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GENERAL PLANNING CONSULTANT

TECHNICAL MEMORANDUM 89.3.2

A NEW METHOD FOR CALIBRATING BIAS COEFFICIENTS IN MODE CHOICE MODELS (Revision of Tech Memo 88.3.7b)

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1. BACKGROUNDS AND SUMMARY

Mode choice model, which estimates the portion of travellers using transit in the region, is a crucial component in travel forecasting process. There are three mode choice models applied at the District. These three models correspond to three different trip purposes:

1. Home-based-work (HW),
2. Home-based-nonwork (HO), and
3. Non-home-based (NH).

These mode choice models are specified in either multinomial logit or binomial logit functional forms and were calibrated by Cambridge Systematics, Inc. using individual level disaggregate data of 1982 Household Telephone Survey, enriched with same year on-board transit survey.

Each model contains two groups of variables. The first group of variables include level-of-service attributes (i.e. in-vehicle time, walk time, wait time, and out of pocket cost, etc.) characterizing the relative competitiveness of each mode, and socio-economic attributes (i.e. household income, household size, car ownership, and transit accessibility, etc.) characterizing the socio-economic backgrounds and the modal availability to each trip maker.

The second group of variables are alternative specific dummy variables. These dummies, also called mode bias constants, are used to capture the unquantifiable service characteristics of each mode. Examples of these unquantifiables are comfort, convenience, and reliability of each mode.

Because the disaggregate calibration data set applied by CSI was an enriched data set, which consists of a random portion from the telephone survey and a nonrandom portion from on-board survey, it can not be viewed as random samples. According to McFadden (1976), when logit models are calibrated with non-random samples, only the parameter estimates for the variables in the first group are statistically consistent and unbiased. The parameters estimated for the alternative specific dummies are biased. These biased coefficients can not be applied to predict regional mode split.

Thus, when the calibrated model is to be applied for aggregate prediction, only the unbiased portion of parameters can be used. The parameter estimate of the alternative specific dummies must be recalibrated to reflect the average mode bias in the entire region.

In order to recalibrate the mode bias coefficients, several steps of trial-and-error adjustments to the dummy coefficients are required. The objective of this trial-and-error process is to search for the

values of mode bias coefficients so that base year mode shares in the entire region can be predicted by the model correctly. Barton-Aschman Associates (BAA) has devised an iterative procedure for undertaking this task. However, their procedure is not based on the formula derived by McFadden, and lacks a systematic progression between iterations. In other words, the values of bias coefficients tried in one iteration may produce poorer prediction of mode shares than does the previous iteration, thus, divergent estimates of dummy coefficients may be resulted.

In this memorandum, an improved calibration procedure is presented. This procedure is based on the correct formula derived by McFadden, and makes use of the powerful capability of Lotus 1-2-3 spreadsheet to revise the values of dummy coefficients in each iteration. This method is a systematic approach. The prediction of mode shares produced in any iteration is always superiors to that in the previous iteration. Converged results on the best estimates of mode bias coefficients are always obtainable from this semi-automatic procedure.

To demonstrate how this procedure works, this memorandum documents the detailed steps for recalibrating the mode bias coefficients in the aggregate mode choice models in a situation that a new path building procedure (which includes transit fare of each link) is implemented.

The remainder of this memorandum is organized as follows. Section 2 reviews the three mode choice models used in the District's travel forecasting process and the correct adjustment formula derived by McFadden. Section 3 describes how the mode bias coefficients in the HW mode choice model are calibrated. Section 4 describes how the bias coefficients in the HO and NH mode choice models are calibrated.

2. REVIEW OF MODE CHOICE MODELS AND McFADDEN'S FORMULA

The mode choice model for HW trips contains seven alternatives:

1. Drive alone,
2. Shared ride with two persons in car,
3. Shared ride with three or more persons in car,
4. Walk access to transit,
5. Park-and-ride drive to transit,
6. Park-and-ride driven to transit, and
7. Kiss-and-ride to transit.

For each of the seven alternative modes, a mode bias coefficient (MBC) is coded as a UPARM in the MCHWORK/UMODEL program. These MBC's are used to capture the immeasurable random utilities which are not explained by the variables specified in the model. Because the mode choice model used at SCRTD is a multinomial logit model, which operates on the differences of attributes among alternatives, one of the seven MBC's is not identifiable and has to be set to zero (or an arbitrary constant). Thus, there are in fact six MBC's to be recalibrated:

1. UPARM(41) --- MBC for drive alone mode,
2. UPARM(42) --- MBC for drive shared ride 3+ mode,
3. UPARM(32) --- MBC for walk to transit mode,
4. UPARM(21) --- MBC for park and ride driver mode,
5. UPARM(22) --- MBC for park and ride passenger mode, and
6. UPARM(23) --- MBC for kiss and ride mode,

where MBC for shared ride 2 mode was set to zero.

Additional to these six MBC's, MCHWORK program contains five county specific transit dummies:

1. UPARM(61) --- transit bias coefficient for Los Angeles County,
2. UPARM(62) --- transit bias coefficient for Orange County,
3. UPARM(63) --- transit bias coefficient for Riverside County,
4. UPARM(64) --- transit bias coefficient for San Bernardino County,
5. UPARM(65) --- transit bias coefficient for Ventura County.

These county dummies are used to capture the differential modal bias among the five counties in the region. With these eleven MBC's (six mode dummies and five county dummies) it was anticipated that the MCHWORK model will be able to produce accurate estimate of mode share in each county. It should be noted that such anticipation can only be achieved partially. If we were to have a model which predicts all seven mode shares in each of the five counties correctly, the total number of MBC's needed would be 6*5=30.

The practice of model recalibration, is to apply an iterative technique to search for the values of these eleven MBC's, such that the base year (1980) mode shares can be produced correctly by the model using base year data and these MBC's. To calibrate these eleven MBC's, a two-stage process was applied. On the first stage, six MBC's were calibrated such that the base year mode shares in L.A. county are correctly predicted. Since transit riders in L.A. county represent over 90% of total regional transit patronage, the six MBC's resulted from first stage can correctly predict mode shares for over 90% of the transit users. On the second stage, the six mode dummies calibrated in the previous stage are fixed; only the transit dummies for Orange, San Bernardino, Riverside, and Ventura counties are calibrated. The transit dummy for Los Angeles County will not be calibrated since it is redundant with those six dummies calibrated on the first stage. The purpose of the second stage is to ensure that MCHWORK model produces combined transit shares (i.e. walk, park-and-ride, and kiss-and-ride access summed together) correctly in each county.

The mode choice model for HO trips and the mode choice model for NH trips are combined into one MCHNWRK/UMODEL program. The mode choice model for HO trips is a simple binary logit model with only two alternative modes in choice set:

1. Auto, and
2. Walk access to transit.

This model predicts the mode shares into each of the five counties separately. Setting the bias coefficient for auto mode to zero, there are only transit bias constants to be calibrated. Because there are five counties in the region, we need to calibrate five transit dummies:

1. UPARM(41) --- Los Angeles County Bias Coefficient,
2. UPARM(42) --- Orange County Bias Coefficient,
3. UPARM(43) --- Riverside County Bias Coefficient,
4. UPARM(44) --- San Bernardino County Bias Coefficient, and
5. UPARM(45) --- Ventura County Bias Coefficient.

All can be calibrated on one stage.

The mode choice model for NH trips is a trinomial logit model with three alternatives:

1. Auto drive alone,
2. Auto shared ride, and
3. Walk access to transit.

Because the production end of these NH trips are unidentifiable, county dummies cannot be incorporated into the model. Only two mode bias coefficients, namely drive alone and shared ride are present and to be calibrated:

1. UPARM(87) --- MBC for drive alone mode, and
2. UPARM(88) --- MBC for shared ride mode.

These bias coefficients can be calibrated on one stage.

The calibration of the MBC's in the three mode choice models are based on a simple formula derived by McFadden (1976)

$$MBC^m_{i+1} = MBC^m_i - \ln\left(Q^m_i / H^m\right) \qquad (1)$$

where

MBC^m_i = Alternative specific constant for mode m in iteration i,

Q^m_i = Predicted share for mode m in iteration i, and

H^m = Observed share for mode m.

According to McFadden, whenever a multinomial logit model is calibrated from choice-based samples, in which the sample shares are different from the actual population shares, Equation (1) should be applied to each of the calibrated MBC's simultaneously to correct the bias in the estimated bias constants. Only the corrected MBC's can represent the true mode bias in population.

This formula is simpler than the one applied by BAA (see Technical Memorandum 86.3.1, p.p. 5-4):

$$MBC^m_{i+1} = MBC^m_i - \ln \frac{Q^m_i / (H^m - 1)}{H^m / (Q^m_i - 1)} \qquad (2)$$

Equation (2) was derived from an incremental logit formulation, not from McFadden's general logit formulation. In incremental logit, there is a very strict assumption that changes in utilities are allowed to happen in only one mode; utility for other modes must be

kept constant. This implies that the adjustment of MBC's has to be conducted one at a time. Adjusting several MBC's simultaneously will violate the basic assumption of incremental logit and may result in divergence of MBC's. Thus, based on this understanding, the new method, which is based on Equation (1), is simpler and more efficient than the existing method.

3. RECALIBRATION OF MBC'S IN MCHWORK MODEL

For calibrating the MBC's in the MCHWORK model, the following base year information are required:

1. MRP.FARELK82.AM17 --- transit time tables in walk, park and ride, and kiss and ride modes,
2. MRP.Y80Z1628.H8 --- highway time and distance tables in drive alone, shared ride 2, and shared ride 3+ modes,
3. MRP.FARE.FARELK82.AM.DATA --- transit fare tables in walk, park and ride, and kiss and ride modes,
4. MRP.TT.HBWORK.Y80PA4.DATA --- base year (1980) HW trip table,
5. MRP.TAZ.SCAG80B.DATA --- base year (1980) socio-economic characteristics of each trip production zone.

On the first stage of calibration, we calibrate the six MBC's so that MCHWORK model predicts base year mode split in Los Angeles County correctly. This process takes four iterations. Table 1 summarizes the progression to arriving the converged MBC's. The detailed iterative results are reported in Appendix A, a series of Lotus 1-2-3 spreadsheets documenting the mode split and required MBC adjustments in each step.

On the second stage of calibration, we need to calibrate the four county bias coefficients so that MCHWORK model predicts base year combined transit share in the other four counties correctly. This process took four iterations. Table 2 summarizes the progression to arriving the converged values. The detailed iterative results are reported in Appendix B.

Table 1 MBC's Calibrated With Mode Split in Los Angeles County -- Home-Based-Work Mode Choice Model

		Model Predicted shares				UPARM Results	
Mode	Obsv. Share	Iter 0	Iter 1	Iter 2	Iter 4	UPARM Numbr	Coeff.
DA	.7038	.6849	.6952	.7028	.7037	41	-0.2588
SR 2	.1427	.1358	.1422	.1427	.1427	n.a.	0.0000
SR 3+	.0576	.0581	.0573	.0576	.0576	42	-1.4941
WALK	.0815	.1065	.0907	.0830	.0817	32	2.8718
PND	.0094	.0095	.0093	.0093	.0093	21	-0.8703
PNP	.0017	.0017	.0017	.0017	.0017	22	-1.1084
KNR	.0034	.0040	.0035	.0030	.0034	23	0.2575

Table 2 Combined Transit Bias Coefficients for Orange, Riverside, San Bernardino, and Ventura Counties -- Home-Based-Work Mode Choice Model

Counties	Obsv. Share	Model Predicted Transit Shares				UPARM Results	
		Iter 0	Iter 1	Iter 2	Iter 4	UPARM Numbr	Coeff.
OR	.0215	.0221	.0216	.0215	.0215	62	-0.2264
RV	.0147	.0111	.0138	.0145	.0147	63	0.7714
SB	.0147	.0181	.0152	.0148	.0147	64	-0.1171
VE	.0147	.0111	.0139	.0145	.0147	65	0.4587

4. RECALIBRATION OF MBC'S IN MCHNWRK MODEL

For calibrating the MBC's in the MCHNWRK model, the following base year information are required:

1. MRP.FARELK82.MD10 --- transit time and transfer tables for midday period,
2. MRP.Y80Z1628.H8 --- highway time and distance tables in midday period for automobile mode,
3. MRP.FARE.FARELK82.MD.DATA --- transit fare table in midday,
4. MRP.TT.HOOOOW.Y80PA4.DATA --- base year HO/NH trip tables,
5. MRP.TAZ.SCAG80B.DATA --- base year (1980) socio-economic characteristics of each trip production zone.

In calibrating the HO mode choice model, we determine the values of the five MBC's so that MCHNWRK model predicts base year mode split in each of the five counties correctly. This process took seven iterations. Table 3 summarizes the progression to arriving the converged MBC's. The detailed iterative results are reported in Appendix C.

In calibrating the NH mode choice model, we need to determine the two MBC's so that MCHNWRK model predicts base year mode split in each of the three modes (drive alone, shared ride, and transit) correctly. This process took five iterations. Table 4 summarizes the progression to arriving the converged MBC's. The detailed iterative results are reported in Appendix D.

Table 3 Combined Transit Bias Coefficients in Orange, Riverside, San Bernardino, and Ventura Counties -- Home-Based-Nonwork Mode Choice Model

		Model Predicted Transit Shares				UPARM Results	
Counties	Obsv. Share	Iter 0	Iter 3	Iter 5	Iter 7	UPARM Numbr	Coeff.
LA	.0356	.0397	.0360	.0357	.0356	41	-0.5665
OR	.0095	.0105	.0094	.0095	.0095	42	-0.2831
RV	.0049	.0059	.0049	.0049	.0049	43	0.1043
SB	.0049	.0078	.0049	.0049	.0049	44	-0.3674
VE	.0049	.0078	.0050	.0049	.0049	45	0.2626

Table 4 MBC's Calibrated With Regional Mode Split
--- Non-home-Based Mode Choice Model

		Model Predicted shares				UPARM Results	
Mode	Obsv. Share	Iter 0	Iter 1	Iter 3	Iter 5	UPARM Numbr	Coeff.
DA	.6905	.6885	.6904	.6905	.6905	87	-3.1014
SR	.2960	.2951	.2959	.2959	.2960	88	-3.0294
TRN	.0135	.0164	.0137	.0135	.0135	n.a.	0.0000

REFERENCES

General Planning Consultant, Technical Memorandum 86.1.4 -- Patronage Forecasting Procedures, Prepared for SCRTD, April 1987.

Dan McFadden (1976), Multinomial Logit Models -- Some Recent Developments, Department of Economics, University of California, Berkeley.

APPENDIX A

DETAILED CALIBRATION RESULTS ON SCRTD MODE CHOICE MODEL HOME-TO-WORK (STAGE I)

TABLE __

SCRTD MODEL MODE CHOICE RECALIBRATION AFTER LINK FARES - HBW TRIPS, PHASE I -- L.A. COUNTY SPLIT CALIBRATION
HOME-BASED WORK *** OBSERVED TRIPS *** SUMMARY

	TOTAL TRIPS (1)	SHARE BY CTY (2)/(1)	TRANSIT TRIPS (1)*(3)	TRN SHR W/I CTY (3)	TRN PCT BY CTY (1)*(3)/(2)	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
L.A.	4,601,414	0.6535	441,276	0.0959	0.9047								
ORANGE	1,563,268	0.2220	33,610	0.0215	0.0689								
RIVERSIDE	236,292	0.0336	3,473	0.0147	0.0071								
S.B.	330,825	0.0470	4,863	0.0147	0.0100								
VENTURA	309,628	0.0440	4,552	0.0147	0.0093								
TOTAL (2)	7,041,427	1.0000	487,774	0.0693	1.0000	5,102,019	1,034,166	417,468	414,559	47,558	8,438	17,218	7,041,427
SUBMODE SHR (5)						0.7785	0.1578	0.0637	0.8499	0.0975	0.0173	0.0353	2.0000
REGION SHR						0.7246	0.1469	0.0593	0.0589	0.0068	0.0012	0.0024	1.0000

STEP 1 CALIBRATE MODE BIAS AND L.A. CO. BIAS SO THAT TRN SHR IN L.A. IS CORRECT

L.A.*	TOTAL TRIPS	SHARE BY CTY	TRANSIT TRIPS	TRN SHR W/I CTY	TRN PCT BY CNTY	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
OBS TRP	4,601,414	0.6535	441,276	0.0959	0.9047	3,238,668	656,470	265,001	375,040	43,024	7,634	15,577	4,601,414
EST TRP	4,603,546	0.6538	560,176	0.1217	1.1484	3,151,350	624,739	267,281	490,244	43,801	7,722	18,409	4,603,546
OBS SHR						0.7038	0.1427	0.0576	0.0815	0.0094	0.0017	0.0034	1.0000
EST SHR						0.6849	0.1358	0.0581	0.1065	0.0095	0.0017	0.0040	1.0005
EST/OBS						0.9730	0.9517	1.0086	1.3072	1.0181	1.0115	1.1818	
LN(EST/OBS)						-0.0273	-0.0495	0.0086	0.2679	0.0179	0.0115	0.1670	
ORIG.BIAS						-0.2484	0.0000	-1.4377	3.3248	-0.8101	-1.0350	0.3837	
BIAS - LN						-0.2211	0.0495	-1.4463	3.0569	-0.8280	-1.0465	0.2167	
ADJ BIAS						-0.2706	0.0000	-1.4958	3.0074	-0.8775	-1.0960	0.1671	
						UPRM(41)		UPRM(42)	UPRM(32)	UPRM(21)	UPRM(22)	UPRM(23)	

TABLE __ (CONTINUED)

LA COUNTY ADJUSTMENT -- ITERATION 1

****** L.A.*	TOTAL TRIPS	SHARE BY CTY	TRANSIT TRIPS	TRN SHR W/I CTY	TRN PCT BY CNTY	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
OBS TRP	4,601,414	0.653477	441,276	0.0959	0.904672	3,238,668	656,470	265,001	375,040	43,024	7,634	15,577	4,601,414
EST TRP	4,601,414	0.653477	484,284	0.1052467	0.992845	3,198,923	654,335	263,872	417,489	42,966	7,727	16,102	4,601,414
OBS SHR						0.7038	0.1427	0.0576	0.0815	0.0094	0.0017	0.0034	1.0000
EST SHR						0.6952	0.1422	0.0573	0.0907	0.0093	0.0017	0.0035	1.0000
EST/OBS						0.9877	0.9967	0.9957	1.1132	0.9986	1.0122	1.0337	
LN(EST/OBS)						-0.0123	-0.0033	-0.0043	0.1072	-0.0014	0.0121	0.0331	
PREV.BIAS						-0.2706	0.0000	-1.4958	3.0074	-0.8775	-1.0960	0.1671	
BIAS - LN						-0.2583	0.0033	-1.4915	2.9002	-0.8762	-1.1081	0.1340	
ADJ BIAS						-0.2615	0.0000	-1.4948	2.8969	-0.8794	-1.1114	0.1307	
						UPRM(41)		UPRM(42)	UPRM(32)	UPRM(21)	UPRM(22)	UPRM(23)	

LA COUNTY ADJUSTMENT -- ITERATION 2

****** L.A.*	TOTAL TRIPS	SHARE BY CTY	TRANSIT TRIPS	TRN SHR W/I CTY	TRN PCT BY CNTY	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
OBS TRP	4,601,414	0.6535	441,276	0.0959	0.9047	3,238,668	656,470	265,001	375,040	43,024	7,634	15,577	4,601,414
EST TRP	4,601,443	0.6535	445,884	0.0969	0.9141	3,233,731	656,817	265,011	381,840	42,701	7,615	13,728	4,601,443
OBS SHR						0.7038	0.1427	0.0576	0.0815	0.0094	0.0017	0.0034	1.0000
EST SHR						0.7028	0.1427	0.0576	0.0830	0.0093	0.0017	0.0030	1.0000
EST/OBS						0.9985	1.0005	1.0000	1.0181	0.9925	0.9975	0.8813	
LN(EST/OBS)						-0.0015	0.0005	0.0000	0.0180	-0.0075	-0.0025	-0.1264	
PREV.BIAS						-0.2615	0.0000	-1.4948	2.8969	-0.8794	-1.1114	0.1307	
BIAS - LN						-0.2600	-0.0005	-1.4948	2.8789	-0.8719	-1.1089	0.2571	
ADJ BIAS						-0.2595	0.0000	-1.4943	2.8795	-0.8714	-1.1083	0.2576	
						UPRM(41)		UPRM(42)	UPRM(32)	UPRM(21)	UPRM(22)	UPRM(23)	

TABLE __ (CONTINUED)

LA COUNTY ADJUSTMENT -- ITERATION 3

****** L.A.*	TOTAL TRIPS	SHARE BY CTY	TRANSIT TRIPS	TRN SHR W/I CTY	TRN PCT BY CNTY	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
OBS TRP	4,601,414	0.6535	441,276	0.0959	0.9047	3,238,668	656,470	265,001	375,040	43,024	7,634	15,577	4,601,414
EST TRP	4,601,440	0.6535	443,359	0.0964	0.9089	3,236,682	656,443	264,956	377,172	42,979	7,634	15,574	4,601,440
OBS SHR						0.7038	0.1427	0.0576	0.0815	0.0094	0.0017	0.0034	1.0000
EST SHR						0.7034	0.1427	0.0576	0.0820	0.0093	0.0017	0.0034	1.0000
EST/OBS						0.9994	1.0000	0.9998	1.0057	0.9989	1.0000	0.9998	
LN(EST/OBS)						-0.0006	-0.0000	-0.0002	0.0057	-0.0011	-0.0000	-0.0002	
PREV.BIAS						-0.2595	0.0000	-1.4943	2.8795	-0.8714	-1.1083	0.2576	
BIAS - LN						-0.2589	0.0000	-1.4941	2.8738	-0.8703	-1.1083	0.2578	
ADJ BIAS						-0.2589	0.0000	-1.4942	2.8738	-0.8703	-1.1084	0.2578	
						UPRM(41)		UPRM(42)	UPRM(32)	UPRM(21)	UPRM(22)	UPRM(23)	

LA COUNTY ADJUSTMENT -- ITERATION 4

****** L.A.*	TOTAL TRIPS	SHARE BY CTY	TRANSIT TRIPS	TRN SHR W/I CTY	TRN PCT BY CNTY	MODE CHOICES DRV ALONE	SR 2	SR 3+	WLK	PND	PNP	KNR	TOTAL
OBS TRP	4,601,414	0.6535	441,276	0.0959	0.9047	3,238,668	656,470	265,001	375,040	43,024	7,634	15,577	4,601,414
EST TRP	4,601,431	0.6535	441,997	0.0961	0.9062	3,238,035	656,433	264,966	375,763	43,020	7,634	15,580	4,601,431
OBS SHR						0.7038	0.1427	0.0576	0.0815	0.0094	0.0017	0.0034	1.0000
EST SHR						0.7037	0.1427	0.0576	0.0817	0.0093	0.0017	0.0034	1.0000
EST/OBS						0.9998	0.9999	0.9999	1.0019	0.9999	1.0000	1.0002	
LN(EST/OBS)						-0.0002	-0.0001	-0.0001	0.0019	-0.0001	-0.0000	0.0002	
PREV.BIAS						-0.2589	0.0000	-1.4942	2.8738	-0.8703	-1.1084	0.2578	
BIAS - LN						-0.2587	0.0001	-1.4940	2.8718	-0.8702	-1.1083	0.2576	
ADJ BIAS						-0.2588	0.0000	-1.4941	2.8718	-0.8703	-1.1084	0.2575	
						UPRM(41)		UPRM(42)	UPRM(32)	UPRM(21)	UPRM(22)	UPRM(23)	

APPENDIX B

DETAILED CALIBRATION RESULTS ON SCRTD MODE CHOICE MODEL HOME-TO-WORK (STAGE II)

TABLE __

HOME BASED WORK MODE CHOICE RECALIBRATION PHASE II --- COUNTY BIAS COEFFICIENTS ADJUSTMENT (UFMTR REPORT 4)

MODE	CTY	(1) OBSERVED TRIPS	(2) PREDICTED TRIPS	(3) PREDICTED SHARE	(4) OBSERVED SHARE	(5) (3)/(4)	(6) LN(5)	(7) COUNTY BIAS	(8) (7)-(6)	(9) NEW COEFFICIENT	
AUTO	OR	1,529,657	1,528,668	0.9779	0.9785	0.9994	-0.0006	0.0000	0.0006	0.0000	
ITER 1		1,529,658	1,529,565	0.9784	0.9785	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 2		1,529,658	1,529,659	0.9785	0.9785	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 3		1,529,657	1,529,655	0.9785	0.9785	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 4		1,529,658	1,529,659	0.9785	0.9785	1.0000	0.0000	0.0000	-0.0000	0.0000	
TRANSIT	OR	33,610	34,599	0.0221	0.0215	1.0294	0.0290	-0.1940	-0.2230	-0.2236	<--- UPRM(62)
ITER 1		33,610	33,703	0.0216	0.0215	1.0028	0.0028	-0.2236	-0.2264	-0.2265	
ITER 2		33,610	33,609	0.0215	0.0215	1.0000	-0.0000	-0.2265	-0.2264	-0.2264	
ITER 3		33,610	33,612	0.0215	0.0215	1.0001	0.0001	-0.2264	-0.2265	-0.2265	
ITER 4		33,610	33,609	0.0215	0.0215	1.0000	-0.0000	-0.2265	-0.2264	-0.2264	
AUTO	RV	232,819	233,672	0.9889	0.9853	1.0037	0.0037	0.0000	-0.0037	0.0000	
ITER 1		232,819	233,020	0.9862	0.9853	1.0009	0.0009	0.0000	-0.0009	0.0000	
ITER 2		232,819	232,867	0.9855	0.9853	1.0002	0.0002	0.0000	-0.0002	0.0000	
ITER 3		232,817	232,820	0.9853	0.9853	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 4		232,819	232,818	0.9853	0.9853	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	RV	3,473	2,620	0.0111	0.0147	0.7543	-0.2820	0.4100	0.6920	0.6956	<--- UPRM(63)
ITER 1		3,473	3,272	0.0138	0.0147	0.9420	-0.0598	0.6956	0.7554	0.7563	
ITER 2		3,473	3,425	0.0145	0.0147	0.9860	-0.0141	0.7563	0.7703	0.7705	
ITER 3		3,473	3,470	0.0147	0.0147	0.9990	-0.0010	0.7705	0.7715	0.7715	
ITER 4		3,473	3,474	0.0147	0.0147	1.0001	0.0001	0.7715	0.7714	0.7714	
AUTO	SB	325,962	324,833	0.9819	0.9853	0.9965	-0.0035	0.0000	0.0035	0.0000	
ITER 1		325,962	325,806	0.9848	0.9853	0.9995	-0.0005	0.0000	0.0005	0.0000	
ITER 2		325,962	325,939	0.9852	0.9853	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 3		325,962	325,962	0.9853	0.9853	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 4		325,962	325,962	0.9853	0.9853	1.0000	0.0000	0.0000	-0.0000	0.0000	
TRANSIT	SB	4,863	5,992	0.0181	0.0147	1.2321	0.2087	0.3660	0.1573	0.1538	<--- UPRM(64)
ITER 1		4,863	5,019	0.0152	0.0147	1.0321	0.0315	0.1538	0.1222	0.1218	
ITER 2		4,863	4,886	0.0148	0.0147	1.0047	0.0047	0.1218	0.1171	0.1170	
ITER 3		4,863	4,863	0.0147	0.0147	1.0000	-0.0000	0.1170	0.1170	0.1170	
ITER 4		4,863	4,863	0.0147	0.0147	1.0000	-0.0000	0.1170	0.1171	0.1171	

HOME BASED WORK MODE CHOICE RECALIBRATION PHASE II --- COUNTY BIAS COEFFICIENTS ADJUSTMENT (UFMTR REPORT 4)

MODE	CTY	(1) OBSERVED TRIPS	(2) PREDICTED TRIPS	(3) PREDICTED SHARE	(4) OBSERVED SHARE	(5) (3)/(4)	(6) LN(5)	(7) COUNTY BIAS	(8) (7)-(6)	(9) NEW COEFFICIENT	
AUTO	VE	305,076	306,176	0.9889	0.9853	1.0036	0.0036	0.0000	-0.0036	0.0000	
ITER 1		305,076	305,326	0.9861	0.9853	1.0008	0.0008	0.0000	-0.0008	0.0000	
ITER 2		305,076	305,128	0.9855	0.9853	1.0002	0.0002	0.0000	-0.0002	0.0000	
ITER 3		305,076	305,086	0.9853	0.9853	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 4		305,076	305,078	0.9853	0.9853	1.0000	0.0000	0.0000	-0.0000	0.0000	
TRANSIT	VE	4,552	3,452	0.0111	0.0147	0.7584	-0.2765	0.1074	0.3839	0.3875	<--- UPRM(65)
ITER 1		4,552	4,302	0.0139	0.0147	0.9452	-0.0564	0.3875	0.4439	0.4447	
ITER 2		4,552	4,500	0.0145	0.0147	0.9887	-0.0114	0.4447	0.4561	0.4563	
ITER 3		4,552	4,542	0.0147	0.0147	0.9979	-0.0021	0.4563	0.4584	0.4584	
ITER 4		4,552	4,550	0.0147	0.0147	0.9997	-0.0003	0.4584	0.4587	0.4587	
AUTO	TOT	2,393,514	2,393,349	0.9809	0.9809	0.9999					
ITER 1		2,393,515	2,393,717	0.9810	0.9809	1.0001					
ITER 2		2,393,515	2,393,593	0.9810	0.9809	1.0000					
ITER 3		2,393,512	2,393,523	0.9809	0.9809	1.0000					
ITER 4		2,393,515	2,393,517	0.9809	0.9809	1.0000					
TRANSIT	TOT	46,498	46,663	0.0191	0.0191	1.0035					
ITER 1		46,498	46,296	0.0190	0.0191	0.9956					
ITER 2		46,498	46,420	0.0190	0.0191	0.9983					
ITER 3		46,498	46,487	0.0191	0.0191	0.9998					
ITER 4		46,498	46,496	0.0191	0.0191	0.9999					
TOTAL	TOT	2,440,012	2,440,012	1.0000	1.0000	1.0000					
ITER 1		2,440,013	2,440,013	1.0000	1.0000	1.0000					
ITER 2		2,440,013	2,440,013	1.0000	1.0000	1.0000					
ITER 3		2,440,010	2,440,010	1.0000	1.0000	1.0000					
ITER 4		2,440,013	2,440,013	1.0000	1.0000	1.0000					

APPENDIX C

DETAILED CALIBRATION RESULTS ON SCRTD MODE CHOICE MODEL HOME-TO-NONWORK

TABLE __

HOME-OTHER MODE CHOICE RECALIBRATION --- BIAS COEFFICIENTS ADJUSTMENT (UFMTR REPORT 4)

MODE	CNTY	(1) OBSERVED TRIPS	(2) PREDICTED TRIPS	(3) PREDICTED SHARE	(4) OBSERVED SHARE	(5) (3)/(4)	(6) LN(5)	(7) COUNTY BIAS	(8) (7)-(6)	(9) NEW BIAS	
AUTO	LA	12,973,914	12,918,750	0.9603	0.9644	0.9957	-0.0043	0.0000	0.0043	0.0000	
ITER 1		12,973,914	12,947,823	0.9625	0.9644	0.9980	-0.0020	0.0000	0.0020	0.0000	
ITER 2		12,973,914	12,961,467	0.9635	0.9644	0.9990	-0.0010	0.0000	0.0010	0.0000	
ITER 3		12,973,914	12,967,983	0.9640	0.9644	0.9995	-0.0005	0.0000	0.0005	0.0000	
ITER 4		12,973,913	12,971,038	0.9642	0.9644	0.9998	-0.0002	0.0000	0.0002	0.0000	
ITER 5		12,973,914	12,972,530	0.9643	0.9644	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 6		12,973,914	12,973,253	0.9644	0.9644	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 7		12,973,913	12,973,622	0.9644	0.9644	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	LA	478,921	534,085	0.0397	0.0356	1.1152	0.1090	-0.3475	-0.4565	-0.4608	<-- UPRMS(41)
ITER 1		478,921	505,012	0.0375	0.0356	1.0545	0.0530	-0.4608	-0.5138	-0.5158	
ITER 2		478,921	491,368	0.0365	0.0356	1.0260	0.0257	-0.5158	-0.5415	-0.5425	
ITER 3		478,921	484,852	0.0360	0.0356	1.0124	0.0123	-0.5425	-0.5548	-0.5552	
ITER 4		478,921	481,796	0.0358	0.0356	1.0060	0.0060	-0.5552	-0.5612	-0.5614	
ITER 5		478,921	480,305	0.0357	0.0356	1.0029	0.0029	-0.5614	-0.5643	-0.5644	
ITER 6		478,921	479,582	0.0356	0.0356	1.0014	0.0014	-0.5644	-0.5658	-0.5659	
ITER 7		478,921	479,212	0.0356	0.0356	1.0006	0.0006	-0.5659	-0.5665	-0.5665	
AUTO	OR	3,820,515	3,816,804	0.9895	0.9905	0.9990	-0.0010	0.0000	0.0010	0.0000	
ITER 1		3,820,515	3,819,367	0.9902	0.9905	0.9997	-0.0003	0.0000	0.0003	0.0000	
ITER 2		3,820,516	3,819,658	0.9903	0.9905	0.9998	-0.0002	0.0000	0.0002	0.0000	
ITER 3		3,820,516	3,820,743	0.9906	0.9905	1.0001	0.0001	0.0000	-0.0001	0.0000	
ITER 4		3,820,516	3,820,589	0.9905	0.9905	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 5		3,820,516	3,820,630	0.9905	0.9905	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 6		3,820,516	3,820,454	0.9905	0.9905	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 7		3,820,515	3,820,508	0.9905	0.9905	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	OR	36,643	40,354	0.0105	0.0095	1.1013	0.0965	-0.1407	-0.2372	-0.2381	<-- UPRMS(42)
ITER 1		36,643	37,791	0.0098	0.0095	1.0313	0.0308	-0.2381	-0.2690	-0.2693	
ITER 2		36,643	37,501	0.0097	0.0095	1.0234	0.0231	-0.2693	-0.2924	-0.2927	
ITER 3		36,643	36,416	0.0094	0.0095	0.9938	-0.0062	-0.2927	-0.2864	-0.2864	
ITER 4		36,643	36,570	0.0095	0.0095	0.9980	-0.0020	-0.2864	-0.2844	-0.2844	
ITER 5		36,643	36,529	0.0095	0.0095	0.9969	-0.0031	-0.2844	-0.2813	-0.2812	
ITER 6		36,643	36,705	0.0095	0.0095	1.0017	0.0017	-0.2812	-0.2829	-0.2829	
ITER 7		36,643	36,650	0.0095	0.0095	1.0002	0.0002	-0.2829	-0.2831	-0.2831	
AUTO	RV	772,812	772,051	0.9941	0.9951	0.9990	-0.0010	0.0000	0.0010	0.0000	
ITER 1		772,812	772,564	0.9948	0.9951	0.9997	-0.0003	0.0000	0.0003	0.0000	
ITER 2		772,812	772,731	0.9950	0.9951	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 3		772,812	772,789	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 4		772,811	772,802	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 5		772,812	772,807	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 6		772,812	772,810	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 7		772,812	772,811	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	RV	3,805	4,566	0.0059	0.0049	1.1999	0.1822	0.3819	0.1997	0.1987	<-- UPRMS(43)
ITER 1		3,805	4,053	0.0052	0.0049	1.0651	0.0630	0.1987	0.1357	0.1354	
ITER 2		3,805	3,886	0.0050	0.0049	1.0212	0.0210	0.1354	0.1144	0.1143	
ITER 3		3,805	3,828	0.0049	0.0049	1.0059	0.0059	0.1143	0.1084	0.1084	
ITER 4		3,805	3,814	0.0049	0.0049	1.0023	0.0023	0.1084	0.1061	0.1061	
ITER 5		3,805	3,810	0.0049	0.0049	1.0012	0.0012	0.1061	0.1049	0.1049	
ITER 6		3,805	3,807	0.0049	0.0049	1.0004	0.0004	0.1049	0.1045	0.1045	
ITER 7		3,805	3,806	0.0049	0.0049	1.0002	0.0002	0.1045	0.1043	0.1043	

TABLE __

HOME-OTHER MODE CHOICE RECALIBRATION --- BIAS COEFFICIENTS ADJUSTMENT (UFMTR REPORT 4)

MODE	CNTY	(1) OBSERVED TRIPS	(2) PREDICTED TRIPS	(3) PREDICTED SHARE	(4) OBSERVED SHARE	(5) (3)/(4)	(6) LN(5)	(7) COUNTY BIAS	(8) (7)-(6)	(9) NEW BIAS	
AUTO	SB	1,082,418	1,079,258	0.9922	0.9951	0.9971	-0.0029	0.0000	0.0029	0.0000	
ITER 1		1,082,418	1,081,772	0.9945	0.9951	0.9994	-0.0006	0.0000	0.0006	0.0000	
ITER 2		1,082,418	1,082,276	0.9950	0.9951	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 3		1,082,418	1,082,388	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 4		1,082,418	1,082,410	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
ITER 5		1,082,417	1,082,419	0.9951	0.9951	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 6		1,082,417	1,082,419	0.9951	0.9951	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 7		1,082,418	1,082,415	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	SB	5,330	8,490	0.0078	0.0049	1.5929	0.4655	0.2495	-0.2160	-0.2190	<-- UPRMS(44)
ITER 1		5,330	5,976	0.0055	0.0049	1.1212	0.1144	-0.2190	-0.3334	-0.3340	
ITER 2		5,330	5,472	0.0050	0.0049	1.0266	0.0263	-0.3340	-0.3603	-0.3604	
ITER 3		5,330	5,360	0.0049	0.0049	1.0056	0.0056	-0.3604	-0.3660	-0.3660	
ITER 4		5,330	5,338	0.0049	0.0049	1.0015	0.0015	-0.3660	-0.3676	-0.3676	
ITER 5		5,330	5,328	0.0049	0.0049	0.9996	-0.0004	-0.3676	-0.3672	-0.3672	
ITER 6		5,330	5,328	0.0049	0.0049	0.9996	-0.0004	-0.3672	-0.3668	-0.3668	
ITER 7		5,330	5,333	0.0049	0.0049	1.0006	0.0006	-0.3668	-0.3674	-0.3674	
AUTO	VE	974,046	971,179	0.9922	0.9951	0.9971	-0.0029	0.0000	0.0029	0.0000	
ITER 1		974,046	973,458	0.9945	0.9951	0.9994	-0.0006	0.0000	0.0006	0.0000	
ITER 2		974,046	973,908	0.9950	0.9951	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 3		974,046	973,908	0.9950	0.9951	0.9999	-0.0001	0.0000	0.0001	0.0000	
ITER 4		974,046	974,114	0.9952	0.9951	1.0001	0.0001	0.0000	-0.0001	0.0000	
ITER 5		974,046	974,063	0.9951	0.9951	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 6		974,046	974,054	0.9951	0.9951	1.0000	0.0000	0.0000	-0.0000	0.0000	
ITER 7		974,046	974,045	0.9951	0.9951	1.0000	-0.0000	0.0000	0.0000	0.0000	
TRANSIT	VE	4,796	7,663	0.0078	0.0049	1.5977	0.4686	0.3623	-0.1063	-0.1092	<-- UPRMS(45)
ITER 1		4,796	5,384	0.0055	0.0049	1.1225	0.1156	-0.1092	-0.2248	-0.2254	
ITER 2		4,796	4,934	0.0050	0.0049	1.0287	0.0283	-0.2254	-0.2537	-0.2538	
ITER 3		4,796	4,934	0.0050	0.0049	1.0287	0.0283	-0.2538	-0.2821	-0.2823	
ITER 4		4,796	4,728	0.0048	0.0049	0.9858	-0.0143	-0.2823	-0.2679	-0.2679	
ITER 5		4,796	4,779	0.0049	0.0049	0.9964	-0.0036	-0.2679	-0.2642	-0.2642	
ITER 6		4,796	4,788	0.0049	0.0049	0.9983	-0.0017	-0.2642	-0.2625	-0.2625	
ITER 7		4,796	4,797	0.0049	0.0049	1.0001	0.0001	-0.2625	-0.2626	-0.2626	
AUTO	TOT	19,623,704	19,558,042	0.9705	0.9737	0.9967					
ITER 1		19,623,704	19,594,984	0.9723	0.9737	0.9985					
ITER 2		19,623,705	19,610,040	0.9730	0.9737	0.9993					
ITER 3		19,623,705	19,617,811	0.9734	0.9737	0.9997					
ITER 4		19,623,703	19,620,953	0.9736	0.9737	0.9999					
ITER 5		19,623,704	19,622,449	0.9737	0.9737	0.9999					
ITER 6		19,623,704	19,622,990	0.9737	0.9737	1.0000					
ITER 7		19,623,703	19,623,401	0.9737	0.9737	1.0000					
TRANSIT	TOT	529,496	595,158	0.0295	0.0263	1.1240					
ITER 1		529,496	558,216	0.0277	0.0263	1.0542					
ITER 2		529,496	543,161	0.0270	0.0263	1.0258					
ITER 3		529,496	535,390	0.0266	0.0263	1.0111					
ITER 4		529,496	532,246	0.0264	0.0263	1.0052					
ITER 5		529,496	530,751	0.0263	0.0263	1.0024					
ITER 6		529,496	530,210	0.0263	0.0263	1.0013					
ITER 7		529,496	529,798	0.0263	0.0263	1.0006					

APPENDIX D

DETAILED CALIBRATION RESULTS ON SCRTD MODE CHOICE MODEL NONHOME-BASED

TABLE __

NON-HOME-BASED MODEL RECALIBRATION --- ASSUMING MODE SPLIT (.6905/.2960/.0135) (UFMTR REPORT 4)

BASE CALCULATION

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,047,101	8,071,118	0.6885	0.6905	0.9970	-0.0030	-2.8850	-2.8880	-3.0847	<-- UPRMS(87)
SR OOOW	3,448,758	3,459,051	0.2951	0.2960	0.9970	-0.0030	-2.8130	-2.8160	-3.0127	<-- UPRMS(88)
TR OOOW	192,097	157,787	0.0164	0.0135	1.2174	0.1968	0.0000	0.1968	0.0000	
TT OOOW	11,687,956	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,775,636	5,789,184	0.6889	0.6905	0.9977	-0.0023	-2.8850	-2.8873	-3.0452	
SR OO	2,475,273	2,481,079	0.2953	0.2960	0.9977	-0.0023	-2.8130	-2.8153	-2.9732	
TR OO	132,530	113,176	0.0158	0.0135	1.1710	0.1579	0.0000	0.1579	0.0000	
AU OO	8,250,909									
TT OO	8,383,439	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,271,465	2,281,934	0.6874	0.6906	0.9954	-0.0046	-2.8850	-2.8896	-3.1787	
SR OW	973,485	977,972	0.2946	0.2960	0.9954	-0.0046	-2.8130	-2.8176	-3.1067	
TR OW	59,567	44,611	0.0180	0.0135	1.3353	0.2891	0.0000	0.2891	0.0000	
AU OW	3,244,950									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

ITERATION 1

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,069,423	8,071,118	0.6904	0.6905	0.9998	-0.0002	-3.0847	-3.0849	-3.1002	<-- UPRMS(87)
SR OOOW	3,458,324	3,459,051	0.2959	0.2960	0.9998	-0.0002	-3.0127	-3.0129	-3.0282	<-- UPRMS(88)
TR OOOW	160,208	157,787	0.0137	0.0135	1.0153	0.0152	0.0000	0.0152	0.0000	
TT OOOW	11,687,955	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,791,043	5,789,184	0.6908	0.6905	1.0003	0.0003	-3.0452	-3.0449	-3.0211	
SR OO	2,481,876	2,481,079	0.2960	0.2960	1.0003	0.0003	-2.9732	-2.9729	-2.9491	
TR OO	110,519	113,176	0.0132	0.0135	0.9765	-0.0238	0.0000	-0.0238	0.0000	
AU OO	8,272,919									
TT OO	8,383,438	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,278,380	2,281,934	0.6895	0.6906	0.9984	-0.0016	-3.1787	-3.1803	-3.2881	
SR OW	976,448	977,972	0.2955	0.2960	0.9984	-0.0016	-3.1067	-3.1083	-3.2161	
TR OW	49,689	44,611	0.0150	0.0135	1.1138	0.1078	0.0000	0.1078	0.0000	
AU OW	3,254,828									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

TABLE __

NON-HOME-BASED MODEL RECALIBRATION --- ASSUMING MODE SPLIT (.6905/.2960/.0135) (UFMTR REPORT 4)

ITERATION 2

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,070,993	8,071,118	0.6905	0.6905	1.0000	-0.0000	-3.1002	-3.1002	-3.1013	<-- UPRMS(87)
SR OOOW	3,458,997	3,459,051	0.2959	0.2960	1.0000	-0.0000	-3.0282	-3.0282	-3.0293	<-- UPRMS(88)
TR OOOW	157,966	157,787	0.0135	0.0135	1.0011	0.0011	0.0000	0.0011	0.0000	
TT OOOW	11,687,956	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,792,121	5,789,184	0.6909	0.6905	1.0005	0.0005	-3.0211	-3.0206	-2.9828	
SR OO	2,482,338	2,481,079	0.2961	0.2960	1.0005	0.0005	-2.9491	-2.9486	-2.9108	
TR OO	108,980	113,176	0.0130	0.0135	0.9629	-0.0378	0.0000	-0.0378	0.0000	
AU OO	8,274,459									
TT OO	8,383,439	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,278,872	2,281,934	0.6896	0.6906	0.9987	-0.0013	-3.2881	-3.2894	-3.3830	
SR OW	976,659	977,972	0.2956	0.2960	0.9987	-0.0013	-3.2161	-3.2174	-3.3110	
TR OW	48,986	44,611	0.0148	0.0135	1.0981	0.0936	0.0000	0.0936	0.0000	
AU OW	3,255,531									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

ITERATION 3

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,071,104	8,071,118	0.6905	0.6905	1.0000	-0.0000	-3.1013	-3.1013	-3.1014	<-- UPRMS(87)
SR OOOW	3,459,045	3,459,051	0.2959	0.2960	1.0000	-0.0000	-3.0293	-3.0293	-3.0294	<-- UPRMS(88)
TR OOOW	157,807	157,787	0.0135	0.0135	1.0001	0.0001	0.0000	0.0001	0.0000	
TT OOOW	11,687,956	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,792,191	5,789,184	0.6909	0.6905	1.0005	0.0005	-2.9828	-2.9823	-2.9436	
SR OO	2,482,367	2,481,079	0.2961	0.2960	1.0005	0.0005	-2.9108	-2.9103	-2.8716	
TR OO	108,881	113,176	0.0130	0.0135	0.9620	-0.0387	0.0000	-0.0387	0.0000	
AU OO	8,274,558									
TT OO	8,383,439	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,278,914	2,281,934	0.6896	0.6906	0.9987	-0.0013	-3.3830	-3.3843	-3.4766	
SR OW	976,677	977,972	0.2956	0.2960	0.9987	-0.0013	-3.3110	-3.3123	-3.4046	
TR OW	48,926	44,611	0.0148	0.0135	1.0967	0.0923	0.0000	0.0923	0.0000	
AU OW	3,255,591									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

TABLE __

NON-HOME-BASED MODEL RECALIBRATION --- ASSUMING MODE SPLIT (.6905/.2960/.0135) (UFMTR REPORT 4)

ITERATION 4

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,071,111	8,071,118	0.6905	0.6905	1.0000	-0.0000	-3.1014	-3.1014	-3.1015	<-- UPRMS(87)
SR OOOW	3,459,047	3,459,051	0.2959	0.2960	1.0000	-0.0000	-3.0294	-3.0294	-3.0295	<-- UPRMS(88)
TR OOOW	157,796	157,787	0.0135	0.0135	1.0001	0.0001	0.0000	0.0001	0.0000	
TT OOOW	11,687,954	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,792,193	5,789,184	0.6909	0.6905	1.0005	0.0005	-2.9436	-2.9431	-2.9044	
SR OO	2,482,369	2,481,079	0.2961	0.2960	1.0005	0.0005	-2.8716	-2.8711	-2.8324	
TR OO	108,875	113,176	0.0130	0.0135	0.9620	-0.0387	0.0000	-0.0387	0.0000	
AU OO	8,274,562									
TT OO	8,383,437	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,278,917	2,281,934	0.6895	0.6906	0.9987	-0.0013	-3.4766	-3.4780	-3.5702	
SR OW	976,679	977,972	0.2956	0.2960	0.9987	-0.0013	-3.4046	-3.4060	-3.4982	
TR OW	48,921	44,611	0.0148	0.0135	1.0966	0.0922	0.0000	0.0922	0.0000	
AU OW	3,255,596									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

ITERATION 5

MODE	1 TRIPS PRED	2 TRIPS OBS	3 SHR PRED	4 SHR OBS	5 (3)/(4)	6 LN(5)	7 BETA	8 BETA+(6)	9 ADJ BETA	
DA OOOW	8,071,120	8,071,118	0.6906	0.6905	1.0000	0.0000	-3.1015	-3.1015	-3.1015	<-- UPRMS(87)
SR OOOW	3,459,051	3,459,051	0.2960	0.2960	1.0000	0.0000	-3.0295	-3.0295	-3.0295	<-- UPRMS(88)
TR OOOW	157,783	157,787	0.0135	0.0135	1.0000	-0.0000	0.0000	-0.0000	0.0000	
TT OOOW	11,687,954	11,687,956	1.0000	1.0000	1.0000	0.0000				
DA OO	5,792,201	5,789,184	0.6909	0.6905	1.0005	0.0005	-2.9044	-2.9038	-2.8650	
SR OO	2,482,372	2,481,079	0.2961	0.2960	1.0005	0.0005	-2.8324	-2.8318	-2.7930	
TR OO	108,864	113,176	0.0130	0.0135	0.9619	-0.0388	0.0000	-0.0388	0.0000	
AU OO	8,274,573									
TT OO	8,383,437	8,383,439	1.0000	1.0000	1.0000	0.0000				
DA OW	2,278,919	2,281,934	0.6896	0.6906	0.9987	-0.0013	-3.5702	-3.5715	-3.6637	
SR OW	976,679	977,972	0.2956	0.2960	0.9987	-0.0013	-3.4982	-3.4995	-3.5917	
TR OW	48,919	44,611	0.0148	0.0135	1.0966	0.0922	0.0000	0.0922	0.0000	
AU OW	3,255,598									
TT OW	3,304,517	3,304,517	1.0000	1.0000	1.0000	0.0000				

APPENDIX E

SUMMARY OF INPUTS AND ASSUMPTIONS IN THE SCRTD MODE CHOICE MODELS

ASSUMPTIONS ON FARE PARAMETERS FOR YEAR 80 TRANSIT SERVICE

Mode 4 Base Fare	--	$ 0.43
Mode 5 Base Fare	--	$ 0.43
Mode 8 Base Fare	--	$ 0.33
Mode 5 Zone Fare	--	$ 0.19 per zone
Mode 4/4 Transfer Fare	--	$ 0.21
Mode 4/5 Transfer Fare	--	$ 0.21
Mode 4/8 Transfer Fare	--	$ 0.21
Mode 5/4 Transfer Fare	--	$ 0.21
Mode 5/5 Transfer Fare	--	$ 0.21
Mode 5/8 Transfer Fare	--	$ 0.21
Mode 8/4 Transfer Fare	--	$ 0.05
Mode 8/5 Transfer Fare	--	$ 0.05
Mode 8/8 Transfer Fare	--	$ 0.05

COEFFICIENTS OF MCHWORK TRAVEL TIME AND COSTS IN UPATH STEP

	COEFFICIENTS OF ATTRIBUTES IN UPATH			
	WAIT	XFER	RUNNING	FARE
Mode 1	-	-	.28	-
Mode 2	-	-	.10	-
Mode 3	-	-	.10	-
Mode 4	.56	.56	.10	.1
Mode 5	.56	.56	.10	.1
Mode 8	.56	.56	.10	.1

COEFFICIENTS OF MCHNWRK TRAVEL TIME AND COSTS IN UPATH STEP

	COEFFICIENTS OF ATTRIBUTES IN UPATH			
	WAIT	XFER	RUNNING	FARE
Mode 1	-	-	.16	-
Mode 2	-	-	.10	-
Mode 3	-	-	.10	-
Mode 4	.32	.32	.10	.1
Mode 5	.32	.32	.10	.1
Mode 8	.32	.32	.10	.1