households prefer accessing transit stations by

cheaper non-auto modes. In the home-based shop/other model, household income does not have a significant impact on various alternatives. However, in the home-based social/recreation model, household income coefficients are negative and significant in reference to the carpool mode. In other words, travelers are more prone to carpool for recreational activities.

- Number of vehicles per household plays a significant role in explaining the mode choice behavior of travelers. The coefficients specific to drive alone and bus/rail mode with auto access is found to be positive in the three models indicating that households with higher vehicle ownership are more prone to opt for auto modes such as drive alone and transit with auto access.

- Estimating a single coefficient for all modes also tests market segments that are sensitive to travel time. This is accomplished by multiplying the dummy market segment variable with total travel time. It is found to be a very significant variable and has the correct sign in the three models. This coefficient is then added to the in-vehicle travel times of auto and bus/rail modes to get the total travel time coefficient by market segment. As expected, the coefficient values for time-sensitive segments are higher than those of other market segments.

- In addition to travel time sensitive segments, coefficients for stress-sensitive and environmentally friendly segments were also estimated in the models as mode-specific constants. It is found that the coefficient associated with travel stress sensitive segments have a negative impact on auto modes in home-based work model indicating that these segments would rather choose transit modes in the event of a stressful commute. The positive sign of the coefficient pertaining to stress-related segments specific to ferry modes further corroborates this finding. However, both of these coefficients are positive in the home-based shop/other and home-based social/recreation models suggesting that home-based non-work trips are more stress-free by auto and ferry modes.

- The environmental friendly mode-specific constant is not included in home-based work and the home-based shop/other models as it was not significant and did not have the correct sign. In the home-based social/recreation model, this constant is specified in carpool and transit modes and is found to be positive and significant. This finding suggests that the market segments that are environmental friendly have an inclination towards carpool and transit modes.

- In all the three models, the value of time for auto modes is found to be higher than that of the transit modes, and on average, the value of time for non-work trips is found to be higher than that of commute trips. We believe that this is related to the specific geographic market of shopping, other, and recreational trips that are correlated with high-end shopping, personal business, and recreational trips. In other words, the primary destination of these non-work trips are to higher cost shopping, other and recreational destinations than the regional average and the value of time is therefore higher than it would be for a more typical shopping, other or recreational trip.

Summary of Stated-Preference Model Results

All the models presented above are multinomial logit models. Various nesting structures were also tested but did not improve the likelihood of the models. Moreover, the nesting coefficients (logsum values) were found to be less than or closer to one indicating that the alternatives are not forming a significant nest.

All the important LOS variables are found to be significant and have the correct sign. The ratio between out-of-vehicle and in-vehicle times indicates the reasonableness of the magnitude of the LOS variable coefficients. Market segment-related LOS and submode-specific constants are also estimated to better understand the implications of various market segments on their mode choice behavior. Only one LOS variable is estimated for market segments that are sensitive to travel time. This coefficient is then added to auto and transit travel in-vehicle times to see the overall sensitivity of market segments towards travel time. It is found that the market segments that are more sensitive to time have a larger and more negative coefficient that the other market segment coefficients. Figure 2 demonstrates this evaluation.

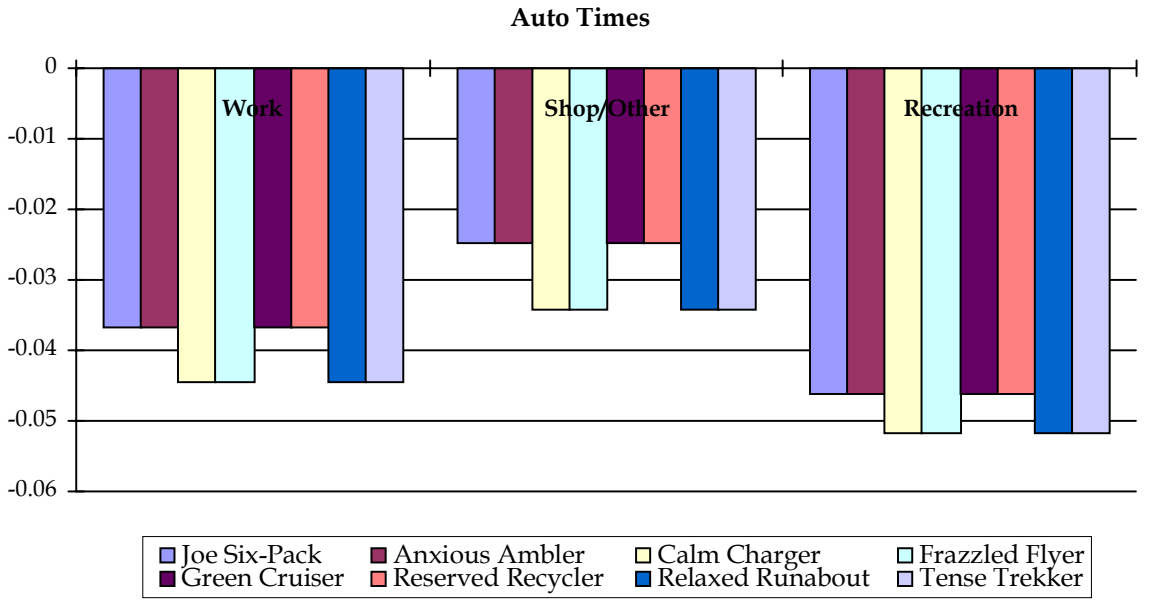
Many socioeconomic variables were tested and only those variables that could be applied and forecastable are included in the final version of the models. In order to see the impact on the utility of various alternatives, submode-specific variable coefficients are estimated.

The sensitivity to travel costs is exactly the same across all the market segments in every model, because no market segment-specific cost coefficients were estimated that were significant and logical.

Additional constants were estimated for various market segments to understand the influence of various factors like travel stress and environmental friendliness towards mode choice behavior. Overall, it was found that stress sensitive travelers are prone to prefer auto modes to transit modes for making non-work trips. On the other hand, the same groups of travelers are more inclined towards transit modes during a stressful commute. Environmental friendly commuters seem to be inclined to ride transit modes for recreational trips. This constant was not significant and did not have the correct sign in work and shopping/other trips models.

As expected, the values of time for time sensitive market segments are higher than that of other market segments. This is presented in Figure 3. It is also found that, these market segments are slightly more sensitive to time when executing shopping/other trips than when commuting to work. These results are graphically shown in Figure 4.

Figure 1. Auto and Transit Travel Time Sensitivity by Market Segment



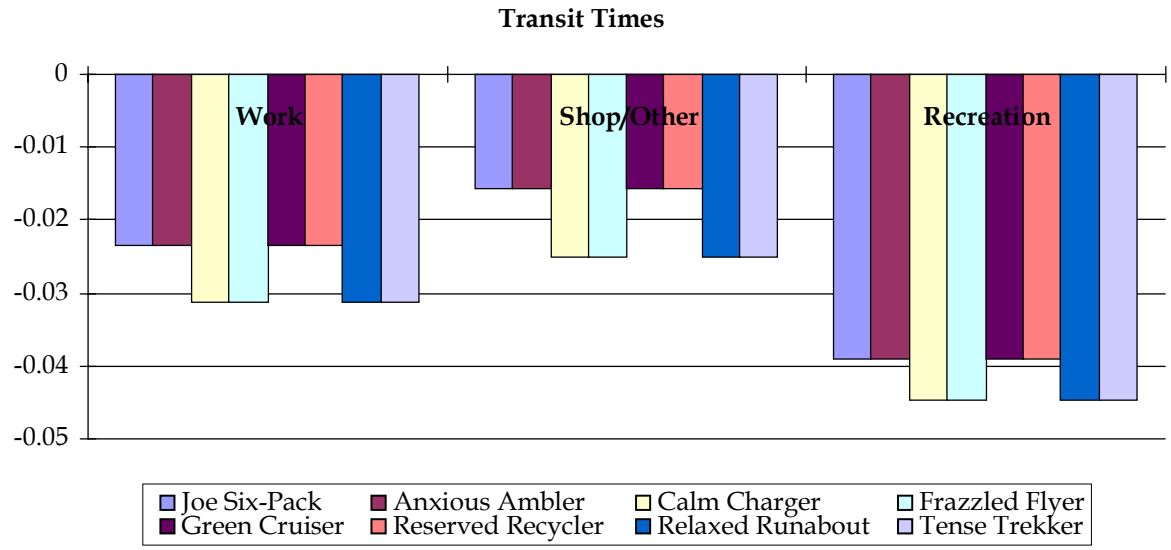
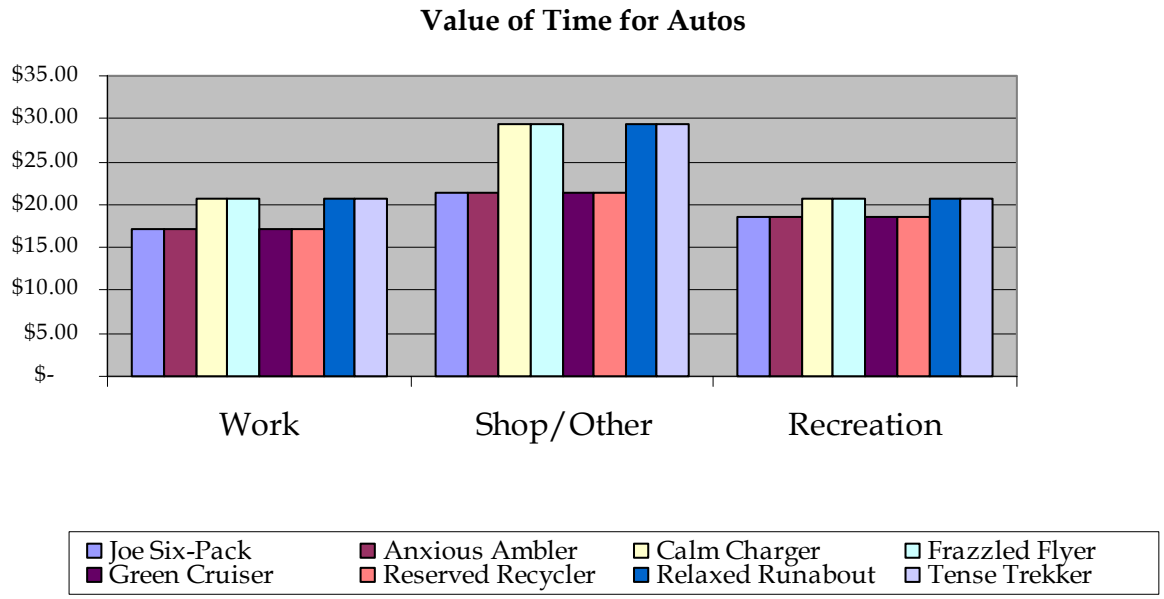


Figure 2. Value of Time for Autos and Transit by Market Segment



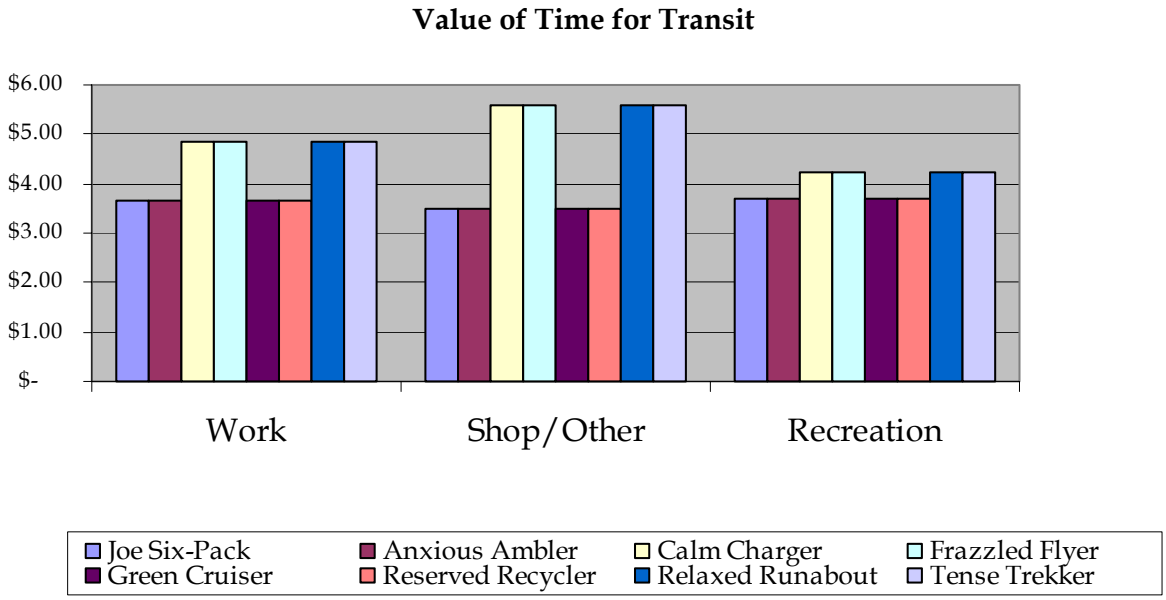


Figure 3. Value of Time by Mode