A MARKET-BASED APPROACH TO COST-EFFECTIVE TRIP REDUCTION PROGRAM DESIGN

Final Report
Results of Survey and Conclusions

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I. PROJECT OBJECTIVES

The purpose of this project is to quantitatively estimate the impacts of various mixes of TDM strategies on ridesharing tendencies. A major component of this project was to develop estimates of impacts under different conditions using identical methodologies and to test whether projected impacts were the same across all situations tested.

This project proposes to accomplish the following three objectives:

1. To determine if the impacts of selected TDM strategies are similar in different areas within Florida itself;
2. If so, to determine if these impacts are also similar to impacts measured in other areas of the nation from other SP discrete choice studies
3. To provide a mechanism for the development of effective TDM strategies for the areas surveyed, which included Miami/Fort Lauderdale, Jacksonville, and Tampa-St. Petersburg.

II. REVIEW OF SURVEY DESIGN AND RECOMMENDED ANALYTICAL APPROACH

The literature is dominated by examples of the use of logit-based models to estimate traveler mode choices. In order to utilize a binomial or multinomial logit model in the estimation of the impacts of TDM strategies, it is necessary to collect data in the form of discrete choices (such as preferring alternative A to alternative B) or to interpret ranked data as a series of discrete choices. If one accepts the notion of the interpretation of rankings as a series of discrete choices, a ranking of, say, 16 alternatives provides effectively (15+14+13+...+3+2+1=) 120 separate discrete choices from each respondent - far more than one could reasonably ask any respondent to complete in a standard format.

The main drawback of this approach is that it does not allow for the respondent to choose part-time use of any given mode. The authors' experience in a stated preference experiment conducted with employees of the City of Orlando was that in one in six *choice tasks* (16%) the respondents indicated part-time use of alternative modes, and in total thirty percent of *respondents* indicated part-time use of alternative modes in at least one of the choice sets presented.

Because the partial use of modes has been demonstrated in earlier projects, and because such use would need to be an integral part of the goals of implementing TDM strategies, it was necessary to design the survey in such a way that partial use could be recorded. For that reason, the approach used in the Orlando study, where the respondent indicates how many days per week they will use each mode, was retained and used in this study. The SAS system was originally considered to create a logit model based on the responses, but technical limitations of the software prevented this approach. Instead, the ALOGIT system developed by the Hague Consulting Group was used to build the models.

Because of the parameters of the study design (see Technical memorandum #1 from this project), ideally four three-level variables needed to be identified for this study. The literature review (again see Technical Memorandum #1) led to the conclusion that four useful variables to test would include:

- Vanpool pricing (subsidies)
- Transit pricing (subsidies)
- Use of compressed work week/telecommuting as rewards for ridesharing
- Vanpool pick-up point distance.

Given the objective of efficiency, particularly in the data collection side, it was appropriate to study each of the variables as three-level variables in a 9-choice design. Given the variables chosen for inclusion, the survey took the following appearance:

Matrix for survey

Sequence	Variable 1 (Rewards)	Variable 2 (VP price)	Variable 3 (TR Price)	Variable 4 (pick-up point)
1	0	0	0	0
2	0	1	1	2
3	0	2	2	1
4	1	0	1	1
5	1	1	2	0
6	1	2	0	2
7	2	0	2	2
8	2	1	0	1
9	2	2	1	0

A sample survey form appears on the following page.

COMMUTER CHOICE 1: Carpool, Vanpool, Bus, Drive alone
Given the conditions described below,
write in the box how many days per week you would use each option.

Option 1. ***Carpool (2-4 riders)*** **DAYS PER WEEK**

- Split your usual parking costs among the riders
- Allow **5 minutes** extra commuting time compared to driving alone

Option 2. ***Vanpool (8-12 riders)*** **DAYS PER WEEK**

- Your vanpool ride is provided at **no cost** to you
- Vanpool picks you up **at your home**
- No parking costs
- Allow **10 minutes** extra commuting time compared to driving alone

Option 3. ***Transit Bus*** **DAYS PER WEEK**

- Your employer provides a transit pass (or tokens) at **no cost** to you.

Option 4. ***Drive Alone*** **DAYS PER WEEK**

- Pay your usual parking costs

Additional demographic data were also collected with other materials included in the layout. Respondents for the survey were selected through a random-digit-dialing process in each of the three metropolitan areas selected.

For further details on the survey design, the reader is directed to Technical Memorandum #1 prepared for this project.

III. RESULTS

Recruitment & return of surveys

A separate random-digit-dialing sample was created for each of the three metropolitan areas to be surveyed: Tampa/St. Petersburg, Miami/Fort Lauderdale, and Jacksonville. The disposition of the surveys is outlined in the table below:

TABLE 1 - Survey Disposition For Market-Based Incentives Project

Metropolitan Area	Total Recruit Surveys completed	Total Surveys mailed out	Total Mail Surveys Returned	Total Valid Surveys
Tampa/St. Petersburg	666	502	277	158
Miami/Fort Lauderdale	1,117	832	389	220
Jacksonville	750	569	290	176

The designation of approximately 60% of the returned surveys as "valid" requires some explanation. If a respondent does not select an alternative mode in any of the scenarios presented, clearly the values of all coefficients in the logit model will be zero. This pattern of response, while not without meaning, does not provide any useful information for the development of the model. While such responses must be considered in any forecasting estimates, they can be treated as a separate group of respondents for the purposes of model-building and integrated into the main model for any forecasting analysis. Also, it should be noted that the percentage of surveys that were withheld from analysis is virtually the same percentage of the population in each metropolitan area (about 58%), and thus should have a similar impact on the value of coefficients produced.

Current Commute Habits

Current mode use was measured in the three areas as part of the survey:

TABLE 2 – Current Mode Split

	Jacksonville	Miami/Ft. Lauderdale	Tampa
Carpool	8.6%	8.5%	10.5%
Vanpool	0.9%	0.9%	0.5%
Bus	1.0%	3.4%	1.1%
Drive Alone	89.5%	87.2%	87.9%

Initial Model Structure

The initial approach to model structures was to build a logit model which attempted to estimate the number of days each respondent chose each alternative. The estimate was based on the incentives available and the respondent's individual circumstances, as described by responses to the demographics and commuting characteristics questions. While the response structure in the survey does not technically meet the format of a "discrete" choice, the responses were interpreted as a separate choice for each *day of the week*, and were analyzed as "repeated measures" as described by Ben-Akiva and Lerman. (pp. 119-120)

The models were built by initially including all of the measured variables and several transformations of those variables (including speed, vehicles per household member, interactions between bus stop distances and length of bus ride, interactions between incentives and bus stop distances, and so forth). The ALOGIT software outputs "t" ratios for each parameter and the associated probability of significance. Parameters were eliminated and models rebuilt in an iterative fashion until every variable met the 95% confidence criterion.

In some modeling situations it is desirable to retain even those coefficients that are not statistically significant, particularly when a theory of travel choice is based upon the existence of a non-zero coefficient for that variable. The reason for insignificance may be due to the survey design, particularly sample size issues. In the case of this survey, however, the *purpose* was to determine if the coefficients differed significantly in different areas. Thus if the coefficients were not significantly different from zero, it would be difficult to argue that they differed significantly from each other. The elimination of all non-significant coefficients from the model thus strengthens the ability to draw conclusions about differences in model characteristics from one area to another.

A crucial test to validate the correctness and appropriateness of the model structure is the test of Independence from Irrelevant Alternatives (IIA). The purpose of this test is to ensure that the alternatives presented to respondents are indeed viewed as independent. The example put forward in Ben-Akiva and Lerman's text is that a model could be built where alternatives included riding a red bus and riding a blue bus. (p. 52) If respondents viewed alternatives as differing only along irrelevant dimensions (such as bus color), when the model was re-estimated it should show a significant difference in explanatory power from the original model.

The explanatory power of a logit model is measured by comparing the log-likelihood values (abbreviated as l) at the initial and final iterations of the model building process. The rho-squared statistic (analogous to the R-square statistic for regressions) is calculated by dividing the improvement in the log-likelihood value by the initial log-likelihood value. State in the form of an equation, this is:

$$1 - ((\beta) / ((0))$$

An adjusted statistic (rho-bar squared) is calculated by subtracting the number of parameters from the numerator in the above equation.

The IIA test is conducted by removing all observations where one of the alternatives was chosen (for this test, the bus alternative was removed). The model is re-estimated using the same variables as the original model. However, the coefficient *values* are re-estimated. The original model (less any parameters that are specific to the removed alternative) is then re-applied and the difference in the ability of the models explain the results is examined. The resulting statistic is compared to chi-square tables. The number of degrees of freedom is equal to the number of parameters in the restricted model.

This test was performed by removing the bus-riding alternative from the choice set and re-estimating each of the models. The test statistic used is Small and Hsiao's corrected approximate likelihood ratio test as described in Ben-Akiva and Lerman. (p. 185) The test statistic is calculated as follows:

$$\frac{1}{1-N_1(\alpha N)}\left\{-2\left[\;{}_{\tilde{C}}\left(\hat{\beta}_C\right)-\;{}_{\tilde{C}}\left(\hat{\beta}_{\tilde{C}}\right)\right]\right\}$$

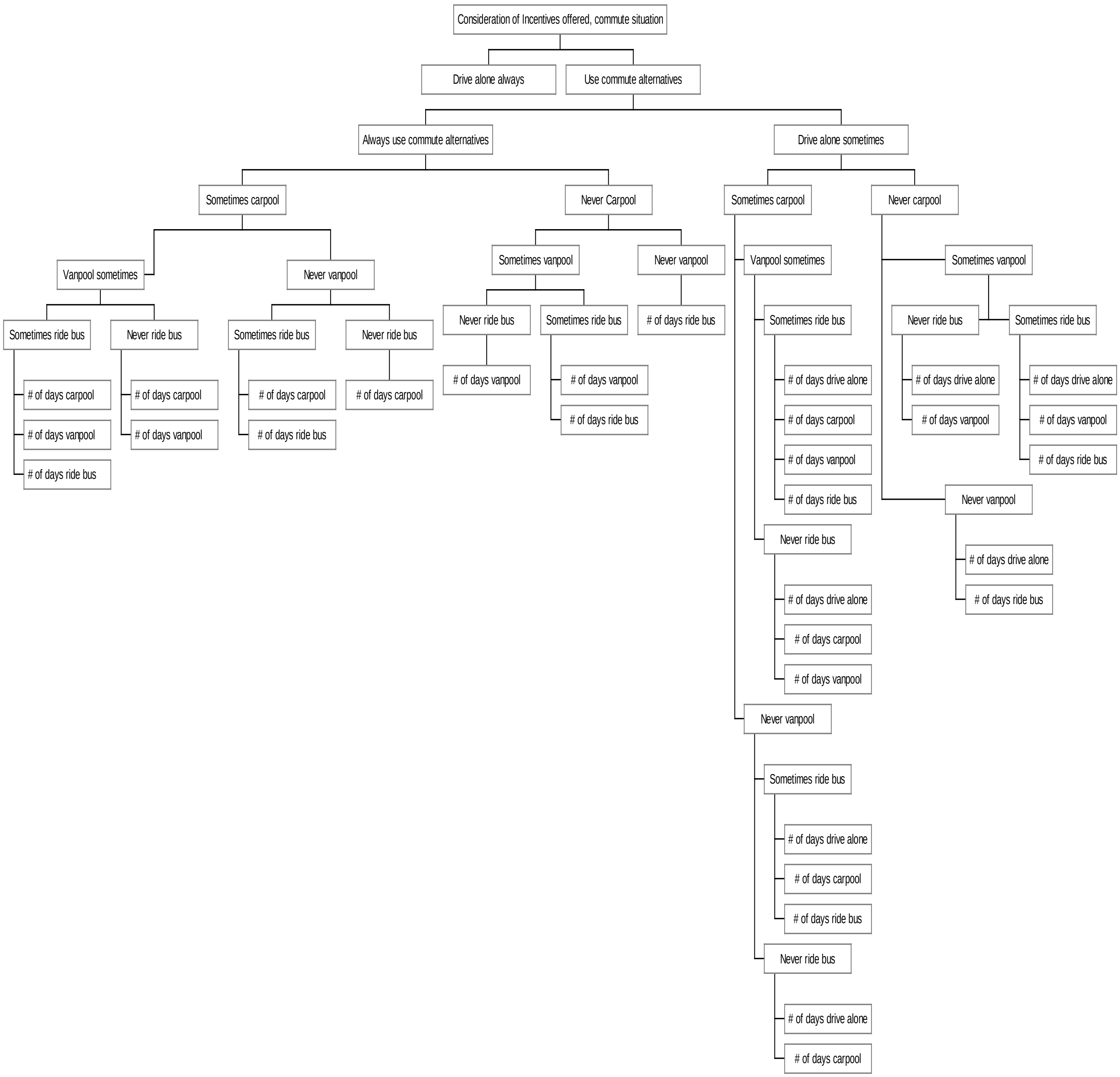
where α is a scalar, generally assumed to be equal to 1, the value of which is checked by examining the covariance matrices of the models being compared, Beta refers to the matrix of coefficients in the logit model, and N and N_1 are the numbers of observations in the restricted and unrestricted models, respectively.

The models created with this method did not uniformly pass the IIA assumption. The usual procedure to correct this problem is to eliminate variables whose covariances differ greatly between the restricted and unrestricted models. However, even after numerous attempts to do so, the models would not pass this test.

This indicated that there were problems with this model structure. With hindsight, this finding was not entirely unexpected. Many of the incentives were set up as rewards for using commute alternatives “at least two days per week”, which might make the choice between carpooling and vanpooling indifferent. Or it could be that the real choice was between whether to drive alone in combination with an alternative or to use the alternative every day. In any case, the failure of the models to pass the IIA test required a new approach to the issue.

Process for Building Second Models

Following the failure of the initial model to provide a stable set of results, a second structure was applied. In this structure it was assumed that the respondent made a series of decisions instead of allocating days directly to each of the individual modes. The decision was modeled as a "tree" with the following structure:



Each level of the decision tree detailed above was modeled as a separate decision among multiple choices, with its own set of explanatory variables. The initial variables to be used for the model were determined by running a SAS stepwise discriminant analysis at an 85% confidence level of significance. This was done to simplify the process of variable selection from a standard trial-and error procedure. In the initial decisions in the tree, variables selected by the discriminant procedure mirrored those deemed significant by the logit estimation process. The selected variables were then run in the ALOGIT modeling software to select those variables that were significant at a 95% confidence level. This process required sequential partitioning of the responses in the data as well. The modeling process was run for each of the three metropolitan areas, as well as for all three areas combined in a single model.

Tests of IIA assumption

Following successful completion of the model building, the models were again tested for violation of the IIA assumption. In this case, however, the alternative removed was not a single alternative (such as carpool, or vanpool, or bus) but rather a unique combination of the alternatives (such as drive alone/carpool), which constituted a "choice" as modeled in the revised structure. In total, there are 15 possible combinations. The test statistic for each is reported below.

With these results, and given that there at a minimum 75 degrees of freedom for each model, this is well under the bounds required for the result to be random at a 95% level of confidence. Rejection of the IIA statistic as explained in Ben-Akiva and Lerman (pp. 185-194) (i.e., that the upper-tail probability of the chi-square distribution be below the .05 level) would occur at test statistic values of 96.2 or less. All of the values reported below pass this test. Thus the IIA assumption cannot be rejected, and the model structure is accepted.

TABLE 3 – IIA Test For Final Model Structure **All Cities**				
	Start Value	**Finish Value**	**Observations**	**Test Statistic**
Drive Alone Only	-9046.0	-9042.3	3745	30.2
Carpool Only	-10277.1	-10275.5	4563	39.7
Vanpool Only	-10828.0	-10827.7	4734	13.0
Bus Only	-11031.6	-11031.2	4801	24.5
Carpool + Vanpool	-10844.9	-10844.8	4812	6.6
Carpool + Bus	-10891.9	-10891.8	4802	6.2
Vanpool + Bus	-11212.8	-11212.7	4881	12.1
Carpool + Vanpool + Bus	-11331.0	-11330.9	4900	15.8
Drive Alone + Carpool	-7380.9	-7379.7	3273	7.0
Drive Alone + Vanpool	-10679.2	-10679.0	4746	9.1
Drive Alone + Bus	-10764.8	-10764.4	4781	21.8
Drive Alone + Carpool + Vanpool	-10347.0	-10346.4	4719	24.4
Drive Alone + Carpool + Bus	-9963.6	-9962.9	4595	18.9
Drive Alone + Vanpool + Bus	-10578.1	-10577.5	4742	26.9
Drive Alone + Carpool + Vanpool + Bus	-11354.2	-11354.0	4912	38.9

TABLE 4 – IIA Test For Final Model Structure **Miami/Fort Lauderdale**				
	Start Value	**Finish Value**	**Observations**	**Test Statistic**
Drive Alone Only	-3451.0	-3447.4	1482	10.3
Carpool Only	-3938.4	-3935.5	1810	9.1
Vanpool Only	-4123.4	-4120.8	1870	8.3
Bus Only	-4224.0	-4223.2	1899	2.6
Carpool + Vanpool	-4079.8	-4079.4	1884	1.3
Carpool + Bus	-4126.2	-4125.7	1888	1.6
Vanpool + Bus	-4193.7	-4193.2	1908	1.6
Carpool + Vanpool + Bus	-4274.8	-4274.7	1921	0.3
Drive Alone + Carpool	-2769.4	-2762.5	1262	18.5
Drive Alone + Vanpool	-4050.0	-4049.6	1866	1.3
Drive Alone + Bus	-4100.5	-4100.1	1879	1.3
Drive Alone + Carpool + Vanpool	-3897.3	-3895.3	1855	6.4
Drive Alone + Carpool + Bus	-3686.1	-3684.8	1780	4.1
Drive Alone + Vanpool + Bus	-4042.1	-4041.8	1868	1.0
Drive Alone + Carpool + Vanpool + Bus	-4314.0	-4313.9	1932	0.3

TABLE 5 – IIA Test For Final Model Structure **Jacksonville**				
	Start Value	**Finish Value**	**Observations**	**Test Statistic**
Drive Alone Only	-2919.5	-2916.6	1212	7.7
Carpool Only	-3272.7	-3269.3	1452	9.6
Vanpool Only	-3461.6	-3460.3	1513	3.7
Bus Only	-3552.1	-3551.8	1547	0.9
Carpool + Vanpool	-3523.6	-3523.0	1551	1.7
Carpool + Bus	-3514.8	-3514.6	1547	0.6
Vanpool + Bus	-3609.9	-3609.8	1571	0.3
Carpool + Vanpool + Bus	-3642.8	-3642.5	1578	0.9
Drive Alone + Carpool	-2378.2	-2371.7	1071	16.6
Drive Alone + Vanpool	-3402.7	-3402.2	1519	1.4
Drive Alone + Bus	-3428.4	-3428.1	1527	0.9
Drive Alone + Carpool + Vanpool	-3248.7	-3245.9	1498	8.0
Drive Alone + Carpool + Bus	-3191.7	-3191.2	1470	1.4
Drive Alone + Vanpool + Bus	-3309.7	-3308.8	1502	2.6
Drive Alone + Carpool + Vanpool + Bus	-3635.1	-3635.1	1576	0.0

TABLE 6 – IIA Test For Final Model Structure **Tampa**				
	Start Value	**Finish Value**	**Observations**	**Test Statistic**
Drive Alone Only	-2292.2	-2287.2	1051	12.7
Carpool Only	-2658.3	-2653.4	1301	13.3
Vanpool Only	-2824.9	-2823.4	1351	4.1
Bus Only	-2890.3	-2889.3	1355	2.8
Carpool + Vanpool	-2830.8	-2829.9	1377	2.5
Carpool + Bus	-2827.9	-2826.9	1367	2.8
Vanpool + Bus	-2948.7	-2948.6	1402	0.3
Carpool + Vanpool + Bus	-1859.4	-1854.1	940	13.1
Drive Alone + Carpool	-2790.4	-2789.6	1361	2.2
Drive Alone + Vanpool	-2836.3	-2835.8	1375	1.4
Drive Alone + Bus	-2735.0	-2734.3	1366	1.9
Drive Alone + Carpool + Vanpool	-2681.5	-2679.6	1345	5.2
Drive Alone + Carpool + Bus	-2811.6	-2811.4	1372	0.6
Drive Alone + Vanpool + Bus	-2955.8	-2955.7	1404	0.3
Drive Alone + Carpool + Vanpool + Bus	-2954.9	-2954.7	1401	0.6

Test of Existence of Multiple Models for Metropolitan areas

The next task in the model building was to determine if it were in fact necessary to create a separate model for each metropolitan area, or if one model would serve to describe the results for all three areas. This procedure does not, however, determine the transferability of the policy coefficients on its own. This procedure is testing *all* of the parameters, *including* non-policy variables such as income and vehicle ownership, to determine whether these parameters do in fact differ between metropolitan areas, or if the differences have been accounted for by the demographic data collected.

The procedure for conducting this type of analysis is described in Ben-Akiva and Lerman's text on discrete choice. (pp. 194-204) Models are built for the three areas and then another model is built that covers all of the results. The log likelihood values for the two types of models are compared. The resulting model statistics were:

TABLE 7 - Comparison Of Single Versus Metropolitan-Area-Specific Models

Model Statistic	Single model	Metro-area specific models
Initial Log Likelihood	-17,063.9	-17,063.9
Final Log Likelihood	-11,482.6	-11,026.0
Test Statistic	456.6 * 2 = 913.2	
Probability that difference is significant	99.9+% (ρ^2 with 78 degrees of freedom)	
ρ^2 value	.327	.354
$\bar{\rho}^2$ value	.323	.336

This test proves conclusively that the independent models for Tampa/St. Petersburg, Miami/Fort Lauderdale, and Jacksonville are superior to the single model that covers all three metropolitan areas. Subsequent analyses were performed using the three area-specific models.

Final Model Structures

The model structure is completely defined in the appendix. Each model has 32 equations, each of which predicts utility for one of the 4 modes in each of its potential combinations as described in the tables above.

The final statistics on each model are shown below:

TABLE 8- Final Model Statistics			
Model Statistic	**Tampa / St. Petersburg**	**Miami/ Ft. Lauderdale**	**Jacksonville**
Initial Log Likelihood	-4893.6	-6696.1	-5474.15
Final Log Likelihood	-3004.2	-4347.6	-3674.21
Base ρ^2 value	0.386096	0.350727	0.328807
Number of parameters	99	102	108
Base $\bar{\rho}^2$ value	0.365866	0.335494	0.309078

It should be noted that the rho-bar square values are well above the “reasonableness” test cited by Beaton, which is that model rho-bar-square values should be between 0.2 and 0.3.
A further test is conducted on the model structure to determine that the coefficients (rather than merely applying constants) add significant information. The results of this test are shown below:

Table 9- Test of Model Structure

Model Statistic	**Tampa / St. Petersburg**		**Miami/Ft. Lauderdale**		**Jacksonville**	
	Base	Test	Base	Test	Base	Test
Initial Log Likelihood	-4,893.6	-4,893.6	-6,696.1	-6,696.1	-5,474.2	-5,474.2
Final Log Likelihood	-3,004.2	-3,558.8	-4,347.6	-4,984.3	-3,674.2	-3,964
Test Statistic	1,110		1,272		580	
Probability that difference is significant	99.9+% (ρ^2 with 99 degs. of freedom)		99.9+% (ρ^2 with 102 degs. of freedom)		99.9+% (ρ^2 with 108 degs. of freedom)	

The model structure is confirmed.

Impact of Incentives

Because of the complexity of the model structures, it is perhaps best to view the model as a black box for the purposes of evaluating the impact of incentives on individual modes. Clearly it would be an extremely complex task to isolate out the effects of individual variables on the individual modes. In order to simplify this analysis, CUTR is applying a sensitivity analysis to each of the incentives. The impact of offering each incentive is predicted for each potential mode. The impact of multiple incentives on any given mode is nearly, but not exactly, additive.

The "baseline" figures in the survey indicate the projected mode split if neither compressed work weeks nor telecommuting is offered as in incentive, and if transit and vanpooling both cost $50 per month. These figures indicate a much higher level of ridesharing than the respondents actually indicated in their survey returns when asked directly how they commuted to work. This suggests two things:

- Some respondents may not be using particular options such as carpooling, vanpooling, or transit because they had not considered using them or don't know how to get started, but would use them if this information were provided.
- Some of the respondents responded unrealistically to the survey, indicating that they would use commute alternatives in situations where they clearly would not. This is a sort of "Hawthorne effect" where subjects are responding differently because they are being studied.

This situation probably results in overstating the amount of ridesharing that would occur given any of these scenarios, but it does not diminish the ability of the study to compare the impact of incentives relative to one another. These results are reported in *percent of trips* as opposed to percent of people using a particular mode.

TABLE 10 – Impact Of Incentives By Metropolitan Area

	Tampa Model				**Miami Model**				**Jacksonville Model**			
	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone
Baseline	15%	4%	3%	78%	16%	3%	3%	78%	19%	4%	4%	74%
CWW	22%	4%	4%	70%	22%	4%	4%	70%	22%	4%	4%	69%
Telecommute	15%	4%	3%	78%	17%	3%	3%	77%	19%	4%	4%	74%
$25 Vanpool	15%	4%	3%	78%	16%	3%	3%	78%	19%	4%	4%	74%
Free Vanpool	14%	6%	3%	77%	15%	8%	3%	75%	17%	8%	3%	72%
$25 Transit	14%	3%	5%	77%	17%	3%	3%	77%	19%	4%	4%	74%
Free Transit	16%	5%	8%	71%	17%	4%	7%	73%	17%	4%	7%	72%
Pick-up 1/4 mile	15%	4%	3%	78%	16%	3%	3%	78%	19%	4%	4%	74%
Pick-up at door	14%	7%	3%	76%	15%	5%	3%	77%	18%	5%	4%	73%

From these data, it is apparent that the incentive with the most impact on reducing solo diver traffic is the reward of allowing compressed work weeks for using commute options at least 2 days/week. The tendency is for this reward to increase carpooling. The next largest decrease in drive alone traffic was provision of free transit service. Free vanpooling had some effect on solo driving in Miami/Fort Lauderdale, less in Jacksonville, and very little in Tampa. Other incentives (pick up point for the vanpool, providing transit or vanpools for $25/month) had minimal impact.

The model structure did not allow for the analysis of interactions between incentives (such as free transit and compressed work week being offered together). A survey that would allow that type of analysis would have required far more respondent time and effort than could be reasonably expected. It is quite likely that combining an incentive that proved beneficial to users of *any* alternative with an incentive *specific* to one form would produce greater increases for that form, but a separate study would have to be conducted to determine whether this is in fact the case.

Comparisons of Coefficients between cities

Due to the complex structure of the model, the best way to test for the equality of the impact of the incentives by mode is to examine the results of applying each of the three cities' models to the same data set. This procedure accounts for differences in response to incentives due to demographic difference, as opposed to variations in preference (or "taste variations" , as they are commonly referred to in the discrete choice literature).

Also, because of the rigorous structure of the models (i.e., that all coefficients were required to be different from zero at a 95% level of confidence to be included at all) , it is highly likely that the differences observed are in fact significant. It should be kept in mind that it was clearly demonstrated that the separate models do in fact perform significantly better than a single model covering all three areas, as discussed earlier. This finding also increases the probability of significance of the differences observed.

Each of the models was applied in turn to the data collected from the Tampa area, the Miami/Fort Lauderdale area, and the Jacksonville area. The results for each will be examined separately.

Tampa

The results for application of each of the models to the Tampa data is shown below: Again, this data is presented as percent of work trips.

TABLE 11 –Model Comparisons Using Tampa Data												
	Tampa Model				**Miami Model**				**Jacksonville Model**			
	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone
Baseline	15%	4%	3%	78%	16%	3%	3%	79%	18%	3%	3%	75%
CWW	22%	4%	4%	70%	21%	4%	4%	71%	22%	4%	4%	71%
Telecommute	15%	4%	3%	78%	16%	3%	3%	78%	18%	3%	3%	75%
$25 Vanpool	15%	4%	3%	78%	16%	3%	3%	79%	18%	3%	3%	75%
Free Vanpool	14%	6%	3%	77%	15%	8%	2%	75%	17%	7%	3%	73%
$25 Transit	14%	3%	5%	77%	16%	3%	3%	78%	18%	3%	4%	75%
Free Transit	16%	5%	8%	71%	16%	3%	7%	74%	16%	4%	7%	73%
Pick-up 1/4 mile	15%	4%	3%	78%	16%	3%	3%	79%	18%	3%	3%	75%
Pick-up at door	14%	7%	3%	76%	15%	5%	2%	78%	18%	4%	3%	75%

The major differences between the models were:

- Jacksonville residents responded less strongly to the compressed work week (CWW) incentive. Driving alone was reduced by only 4%, while the reduction was twice as large for Tampa and Miami/Fort Lauderdale residents.
- Tampa residents responded less strongly to the Free Vanpool options than either Jacksonville or Miami/Fort Lauderdale residents. Vanpool use was predicted to account for 2% more trips (up from 4%) for Tampa residents, whereas the increase was 5% in Miami/Fort Lauderdale and 4% in Jacksonville.
- Response to free transit was different for each market. Tampa residents increased use of carpooling, vanpooling, and bus when Free Transit was available (indicating that many would ride transit 1/week with free transit, but not much more), whereas carpooling actually decreased for Miami/Fort Lauderdale residents and stayed the same for Jacksonville residents. Vanpooling increased slightly for Jacksonville residents when free Transit was made available.
- Increase in vanpooling was slightly greater for Tampa residents in response to door-to-door pickup than for Miami/Fort Lauderdale or Jacksonville residents, although the increases were negligible in all areas.

Miami/Fort Lauderdale

Below are the results of application of the three models to Miami/Fort Lauderdale data:

TABLE 12 – Model Comparisons Using Miami/Fort Lauderdale Data												
	Miami Model				**Tampa Model**				**Jacksonville Model**			
	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone
Baseline	16%	3%	3%	78%	13%	5%	4%	78%	20%	4%	4%	72%
CWW	22%	4%	4%	70%	19%	6%	5%	70%	23%	4%	5%	68%
Telecommute	17%	3%	3%	77%	13%	5%	4%	78%	20%	4%	4%	72%
$25 Vanpool	16%	3%	3%	78%	13%	5%	4%	78%	20%	4%	4%	72%
Free Vanpool	15%	8%	3%	75%	12%	8%	4%	76%	18%	8%	4%	70%
$25 Transit	17%	3%	3%	77%	13%	4%	6%	77%	19%	4%	5%	72%
Free Transit	17%	4%	7%	73%	14%	6%	8%	72%	17%	4%	8%	70%
Pick-up 1/4 mile	16%	3%	3%	78%	13%	5%	4%	78%	20%	4%	4%	72%
Pick-up at door	15%	5%	3%	77%	12%	9%	4%	76%	19%	5%	4%	72%

Most of the major differences seen in the initial comparison using Tampa data were confirmed in the application of the models to the Miami/Fort Lauderdale data.

- Jacksonville residents responded less strongly to the compressed work week (CWW) incentive. Driving alone was reduced by only 4%, while the reduction was twice as large for Tampa and Miami/Fort Lauderdale residents.
- Tampa residents responded somewhat less strongly to the Free Vanpool options than either Jacksonville or Miami/Fort Lauderdale residents, although this difference was not as marked as with the previous data set.. Vanpool use was predicted to account for 3% more trips (up from 5%) for Tampa residents, whereas the increase was 5% for Miami/Fort Lauderdale residents and 4% for Jacksonville residents.
- Response to free transit was different for each market. Tampa residents increased use of carpooling, vanpooling, and bus when Free Transit was available (indicating that many would ride transit 1/week with free transit, but not much more), whereas carpooling increased only slightly in Miami/Fort Lauderdale and decreased markedly for Jacksonville residents.
- Increase in vanpooling was substantially greater for Tampa residents in response to door-to-door pickup than for Miami/Fort Lauderdale or Jacksonville residents.

Jacksonville

Finally, each of the three models are compared using demographic data from Jacksonville.

TABLE 13 – Model Comparisons Using Jacksonville Data												
	Jacksonville Model				Miami Model				Tampa Model			
	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone	CP	VP	Bus	Drive Alone
Baseline	19%	4%	4%	74%	17%	3%	3%	77%	15%	5%	3%	77%
CWW	22%	4%	4%	69%	23%	4%	4%	69%	21%	6%	4%	69%
Telecommute	19%	4%	4%	74%	18%	3%	3%	76%	15%	5%	3%	77%
$25 Vanpool	19%	4%	4%	74%	17%	3%	3%	77%	15%	5%	3%	77%
Free Vanpool	17%	8%	3%	72%	16%	8%	2%	73%	14%	7%	3%	76%
$25 Transit	19%	4%	4%	74%	17%	3%	3%	76%	14%	4%	5%	76%
Free Transit	17%	4%	7%	72%	17%	4%	7%	72%	16%	5%	9%	70%
Pick-up ¼ mile	19%	4%	4%	74%	17%	3%	3%	77%	15%	5%	3%	77%
Pick-up at door	18%	5%	4%	73%	16%	6%	3%	76%	14%	8%	3%	75%

The same major differences in response are observed:

- Jacksonville residents responded less strongly to the Compressed Work week (CWW) incentive. Driving alone was reduced by only 5%, while the reduction was nearly twice as large for Tampa and Miami/Fort Lauderdale residents.
- Tampa residents responded somewhat less strongly to the Free Vanpool options than either Jacksonville or Miami/Fort Lauderdale residents, although this difference was not as marked as with the previous data set.. Vanpool use was predicted to account for 2% more trips (up from 5%) for Tampa residents, whereas the increase was 5% for Miami/Fort Lauderdale residents and 4% for Jacksonville residents.
- Response to free transit was different for each market. Tampa residents increased use of carpooling and bus when Free Transit was available (indicating that many would ride transit 1/week with free transit, but not much more), whereas carpooling did not increase for Miami/Fort Lauderdale residents and decreased for Jacksonville residents. Overall reductions in driving alone were greatest for Tampa residents, less large for Miami/Fort Lauderdale residents, and smallest for Jacksonville residents.
- Increase in vanpooling was greater for Tampa residents in response to door-to-door pickup than for Miami/Fort Lauderdale, and both responded more strongly than Jacksonville residents.

Conclusions

The results from this analysis of applying the three models to each of the three datasets are remarkably consistent. From this analysis, CUTR concludes:

- The impacts of these incentives are not identical in all cities. Customized, single city trip reduction plans should be emphasized and standardized regional or statewide plans should be de-emphasized. This finding essentially validates most of the state TDM policies to date.
- A compressed work week reward would be most effective in Tampa and Miami/Fort Lauderdale, and should have a substantial effect on both use of commute alternatives and traffic reduction. The added benefit is that this type of schedule typically moves people off of peak hours for their commutes.
- Vanpool price reductions will be more effective in Miami/Fort Lauderdale and Jacksonville than in Tampa.
- Transit price reductions, or promotions (such as free bus passes) will be more effective in Tampa, and markedly less so in Jacksonville.
- Door-to-door pickup for vanpools has marginal effects in all cities, but appears to be most effective in Tampa.
- Continued promotion of alternatives and how to start using them should remain a mainstay of TDM efforts, as the survey results indicate a higher potential for their use even given no incentives than currently exists.

It should also be noted that the compressed work week and telecommuting options were provided as *incentives* rather than actual commute options. The failure of telecommuting to operate as an effective incentive for use of alternate commute modes should not in any way discourage its use as an alternate mode in its own right. The success of compressed work weeks in promoting use of alternative modes in this survey is an extremely positive result, as it shows that commute trip reduction techniques can actually be used as effective rewards for use of other commute trip reduction techniques.

Recommendations

- Tampa area TDM programs should begin work to implement compressed work weeks, particularly in conjunction with transit subsidies, to reduce traffic in the Tampa area.
- Miami/Fort Lauderdale area TDM programs should also focus on implementation of a compressed work week reward, in conjunction with vanpool/transit subsidies. Both vanpooling and transit could be effective trip reduction strategies for the area.
- Jacksonville area TDM programs should also focus on the CWW program. However, impacts of such a program in Jacksonville will probably be less than in Tampa of the Miami/Fort Lauderdale area. This should be kept in mind when allocating resources and evaluating the effectiveness of this type of program.
- Promotion of use of alternatives, their availability, and how to start using them should continue in all areas.

Bibliography

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