Pathbuilder Calibration with Data on Ridership Patterns

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Pathbuilder Calibration
It needs to be real!

- Vital precursor to mode choice calibration and estimation (if done)
- Pathbuilder calibration must consider:
  - Highway and transit networks
  - Network attributes
  - Pathbuilding parameters
- Two phases
  - Before model building
  - During model calibration/validation

Before model building

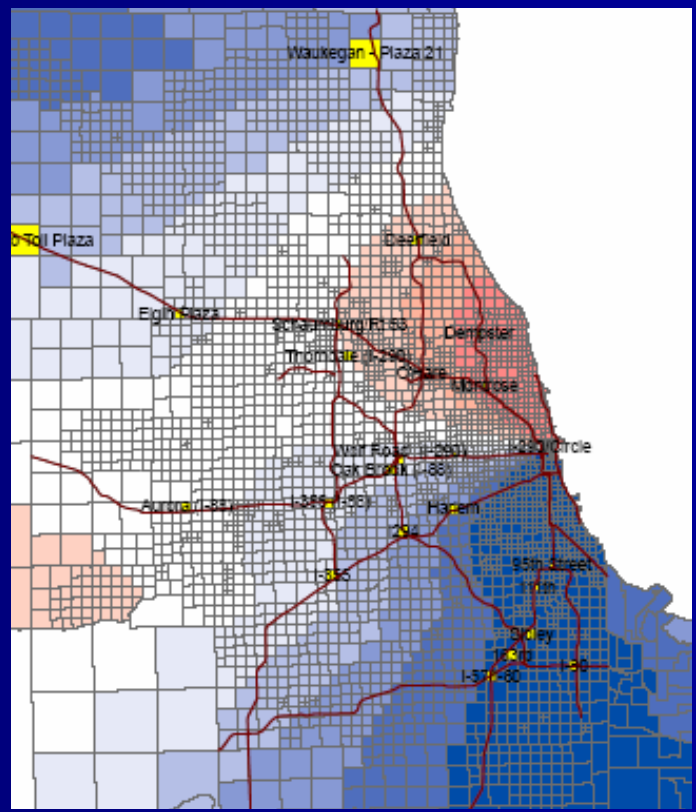
- Test highway speeds
- Test transit running times
- Test assign transit trip tables to transit network

Highway networks

- Key questions to ask:
  - Do highway skims reflect realistic estimates of running times today and in future?
  - Are facility travel times good enough to yield realistic estimates of bus running times?

Comparison of observed and modeled highway times

- Speed data obtained from electronic monitoring system
- Basis for adjustments to skims



Transit networks

- Carefully check the representation of transit supply
  - Bus headways and segment-level running times
  - Rail service patterns
  - Access/egress/transfer links
  - Pathbuilding parameters

Accurate representation of transit services

- Detailed schedule information can be translated to modeled route data

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Line			Chicago to Orland Park - Monday through Friday*								
Train#		SWS	3	7	9	11	13	15	17	19	
Headway			60	60	60	60	60	60	60	60	
Beginning Time			AM	PM	PM	PM	PM	PM	PM	PM	
>Chicago Union Sta	68	42292	7:48	1:45	3:00	4:30	4:57	5:30	6:45	8:30	
Interlocking		41710	|	|	|	|	|	|	|	|	
Wrightwood		42491	8:14	2:10	3:27	4:55	5:23	5:55	7:10	8:56	
Ashburn	27	42490	8:16	2:12	3:29	4:58	5:26	5:58	7:13	8:59	
Oak Lawn		42489	8:21	2:17	3:34	5:03	5:32	6:03	7:18	9:04	
Chicago Ridge		42488	8:25	2:21	3:38	5:07	5:36	6:07	7:22	9:08	
Worth	24	42487	8:28	2:24	3:41	5:11	5:42	6:12	7:25	9:12	
Palos Heights		41747	|	|	|	|	|	|	|	|	
Palos Park		42486	8:33	2:29	3:46	5:16	5:48	6:19	7:30	9:17	
Orland Park (143rd St)		42484	8:39	2:35	3:52	5:23	5:54	6:25	7:36	9:23	
Orland Park (153rd St)	27	41742	8:43	2:39	3:56	5:29	5:58	6:29	7:40	9:27	
Orland Park (179th St)		41743	8:52	2:48	4:06	----	6:07	6:38	7:49	9:36	
Lenox Park		41843	9:00	2:56	4:14	----	6:15	6:46	7:57	9:44	
Manhatten		41845	9:04	3:00	4:18	----	6:19	6:50	8:01	9:48	

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Line			Joliet to Chicago - Monday through Friday - Page								
Train#		R-I	600	400	402	602	404	604	406	606	408
Headway			60	60	60	60	60	60	60	60	60
Beginning Time			AM	AM	AM	AM	AM	AM	AM	AM	AM
Joliet	24	42458	----	5:04	5:33	----	5:50	----	6:12	----	6:30
New Lenox	27	42457	----	5:13	5:42	----	6:00	----	6:22	----	6:39
Mokena/Front Street		42456	----	5:19	5:48	----	6:06	----	6:28	----	6:45
Mokena/Hickory Creek	27	41839	----	5:22	5:51	----	6:10	----	6:32	----	6:49
Tinley Park - 80th Av		41838	----	5:26	5:56	----	6:15	----	6:37	----	6:54
Tinley Park		42455	----	5:30	6:00	----	6:19	----	6:41	----	6:58
Oak Forest	24	42454	----	5:35	6:05	----	6:25	----	6:47	----	7:04
Midlothian		42453	----	5:39	6:09	----	6:29	----	6:51	----	7:08
Robbins		42452	----	5:41	6:12	----	6:32	----	6:53	----	7:11
Blue Island - Vermont	27	42446	----	5:44	6:15	----	6:35	----	6:57	----	7:16
Blue Island - Vermont		42446	5:20	----	----	6:03	----	6:33	----	6:49	----
Prairie St		42445	5:22	----	----	6:05	----	6:35	----	6:51	----
123rd St	27	42444	5:24	----	----	6:07	----	6:37	----	6:53	----
119th St		42443	5:26	----	----	6:09	----	6:39	----	6:55	----
115th St - Morgan Park		42442	5:28	----	----	6:11	----	6:41	----	6:57	----
111th St - Morgan Park		42441	5:30	----	----	6:13	----	6:43	----	6:59	----
107th St - Beverly Hills		42440	5:32	----	----	6:15	----	6:45	----	7:01	----
103rd St - Beverly Hills		42439	5:34	----	----	6:18	----	6:47	----	7:04	----
99th St - Beverly Hills		42438	5:36	----	----	6:20	----	6:49	----	7:06	----
95th St - Beverly Hills		42437	5:38	----	----	6:22	----	6:51	----	7:08	----
91st St - Beverly Hills		42436	5:40	----	----	6:24	----	6:53	----	7:10	----
Brainerd	54	42435	5:42	----	----	6:26	----	6:55	----	7:12	----
103rd St - Wash Hts		42450	----	5:49	6:20	----	|	----	7:02	----	|
95th St - Longwood	54	42448	----	5:52	6:24	----	|	----	7:05	----	|
Gresham	14	42434	5:45	|	|	6:29	|	6:58	|	7:15	|
>Chicago (LaSalle St		42430	6:04	6:14	6:45	6:48	7:02	7:18	7:27	7:34	7:44

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Test assignment

- Build a zone-to-zone survey-based transit trip table
- Assign to network using same path parameters used for skimming
- Check
  - Rail ridership by station group/mode of access
  - Bus ridership by route group/mode of access
  - Transfer rates by mode

During model calibration

- Look at patterns in the travel data
- Understand why the model does or does not properly value the trip
- Adjust the model –
  - Perceptions of impedance in path-builder
  - Other factors in mode choice

Example 1: Charlotte

Table 1c - Summary of Linked Transit Trips on all Transit Modes

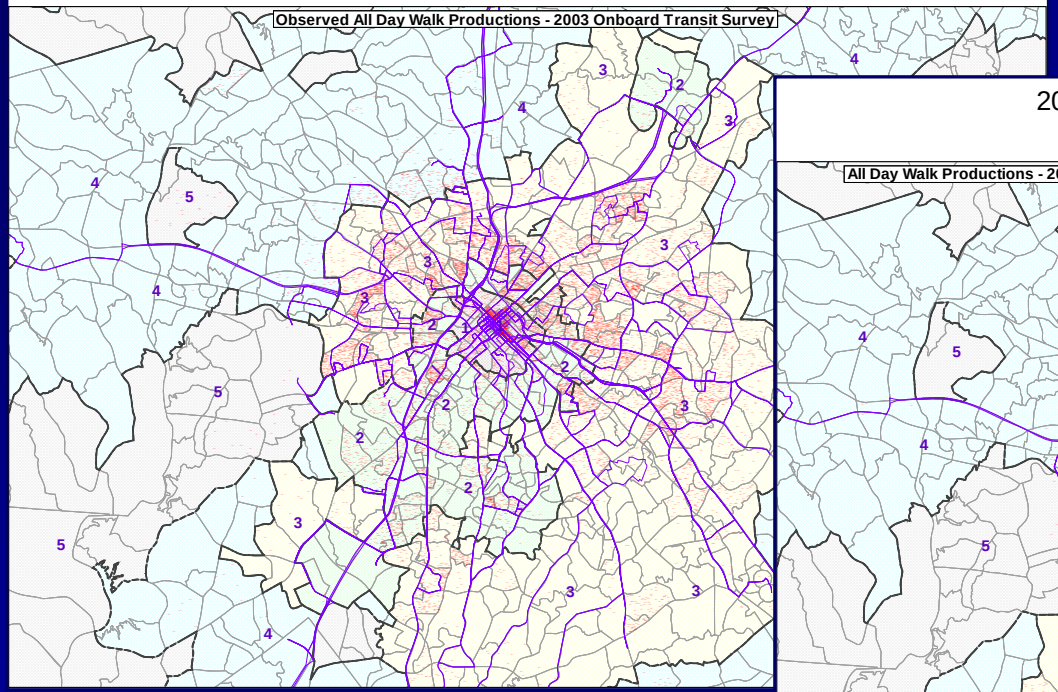
	Walk Mode					Drive Mode					Drop-Off Mode					
ALL-Transit	**CBD Peak**	**NonCBD Peak**	**CBD Off Peak**	**NONCBD Off Peak**	**TOTAL**	**CBD Peak**	**NonCBD Peak**	**CBD Off Peak**	**NONCBD Off Peak**	**TOTAL**	**CBD Peak**	**NonCBD Peak**	**CBD Off Peak**	**NONCBD Off Peak**	**TOTAL**	**GRAND TOTAL**
HBW - Inc 1 (incl HBU)	402	1,652	445	1,955	4,454	41	4	-	-	44	34	67	-	50	151	4,649
HBW - Inc 2	411	1,935	468	1,604	4,418	46	-	-	-	46	6	45	25	101	177	4,642
HBW - Inc 3	702	942	656	869	3,168	310	19	3	-	331	42	7	3	60	111	3,610
HBW - Inc 4	545	360	202	262	1,368	999	35	61	0	1,095	82	36	32	2	152	2,616
HBW - All	2,060	4,889	1,771	4,690	13,409	1,396	58	64	0	1,517	164	155	59	213	592	15,518
HBO - Inc 1	516	1,538	658	2,502	5,214	9	3	-	-	12	1	30	33	121	185	5,411
HBO - Inc 2	321	893	558	1,719	3,492	4	3	-	-	8	8	99	-	26	132	3,632
HBO - Inc 3	275	525	397	983	2,180	3	5	-	0	7	-	15	25	47	86	2,273
HBO - Inc 4	123	253	124	188	689	14	11	-	-	25	-	6	-	22	28	742
HBO - All	1,235	3,210	1,737	5,392	11,574	30	22	-	0	52	9	150	58	216	432	12,058
NHB	509	1,699	733	2,520	5,462	7	2	1	-	11	45	108	47	189	389	5,862
Walk to Local	**3,804**	**9,798**	**4,241**	**12,602**	**30,445**	**1,434**	**82**	**65**	**0**	**1,580**	**218**	**413**	**163**	**618**	**1,413**	**33,438**

Begin by understanding the market:

- Express bus survey shows CBD orientation with 62% of total trips park-and-riding.
- Local bus survey shows most riders being Income Groups 1-3 (under $25K) with few PNR trips.

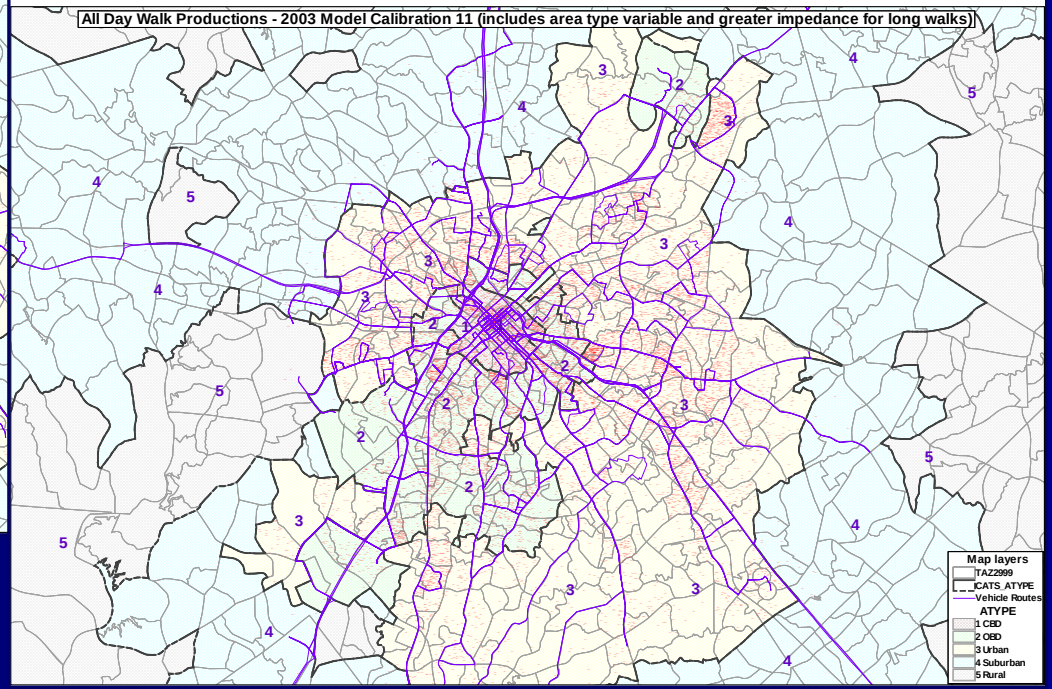
Walk to Transit: Survey vs. Model—pretty good but too much suburban travel in SE and NE

2003 Onboard Transit Survey All Day Walk Productions



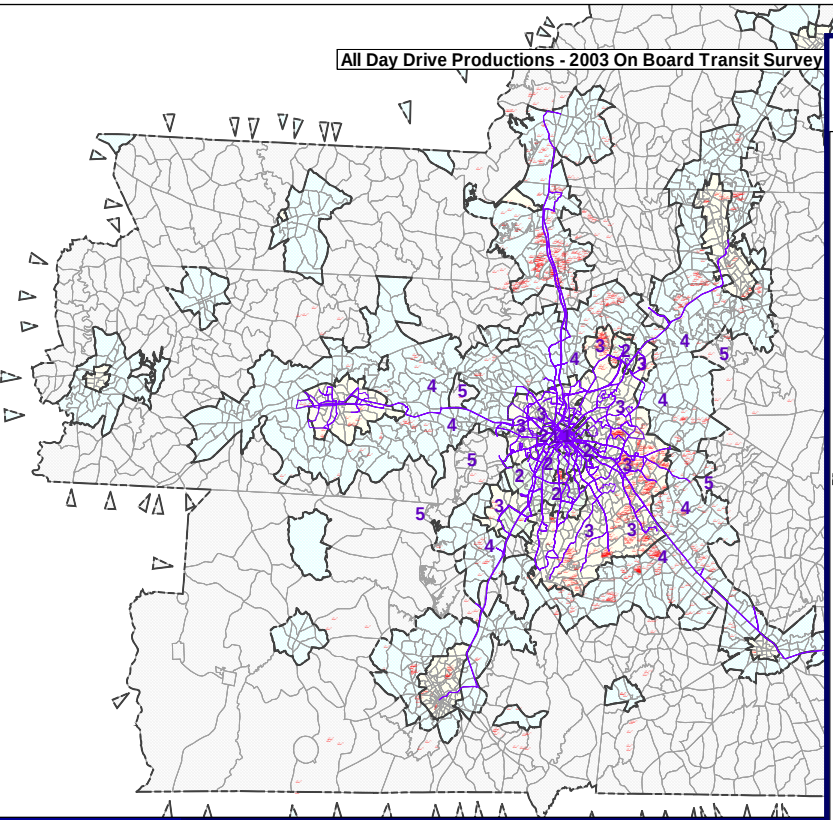
2003 Model Calibration All Day Walk Productions

(includes higher impedance for long walks and area type 4 & 5)



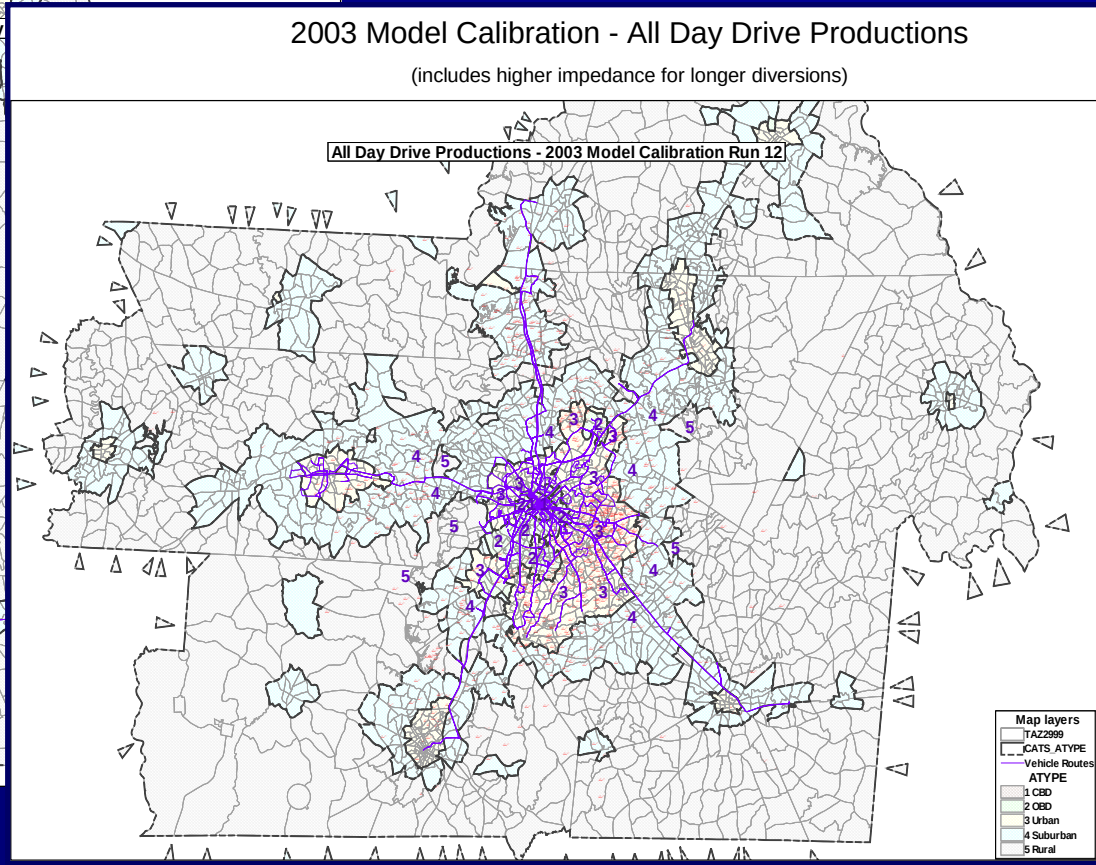
Drive to Transit: Survey vs. Model—too dispersed, too close to CBD and missed concentration in North and NE

2003 Onboard Transit Survey - All Day Drive Productions



2003 Model Calibration - All Day Drive Productions

(includes higher impedance for longer diversions)



Diagnosis of drive access issues

1. Too many PNR trips near downtown
2. Too much backtracking.
3. Model over-predicted PNR trips on local buses versus express buses
4. Too few PNR trips using formal PNR facilities

Impedance adjustments— Part 1: Improved backtracking penalty

- Initial calibration –The auto access weighted by:

$$\frac{\text{drive access distance + transit distance}}{\text{auto mode distance}}$$

- Enhanced calibration – Compute perceived time as ratio follows:

$$\frac{\text{drive access time + transit IVTT}}{\text{auto mode distance}}$$

- If ratio greater than 1.0, compute perceived transit IVT:

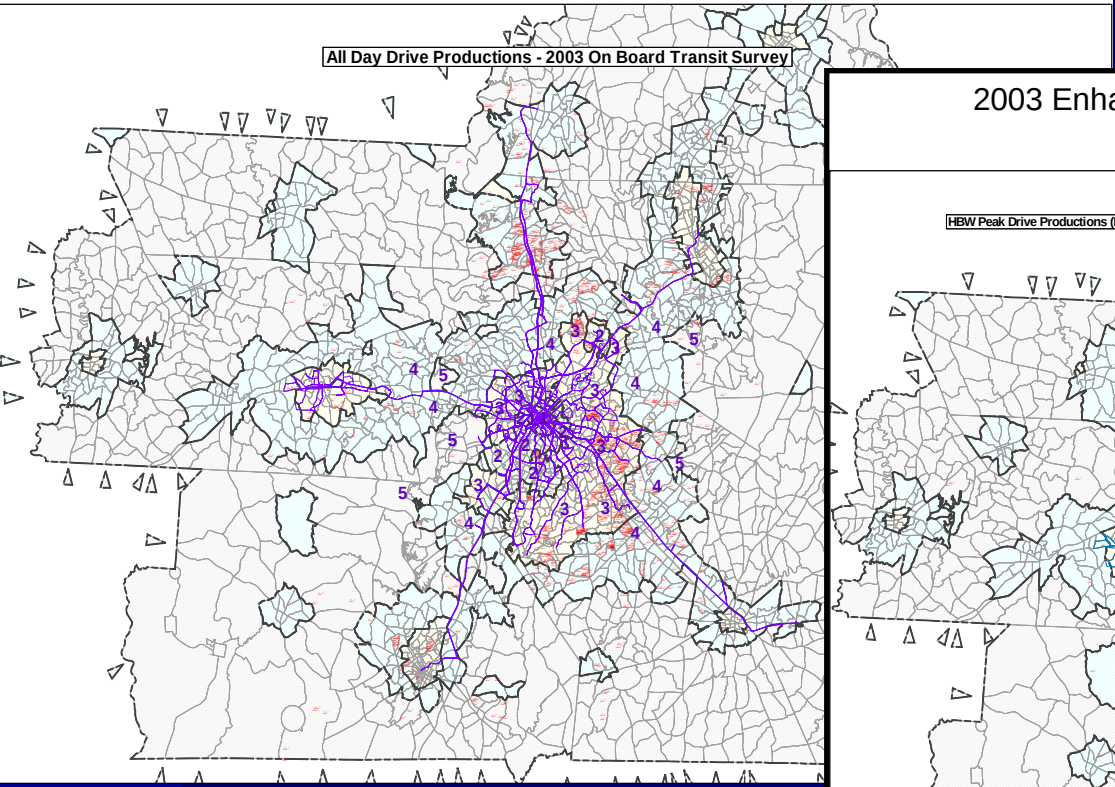
IVT + 60*(ratio-1).

Impedance adjustments—Part 2 shadow prices for informal lots

- Formal vs. Informal shadow pricing
  - Formal PNR lots – no shadow price
  - Informal PNR lots
    - 70+ spaces – 3 min. shadow price
    - 20-70 spaces – 6 min. shadow price
    - less than 20 spaces – 9 min. shadow price

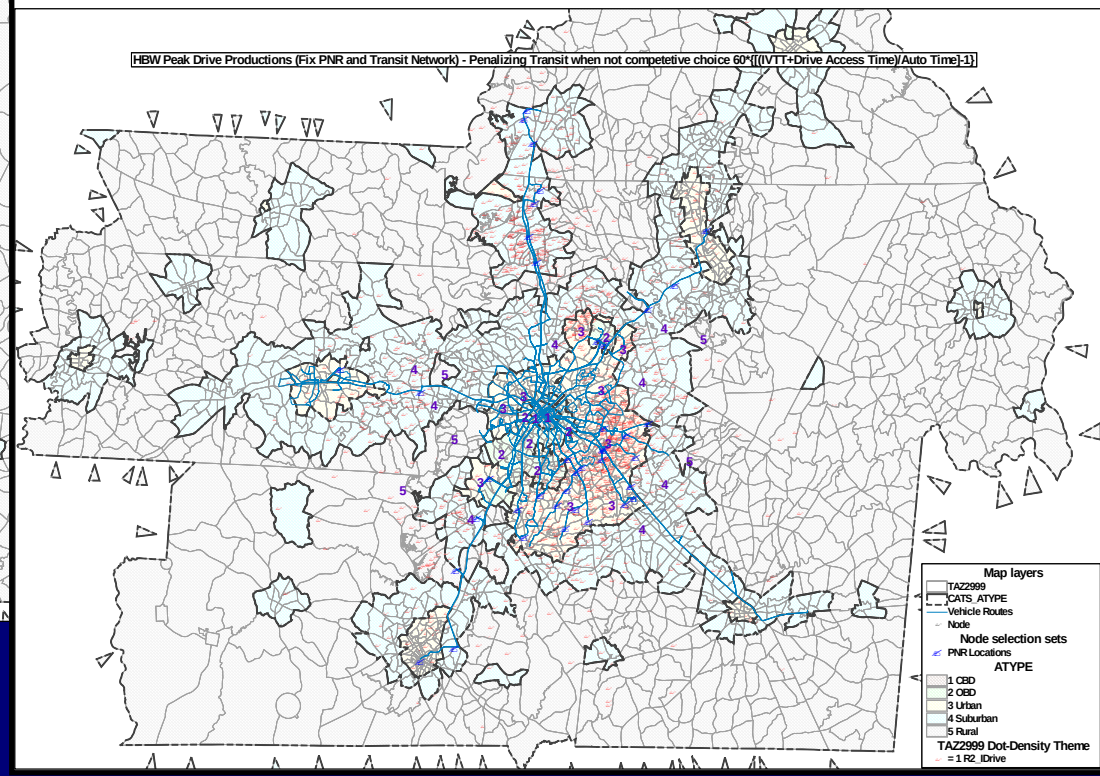
Drive to Transit: survey vs. new model—better distribution of trips

2003 Onboard Transit Survey - All Day Drive Productions



2003 Enhanced Model Calibration - All Day Drive Productions

(includes shadow pricing and transit competitive factors)



Example 2: Denver

	2005 LRT Customer Satisfaction Survey		Old Model - Calibration 3		New Model - Calibration 9	
	Factored 2005 Trips	% Trips	Modeled 2005 Trips	% Trips	Modeled 2005 Trips	% Trips
LRT Only (no transfer)	11,411	33%	7,007	21%	10,418	31%
LRT + Mall Shuttle Only	8,645	25%	9,530	28%	8,938	27%
LRT + Bus (1+bus transfer)	14,523	42%	17,467	51%	13,848	42%
Total	**34,578**	**100%**	**34,004**	**100%**	**33,204**	**100%**

Note: The survey trips are factored to observed average weekday LRT boardings. The percentages were derived from 2005 LRT Customer Satisfaction Survey.

- Initial calibrations needed better representation of mode of access

Problem diagnosis

- Reasons for over-prediction of transfers
  - Too hard to walk:
    - Access / Egress times weighted uniformly at three times IVTT
  - Too easy to take the bus
    - Grid of bus network around mainline service
    - No Mode-to-Mode transfer penalty

Solutions – Walk time weight

- Set perceived walk time as function of pedestrian environment
  - Superior walk environment in high density areas
  - Walking more difficult in less dense environment

- Weights by Area Type:

AT 1 (CBD) =	1.2	AT 4 (Suburban) =	3.0
AT 2 (CBD Fringe) =	1.5	AT 5 (Rural) =	3.5
AT 3 (Urban) =	2.5		

- Pre-weighted walk times used for path-building and skims and sent to mode choice

Solutions – Add transfer penalty

- Mode to mode transfer penalties introduced:
  - Bus - Bus: 2 minutes
  - Rail - Bus / Bus - Rail: 1 minute
    - More pleasant transfer environment at rail-bus stations
  - Transfers to / from Mall Shuttle: No penalty
    - Mall shuttle is a very frequent CBD circulator

Result: much better mode of access

	2005 LRT Customer Satisfaction Survey		Old Model - Calibration 3		New Model - Calibration 9	
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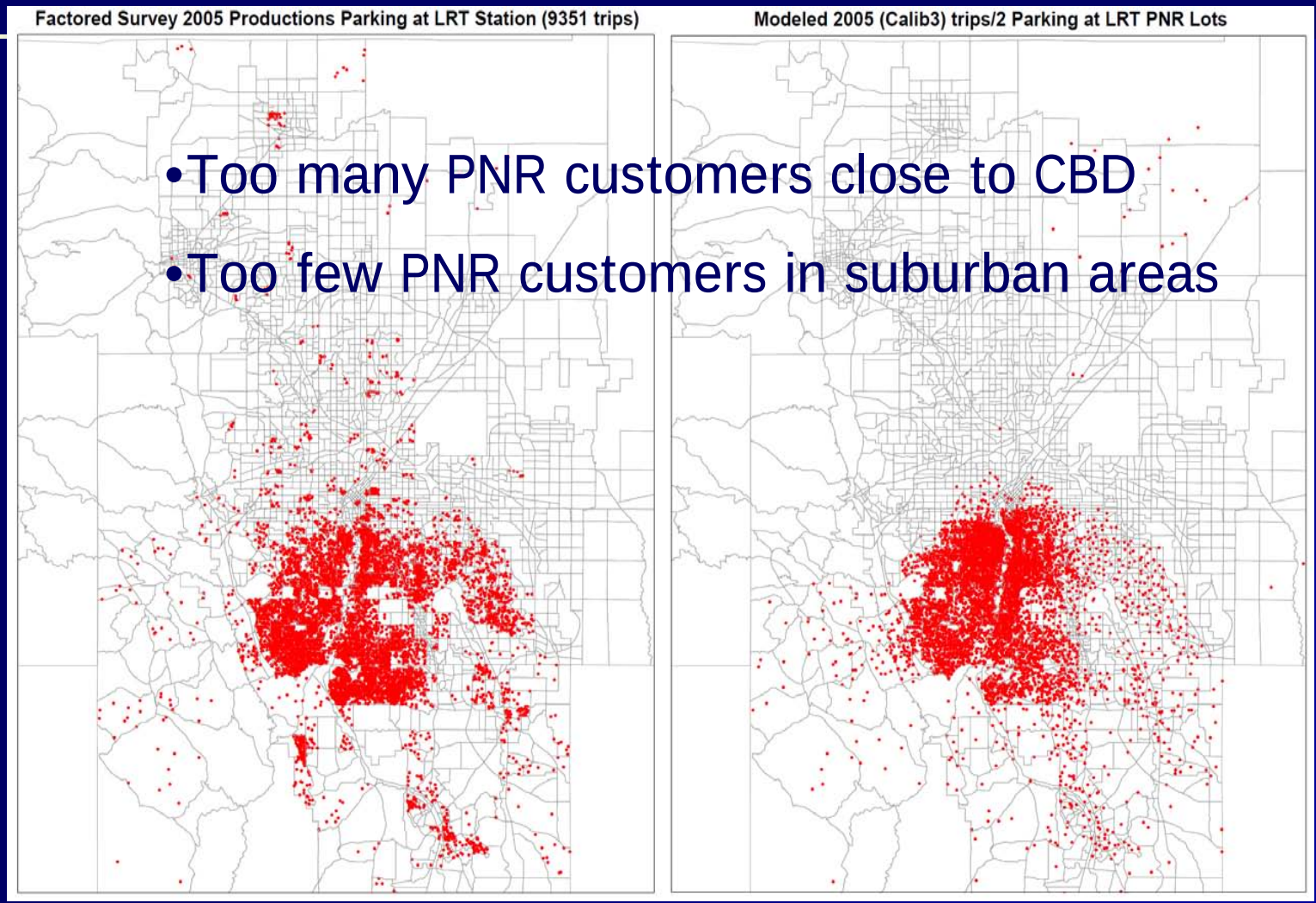
Example 3: Denver



- Too many PNR customers close to CBD
- Too few PNR customers in suburban areas

Solution: Part 1 Improved back-track logic

- Before: weight drive access time like OVTT
- After: to prevent back-tracking and to improve park-n-ride distribution:
  - Drive access time penalized if parking at distant park-n-ride lot
  - Penalty applied to extra drive time past the nearest PNR lot

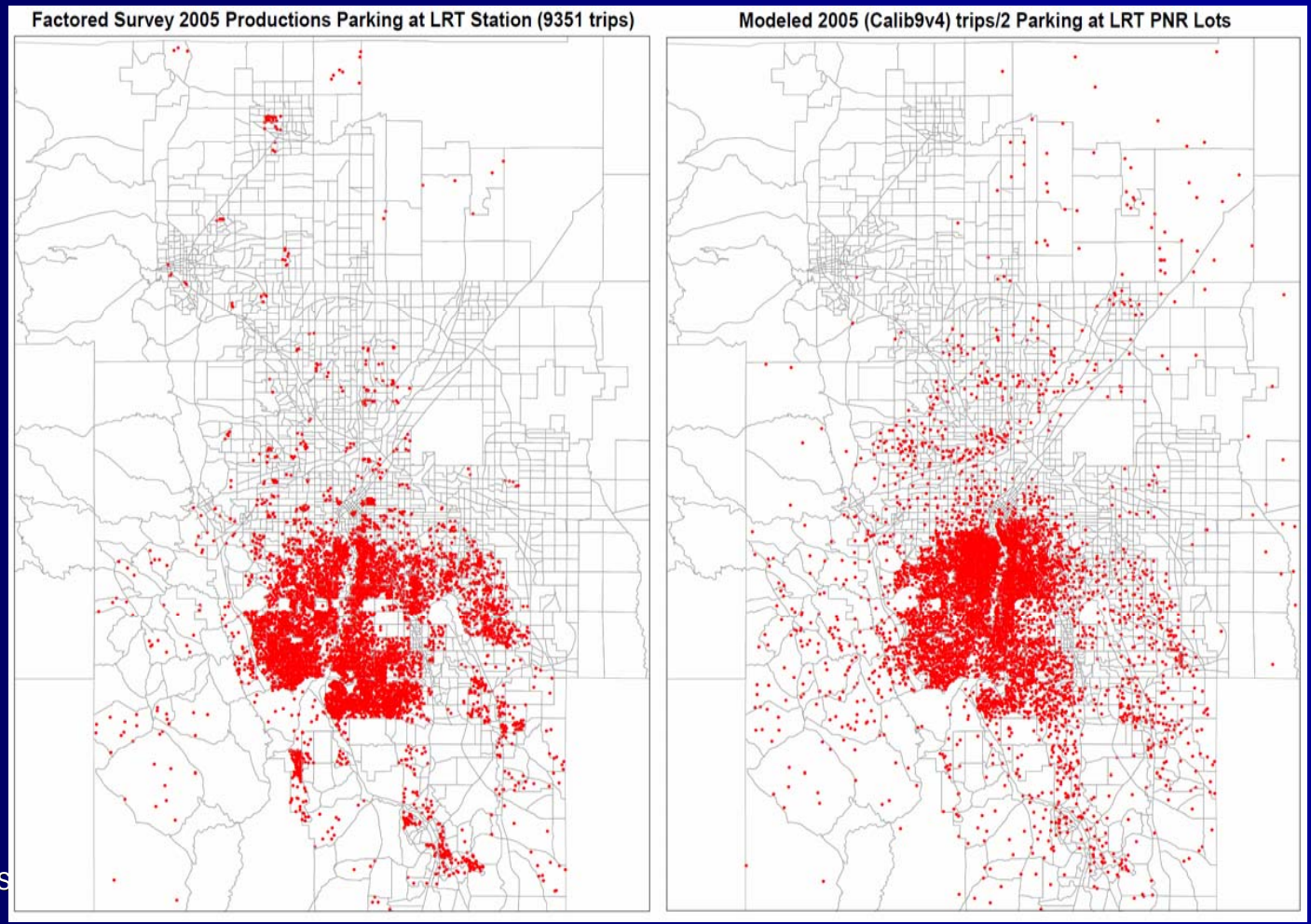
    Penalty = 1.5 times extra drive time

    Composite Drive Access Time = Actual Time + Penalty
  - Apply penalty in pathbuilding and mode choice

Solution: Part 2 weight drive access time by area type

- New model's drive access time weight: Function of Production Area Type
  - Production Area Type 1 (CBD) 3.0
  - Production Area Type 2 (CBD Fringe) 2.5
  - Production Area Type 3 (Urban) 1.5
  - Production Area Type 4 (Sub-urban) 1.0
  - Production Area Type 5 (Rural) 1.0

Result: Somewhat better dispersion



Example 4: Chicago

- Initial runs showed that modeled station boarding patterns didn't match count data

Diagnosis

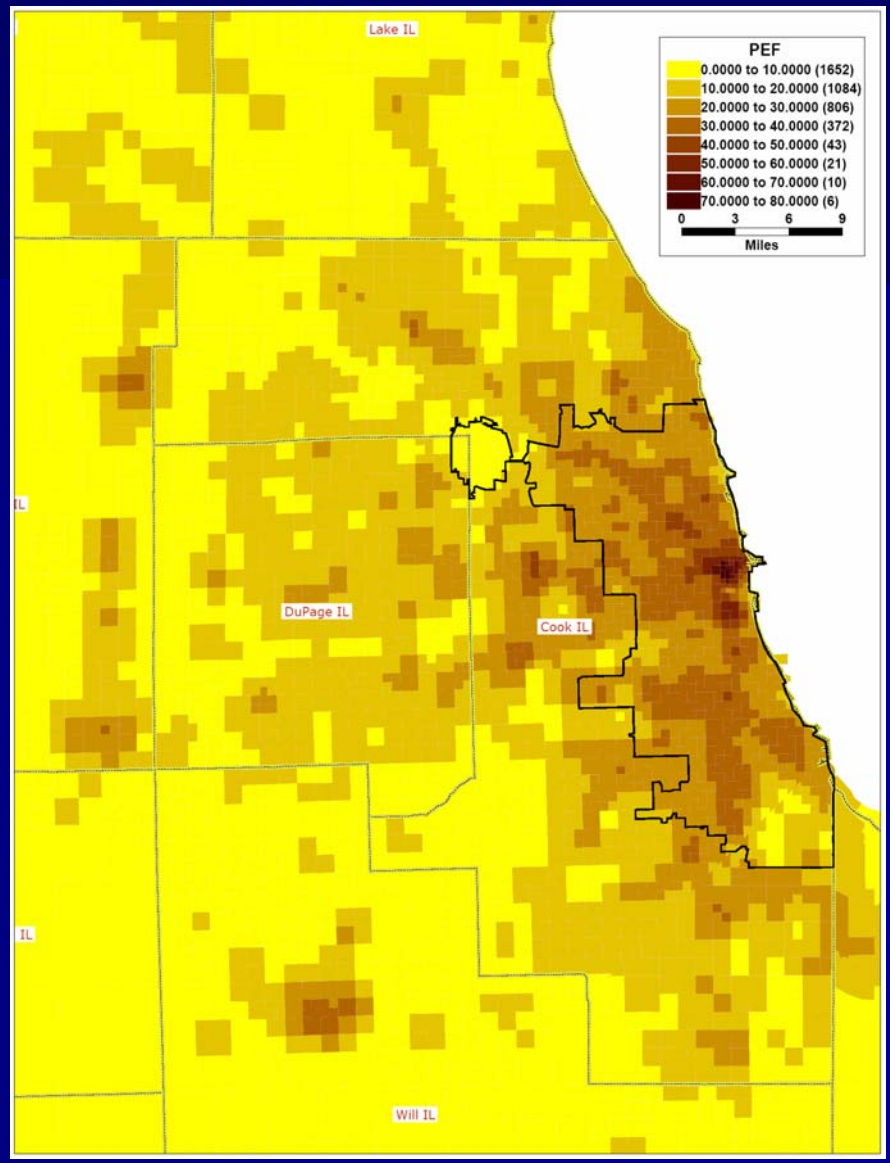
- Model overstated difficulty in walking in downtown Chicago
- Model understated difficulty of walking in suburban areas
- Model unaware of parking constraints or long-drive / short-drive trade-offs

Walk Access

- Walk weight = function of Pedestrian Environment Factor (PEF)
- PEF = blocks per square mile
  - >50 in CBDs
  - <10 in exurban areas

Improve representation of walk access/egress

- Weight walk time by location:
  - PEF >50, weight=1.5
  - PEF <30, weight =3.0
  - Linear between 30 and 50
- Apply in pathbuilder and feed weighted times to mode choice



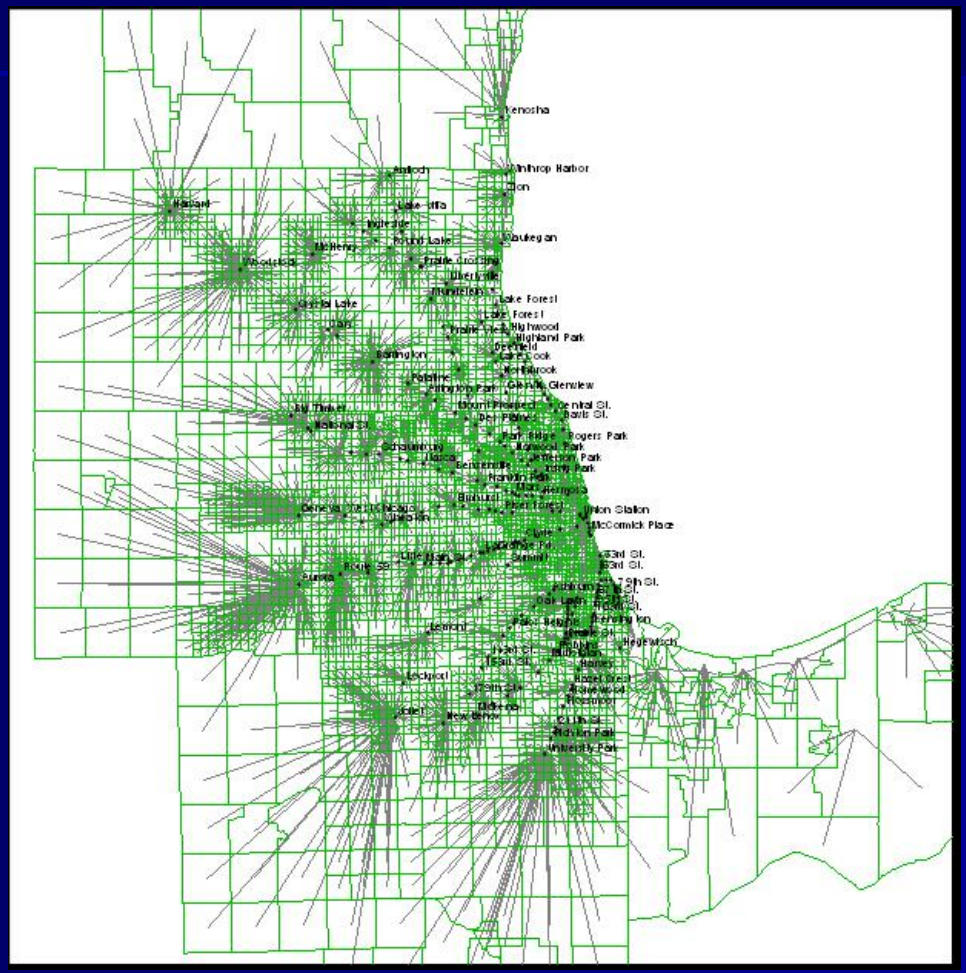
Effect

- Appropriate willingness to walk across Chicago CBD
- Appropriate tendency to use the closest transit route in suburban areas

Drive access

- Minimize backtracking
- Balance long auto connects to good service vs. short connects to less frequent service
  - Time to closest PNR = IVTT
  - Incremental time to further PNRs = OVTT
- Apply shadow prices to overused PNR Lots
  - Procedures already allowed access to multiple lots

Drive access results



Results

- Appropriate ridership by station
- Ability to capture User Benefits realized by capacity relief

Conclusions

- Careful representation of supply is the ***first*** step to making models work better
- Model problems can sometimes be traced to representation of supply
- Network processing procedures can be adjusted to reflect perceptions
  - Desirability of walking
  - Likelihood of driving a long distance
  - Preference of auto access customers to board and express service

Mode Choice Calibration with Data on Ridership Patterns

Bill Davidson

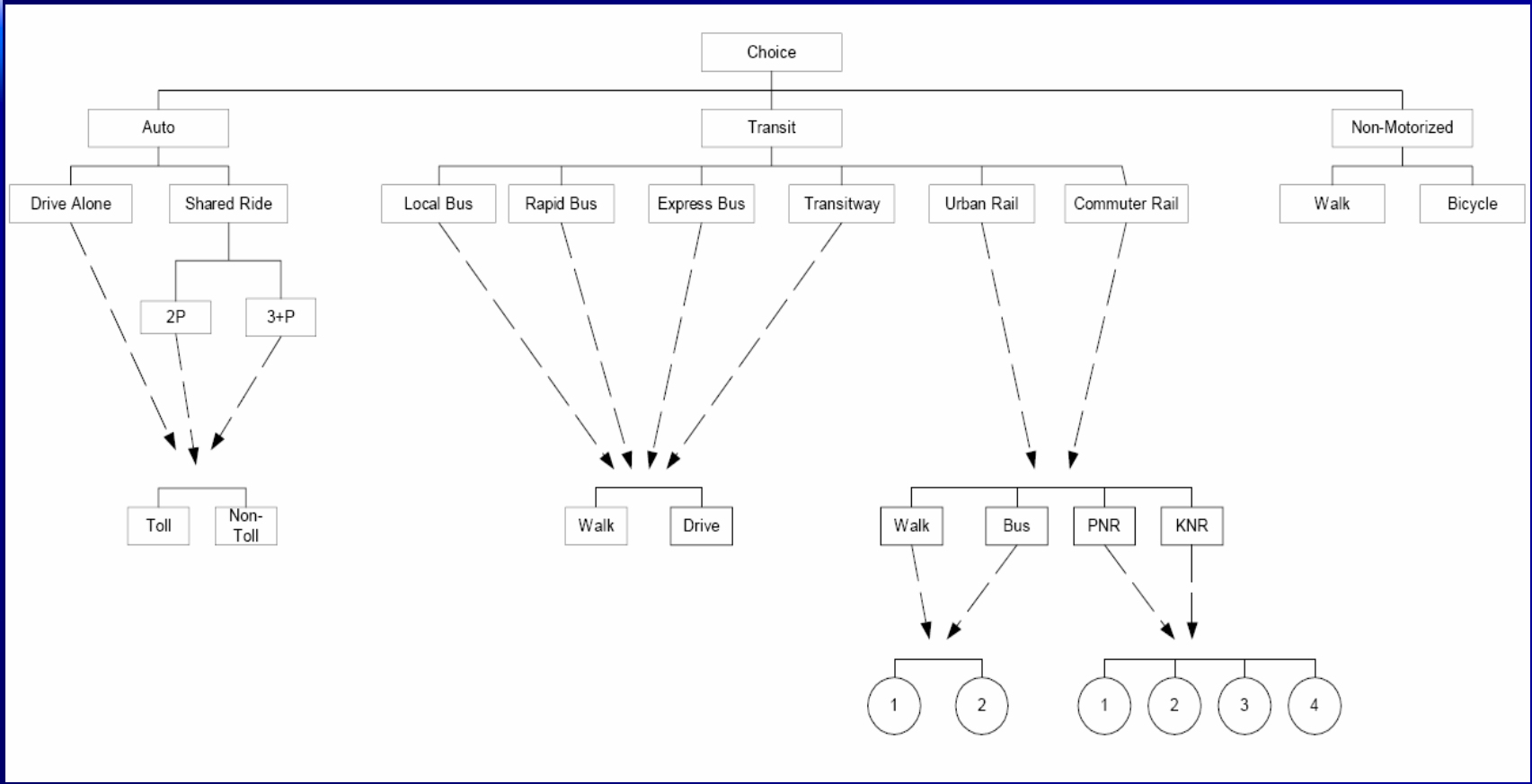
Parsons Brinckerhoff

Topics

- Avoiding the correction-factor effect
- Understanding markets & behavior
- Making the model understand travel behavior
- Observations & lessons learned

Perris Valley Extension

Los Angeles Mode Choice Model



Key Model Inputs

- Person trip matrices
  - CTPP Comparisons
    - Primarily focused on Los Angeles CBD
  - Options?
- Metrolink Fare Representation
  - Fare discounts based upon type of fare paid
  - Employer discounts
  - Removal of transfer fare to Red Line

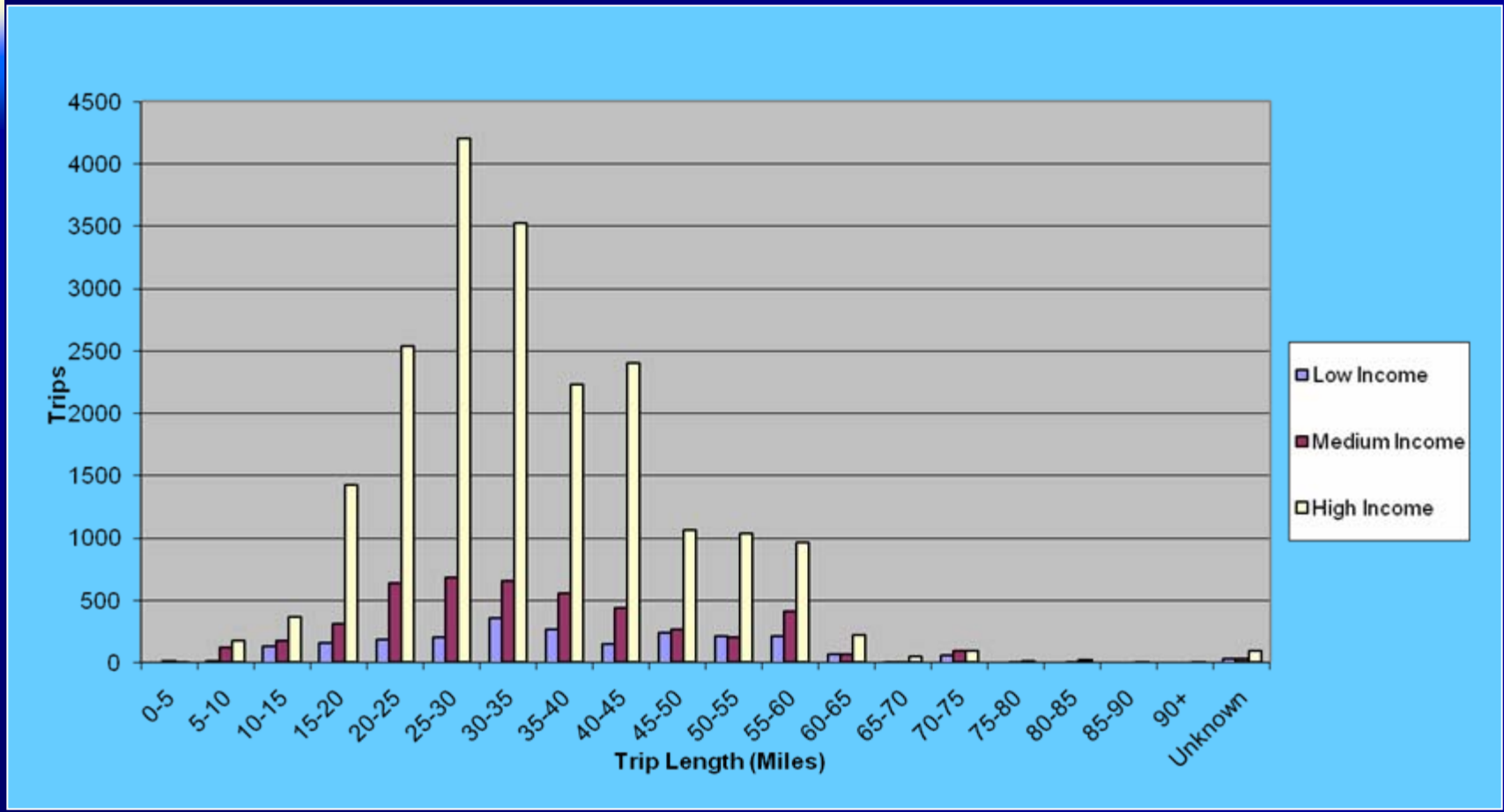
Key Model Inputs

- Evaluation of highway travel times
  - Based upon observed values
  - Identified error in matrix input
- Coding error corrections
  - Assignment of on-board surveys
  - Verification of path building parameters
  - Connectors, headways, running times.....

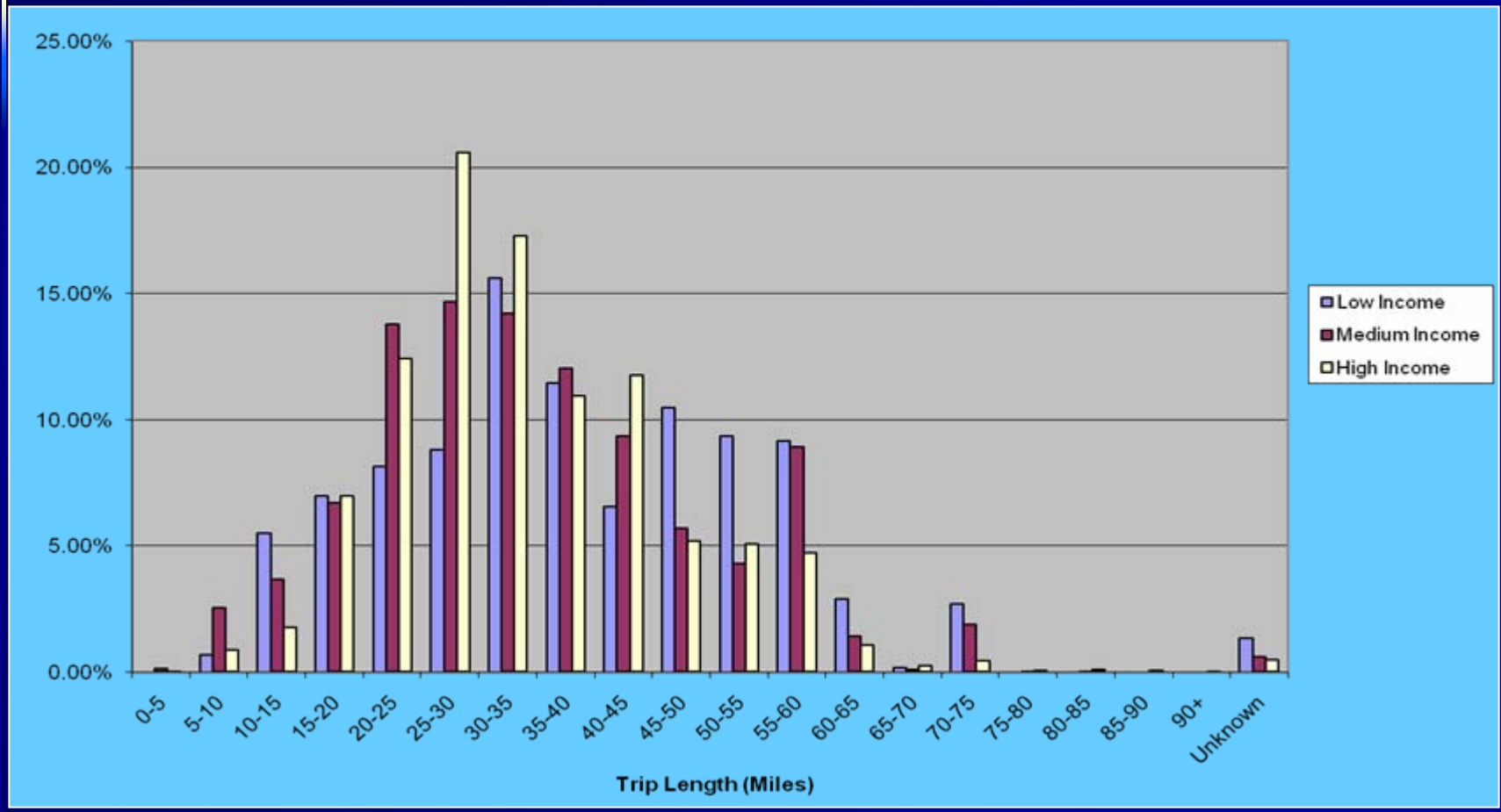
Understanding Markets

	Mode	Household Income 1	2	3	All	Percent
Total	Commuter Rail - Walk	608	571	1,694	*2,872*	8.9%
	Commuter Rail - PNR	1,313	3,413	17,002	*21,729*	67.6%
	Commuter Rail - KNR	1,136	1,142	3,129	*5,407*	16.8%
	Commuter Rail - Bus	906	485	730	*2,121*	6.6%
	Commuter Rail	*3,963*	*5,611*	*22,554*	*32,129*	
Home-Based Work	Commuter Rail - Walk	348	472	1,226	*2,046*	
	Commuter Rail - PNR	1,054	3,153	16,427	*20,634*	
	Commuter Rail - KNR	680	916	2,856	*4,451*	
	Commuter Rail - Bus	447	338	539	*1,324*	
	Commuter Rail	*2,529*	*4,879*	*21,047*	*28,455*	88.6%
Home-Based Other	Commuter Rail - Walk	139	36	90	*265*	
	Commuter Rail - PNR	206	116	314	*636*	
	Commuter Rail - KNR	336	143	148	*628*	
	Commuter Rail - Bus	318	96	50	*464*	
	Commuter Rail	*999*	*391*	*603*	*1,992*	6.2%
Non-Home Based	Commuter Rail - Walk	121	63	377	*562*	
	Commuter Rail - PNR	54	144	261	*459*	
	Commuter Rail - KNR	120	83	125	*328*	
	Commuter Rail - Bus	140	51	142	*333*	
	Commuter Rail	*435*	*342*	*904*	*1,682*	5.2%

HBW Peak Metrolink Trip Length



HBW Peak Trip Length (Relative)



Miami Metrorail Survey

General Trip Purpose

	Frequency	Percent
Home-Based Work	24,487	43.5%
Home-Based School	6,452	11.5%
Home-Based Other	11,931	21.2%
Non-Home Based	13,466	23.9%
Total	56,335	

Auto Ownership Level

	0	1	2+	Total
Home-Based Work	6,039	7,199	11,249	24,487
Home-Based School	1,455	1,793	3,203	6,451
Home-Based Other	4,613	3,369	3,949	11,931
Non-Home Based	5,320	3,240	4,899	13,459
Total	17,427	15,601	23,300	56,328
	30.9%	27.7%	41.4%	

Only 35% of the Metrorail Trips are destined to the CBD !!!

Miami Mode Of Access

Total Metrorail Trips Production Access Mode	Attraction Access Mode: Walk	Drive	Transfer	Other	Total
Walk	17.9%	2.3%	8.6%	1.8%	30.5%
Drive	15.5%	4.7%	7.2%	1.3%	28.7%
Transfer	12.6%	2.8%	17.5%	1.9%	34.8%
Unknown	1.5%	0.6%	1.4%	2.5%	5.9%
Total	47.5%	10.3%	34.7%	7.5%	

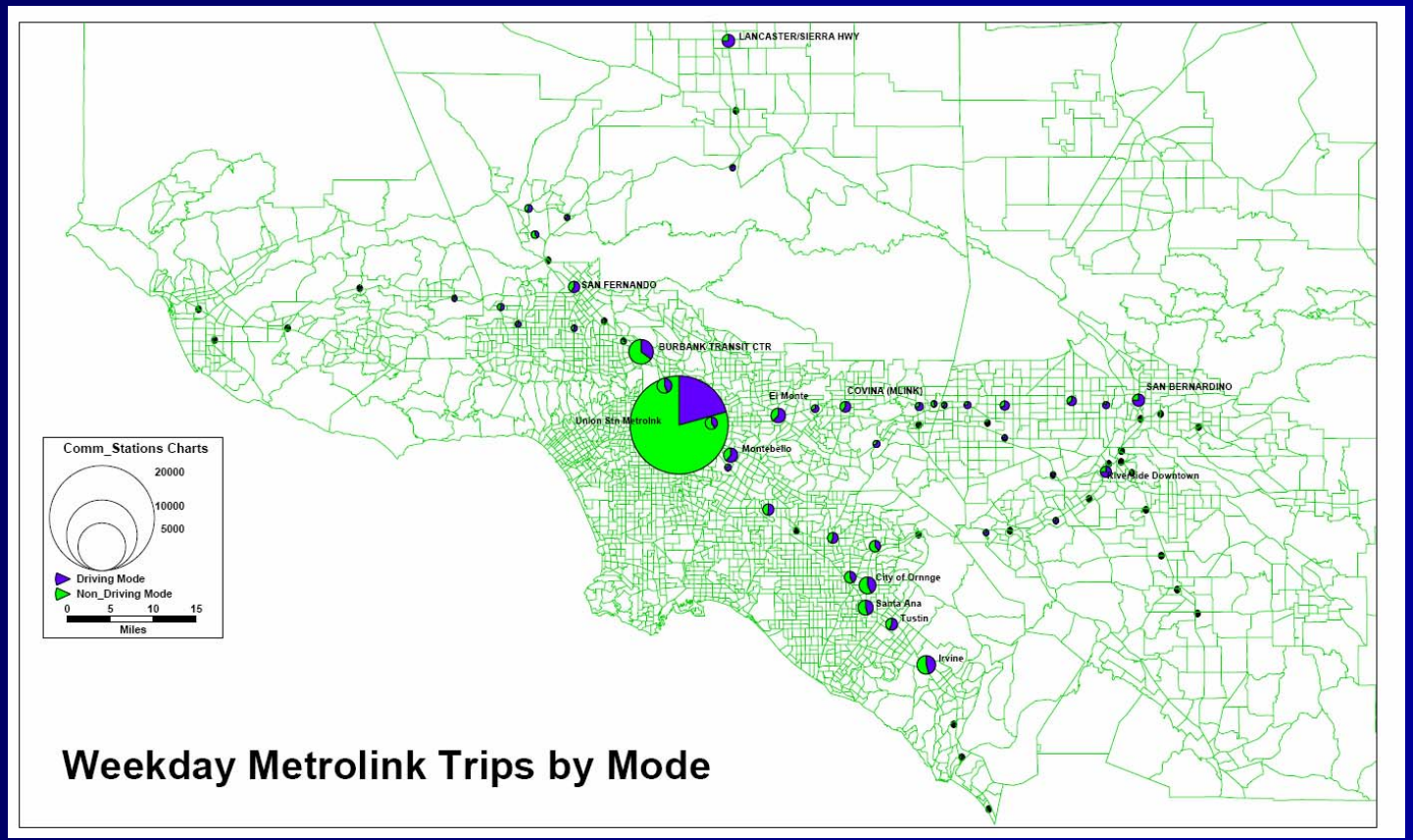
		Mode of Arrival: Walk (0-3)	Walk (>3)	Passenger	Bicycle	Driver	Metromover	Tri-Rail	Metrobus	Other	Unknown	Total
	Unknown								100.0%			100.0%
Dadeland	South	8.8%	6.9%	7.7%	1.3%	38.9%	0.2%		34.7%	1.6%		100.0%
Dadeland	North	7.8%	3.5%	9.4%	0.8%	40.1%		0.5%	35.2%	2.7%		100.0%
South	Miami	10.9%	10.8%	9.4%	1.7%	53.2%		1.3%	10.8%	2.0%		100.0%
	Unversity	35.2%	5.8%	18.4%	6.8%	19.8%			5.1%	9.0%		100.0%
Douglas	Road	17.3%	11.5%	5.4%	1.2%	6.9%			36.6%	18.9%	2.2%	100.0%
Coconut	Grove	27.4%	29.4%	10.9%	2.4%	7.9%		1.0%	20.5%	0.5%		100.0%
	Vizcaya	31.2%	15.6%	3.6%	0.9%	11.3%			37.5%			100.0%
	Brickell	40.1%	8.8%	0.7%	0.7%	0.9%	9.7%		39.1%			100.0%
Govt	Center	23.9%	6.8%	1.4%		3.3%	22.5%	1.3%	40.6%	0.2%		100.0%
Overtown	Arena	31.7%	13.7%	9.3%	9.8%	5.6%	5.1%		16.9%	7.9%		100.0%
	Culmer	44.3%	16.7%			2.6%			32.6%	1.2%	2.7%	100.0%
Civic	Center	57.7%	8.2%	14.5%	0.6%	1.7%	1.6%	1.5%	10.3%	3.8%		100.0%
Santa	Clara	57.3%	18.6%	2.8%	11.8%	9.4%						100.0%
	Allapattah	15.8%	20.4%	10.1%	3.6%	2.6%			44.0%	3.5%		100.0%
Earlington	Heights	27.0%	20.6%	9.2%		6.4%			36.0%			100.0%
	Brownsville	20.4%	35.1%	0.0%	3.6%	6.7%			34.3%			100.0%
	MLK	17.9%	7.2%	12.7%	6.4%	2.4%			53.4%			100.0%
	Northside	18.5%	7.1%	13.3%	1.3%	19.0%	3.9%	0.5%	31.7%	3.1%	1.7%	100.0%
	Tri-Rail	6.6%	3.7%	22.5%		21.7%		37.6%	2.4%	5.5%		100.0%
	Hialeah	11.1%	12.7%	12.7%	3.4%	18.4%	1.5%	1.7%	32.7%	3.6%	2.1%	100.0%
	Okeechobee	2.2%	6.8%	16.0%	0.4%	44.9%		0.8%	24.8%	3.9%	0.3%	100.0%
	Palmetto	1.3%	1.6%	34.5%		39.9%			21.5%	1.4%		100.0%
	Total	17.9%	9.8%	9.1%	1.5%	23.0%	3.0%	1.0%	31.2%	3.1%	0.4%	100.0%

Metrolink Egress Mode Characteristics

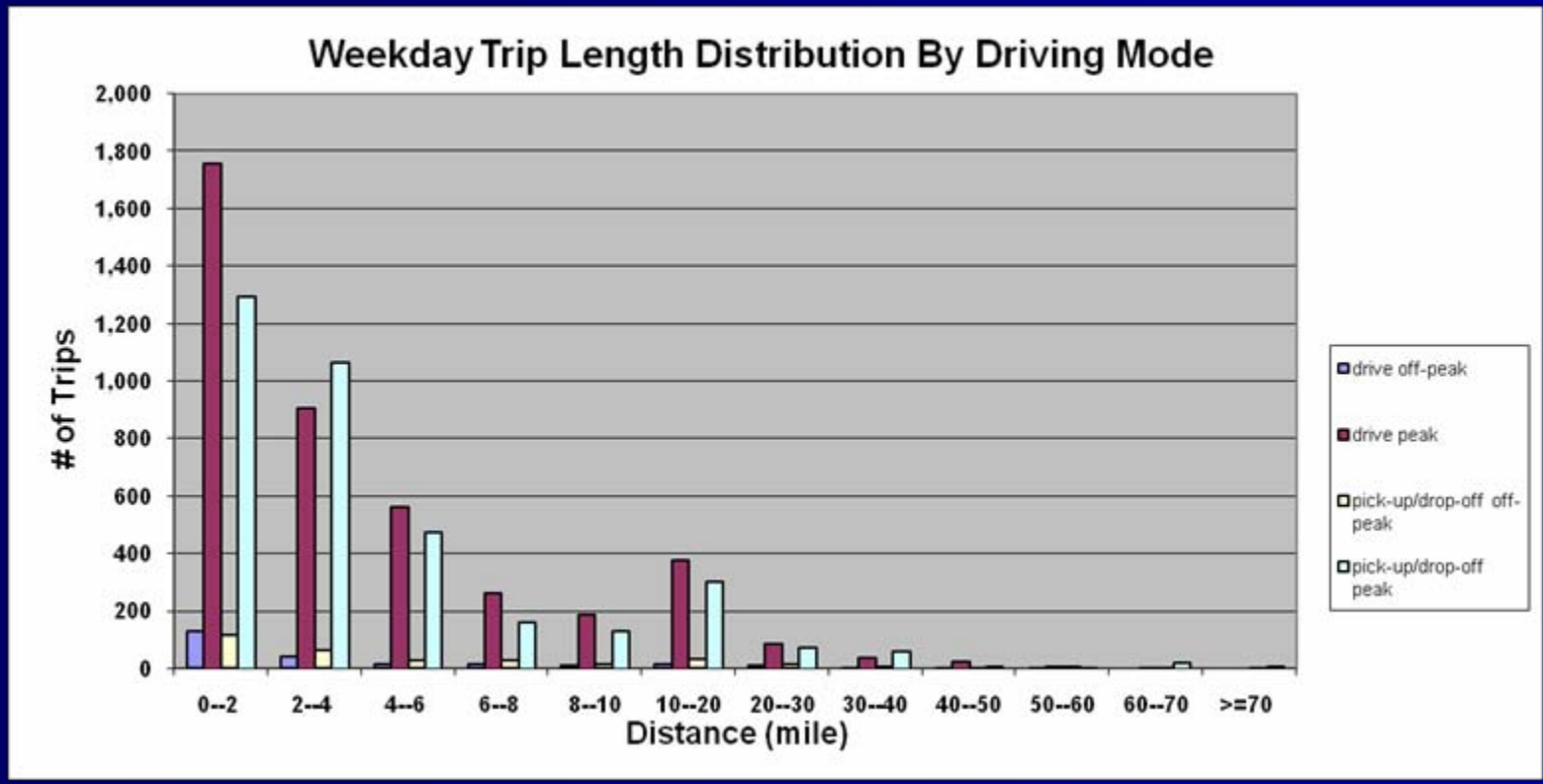
Weekday Metrolink Trips by Egress Mode

Egress Mode	# of Trips	Percent
Driving Modes	**12,236**	**34.70**
drive	6,172	17.50
pick-up/drop-off	6,064	17.20
Non_Driving Modes	**23,030**	**65.30**
bicycle	545	1.55
bus	14,004	39.71
walk	8,481	24.05
Total	**35,266**	**100**

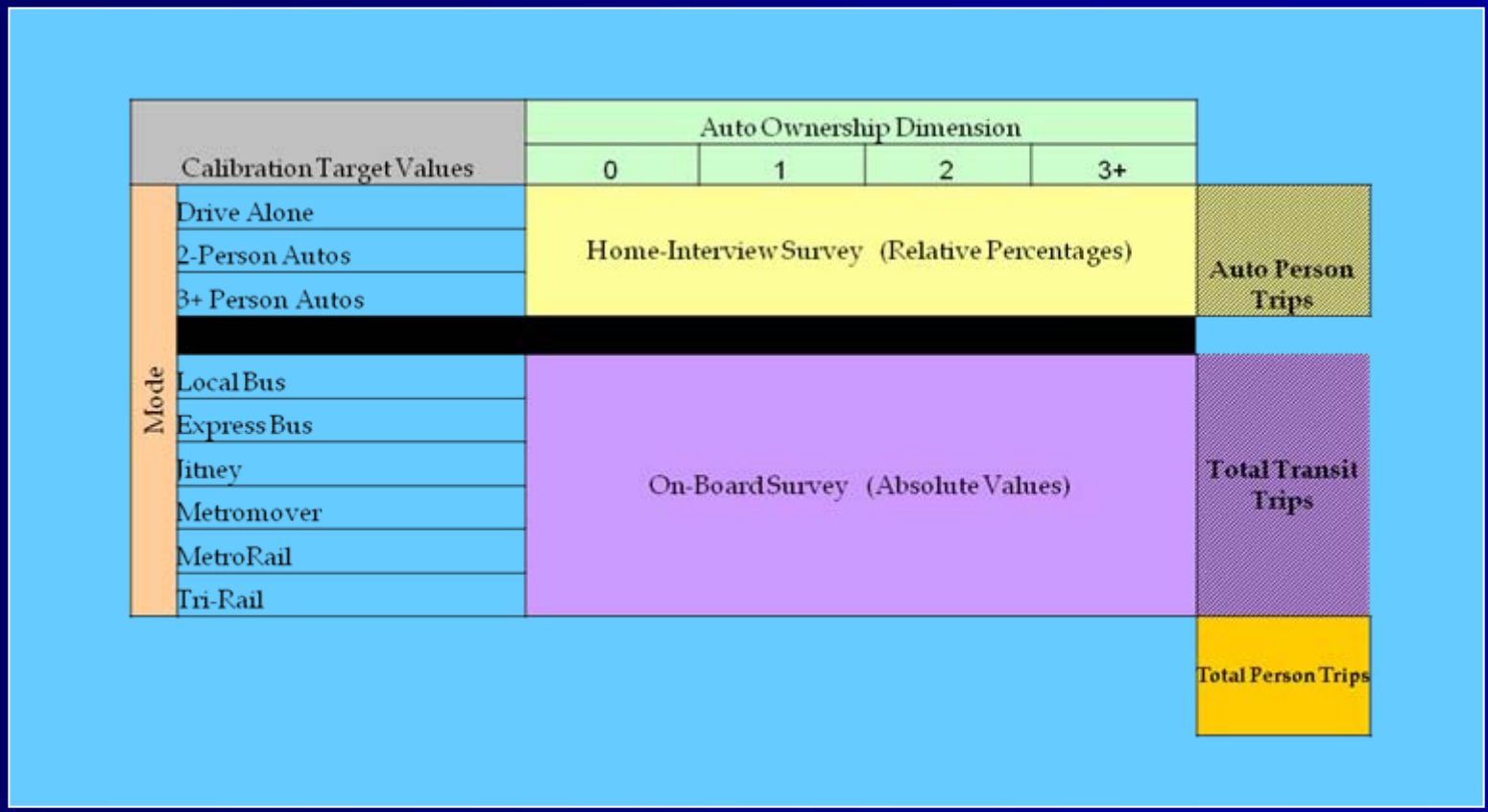
Metrolink Egress Mode



Drive Egress Trip Length



Calibration Target Values



District Level Shares

Commuter Rail Shares

Obs CR Trips Divided by Daily HBW Person Trips

	District	Total	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Perris	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0111	0.0103	0.3983	0.0825	0.0083	0.0000
2	CityRiv	0.0093	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0267	0.0455	0.6597	0.0634	0.0152	0.0000
3	Norco	0.0093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0265	0.0316	0.4485	0.1227	0.0157	0.0000
4	Hemet	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0450	0.0040	0.6097	0.0237	0.0107	0.0000
5	Temucula	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0047	0.0011	0.2438	0.0526	0.0076	0.0000
6	CVAG	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0070	0.0246	0.2637	0.0315	0.0054	0.0000
7	SBD	0.0067	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0079	0.0133	0.5368	0.0590	0.0159	0.0105
8	OC North	0.0019	0.0000	0.0082	0.0170	0.0000	0.0381	0.0000	0.0023	0.0001	0.0007	0.2144	0.0020	0.0031	0.0000
9	OC South	0.0030	0.0000	0.0189	0.0000	0.0000	0.0000	0.0000	0.0013	0.0009	0.0000	0.7618	0.0171	0.0159	0.0000
10	LA CBD	0.0562	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7492	2.0200	0.0044	0.0069	0.0313	0.0000
11	LA Core	0.0008	0.0707	0.0899	0.1956	0.0000	0.0000	0.0000	0.0154	0.0006	0.0039	0.0086	0.0001	0.0004	0.0030
12	LA Rest	0.0020	0.0000	0.0074	0.0099	0.0000	0.0000	0.0000	0.0077	0.0013	0.0044	0.0326	0.0016	0.0009	0.0010
13	Ventura	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0165	0.0907	0.1565	0.2200	0.0245	0.0039	0.0000
	Total	0.0027	0.0001	0.0010	0.0017	0.0002	0.0002	0.0000	0.0007	0.0019	0.0018	0.0547	0.0027	0.0017	0.0002

Available PNR Commuter Rail Shares

Observed CR Trips Divided by Available PNR CR Person Trips

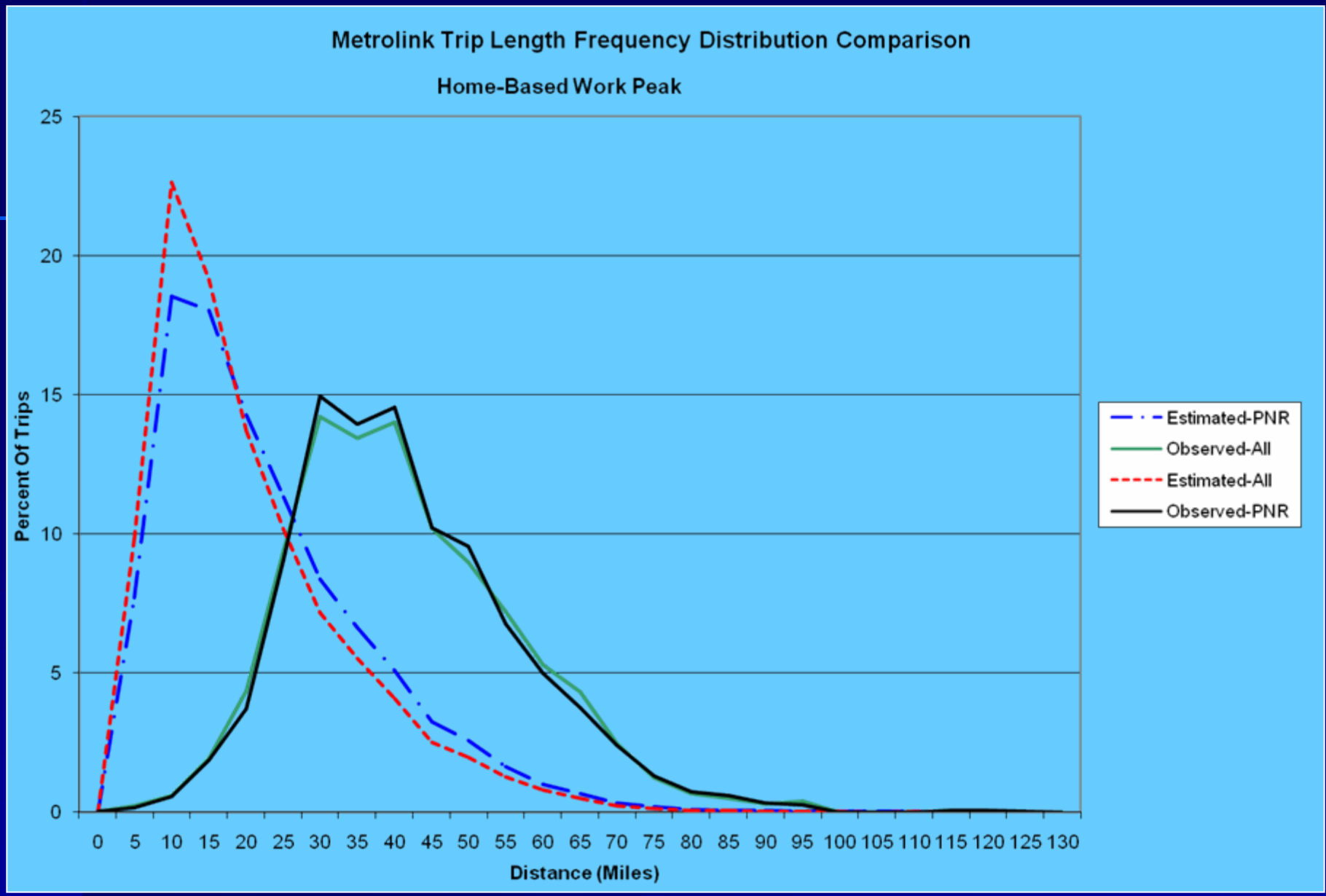
	District	Total	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Perris	0.0038	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0126	0.0128	0.3957	0.0865	0.0092	0.0000
2	CityRiv	0.0117	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0346	0.0516	0.6800	0.0656	0.0167	0.0000
3	Norco	0.0117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0334	0.0357	0.4484	0.1289	0.0177	0.0000
4	Hemet	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0550	0.0052	0.6111	0.0221	0.0111	0.0000
5	Temucula	0.0023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061	0.0014	0.2462	0.0548	0.0084	0.0000
6	CVAG	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0094	0.0282	0.2647	0.0323	0.0058	0.0000
7	SBD	0.0090	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0091	0.0148	0.5369	0.0619	0.0180	0.0106
8	OC North	0.0020	0.0000	0.0114	0.0318	0.0000	0.0699	0.0000	0.0030	0.0001	0.0008	0.2144	0.0020	0.0032	0.0000
9	OC South	0.0034	0.0000	0.0260	0.0000	0.0000	0.0000	0.0000	0.0017	0.0010	0.0000	0.7618	0.0176	0.0167	0.0000
10	LA CBD	0.0574								0.7849	2.2222	0.0046	0.0071	0.0324	
11	LA Core	0.0008	0.1250	0.1264	0.3750	0.0000	0.0000	0.0000	0.0194	0.0006	0.0043	0.0086	0.0001	0.0004	0.0032
12	LA Rest	0.0022	0.0000	0.0100	0.0203	0.0000	0.0000	0.0000	0.0098	0.0014	0.0048	0.0326	0.0016	0.0009	0.0014
13	Ventura	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0241	0.0957	0.1724	0.2202	0.0246	0.0050	0.0000
	Total	0.0030	0.0001	0.0012	0.0032	0.0004	0.0003	0.0000	0.0010	0.0021	0.0021	0.0547	0.0027	0.0018	0.0002

Model's Understanding Of Travel Behavior

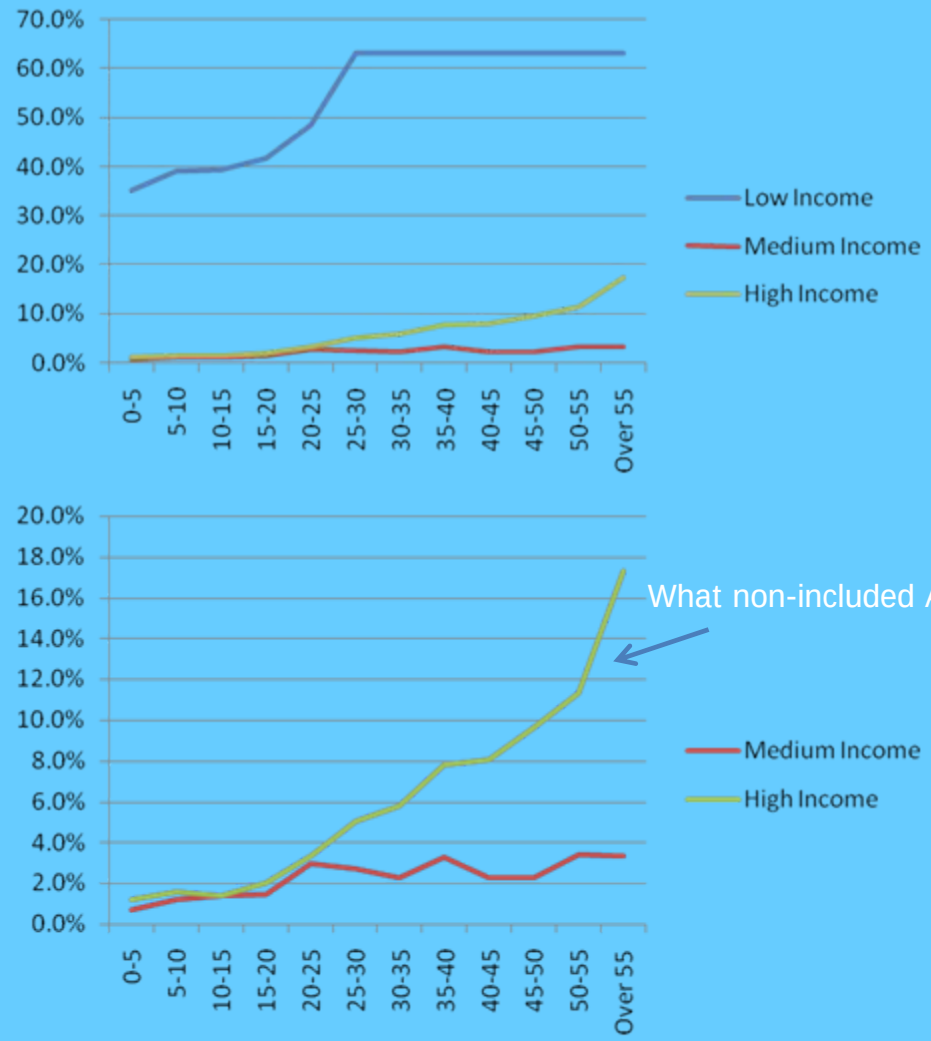
- Model coefficients & relationships
  - Consistent with national practice
  - Nasty thresholds
- Appropriate stratification of alternative specific constants
- Reduced commuter rail in-vehicle coefficient

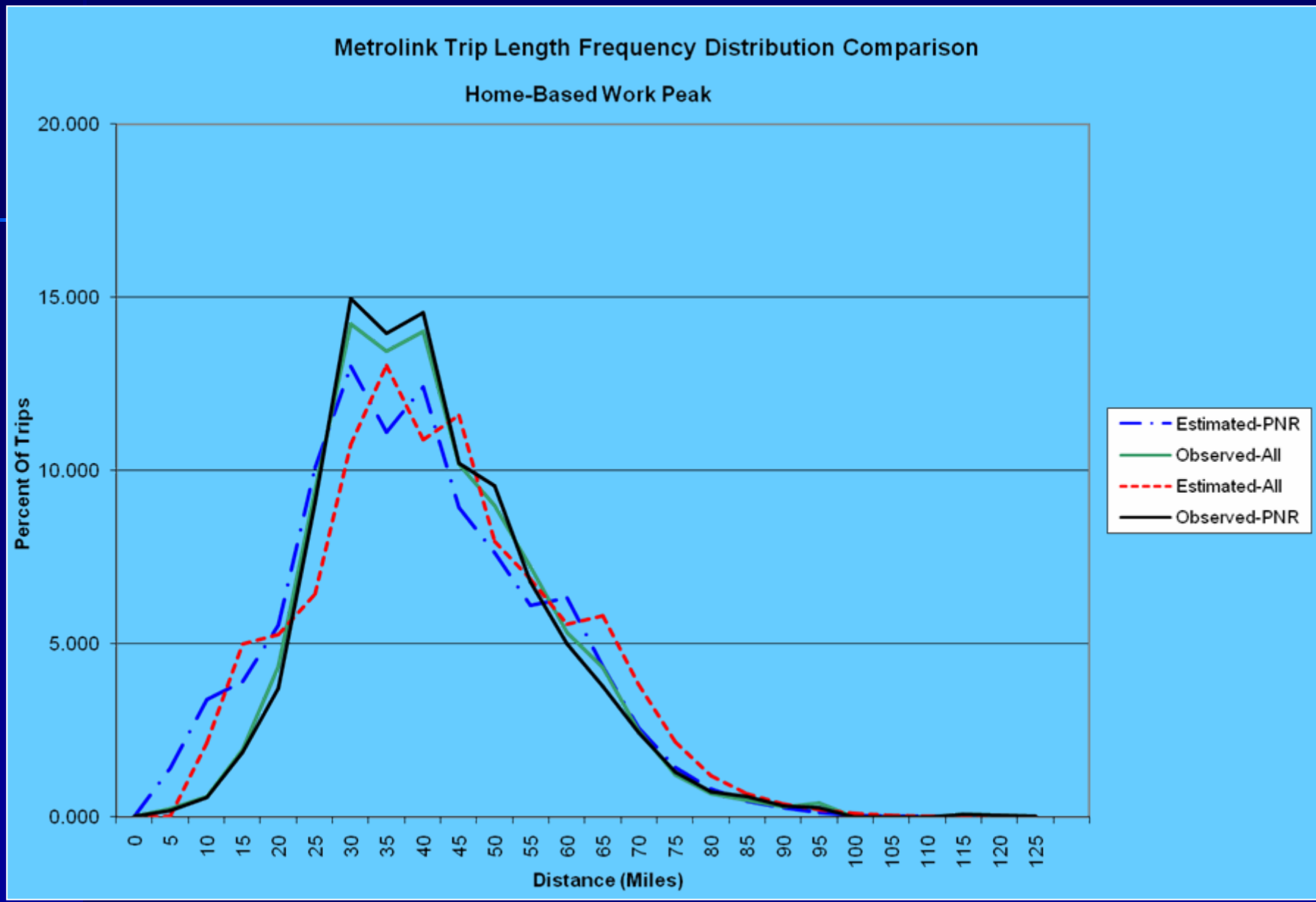
Model's Understanding Of Travel Behavior

- Income-stratified cost coefficients
- Minor adjustment of logsum coefficients
- Consistent drive access distance for all transit submodes
- Lower station-level shadow prices


Metrolink Trip Length Frequency Distribution Comparison
Home-Based Work Peak
Percent Of Trips
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130
Distance (Miles)
Estimated-PNR
Observed-All
Estimated-All
Observed-PNR

Los Angeles Transit Shares versus Trip Distance




Metrolink Trip Length Frequency Distribution Comparison
Home-Based Work Peak
Percent Of Trips
20.000
15.000
10.000
5.000
0.000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
Distance (Miles)
Estimated-PNR
Observed-All
Estimated-All
Observed-PNR

Observations and Lessons Learned

- Calibration/validation vs. estimation
- Transit-focused calibration
  - Regional vs. Corridor level
  - Compensation for upper level errors/limitations

Observations and Lessons Learned

- "Making The Case"
  - Understanding markets
  - Role of transit today
  - Model strengths/weaknesses
- On-board survey data
  - Surprises
  - More than aggregate totals
- Resource allocation