

# Ver. 2.3 travel model, trip generation: Development of trip attraction model

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Mary Martchouk, TPB Staff  
National Capital Region Transportation Planning Board (TPB)

# Background

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- Trip attraction models are used in the trip generation step of the model
- Typically estimated based on land use data
  - Employment
  - Population
- Version 2.2 trip attraction models
  - Based on 1994 Household Travel Survey
  - Estimated at the district (TAD) level

# Background cont'd

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- Version 2.3 trip attraction models
  - Based on 2007/2008 Household Travel Survey and Pseudo Round 8.0 Cooperative Land Use Forecast
  - TAZ level models will be tested and compared to TAD level models

# TAZ Level Models

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<b>Trip Purpose</b>	<b>Significant Variables</b>	<b>Adjusted R<sup>2</sup></b>
HBW	Total employment	0.71
HBS	Retail employment, population	0.35
HBO	Retail employment, non-retail employment, population	0.35
NHW	Retail employment, office employment, other employment, population	0.64
NHO	Retail employment, non-retail employment, population	0.40

- Mediocre fit
- One issue may be that all the area types are combined into a single model

# TAZ Level Models by Area Type

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- Estimated models by area type. This yielded some improvement over previous results, but not sufficient
- Adjusted  $R^2$  values are shown in the table:

Area Type	HBW	HBS	HBO	NHW	NHO
1	0.726	0.411	0.304	0.757	0.426
2	0.651	0.356	0.326	0.591	0.397
3	0.669	0.358	0.348	0.535	0.413

- The next step is to try estimating TAD level models (reduces HTS sampling error)
- An important observation from TAZ level models is that the independent variable coefficients are different by area type

# TAD Level Models

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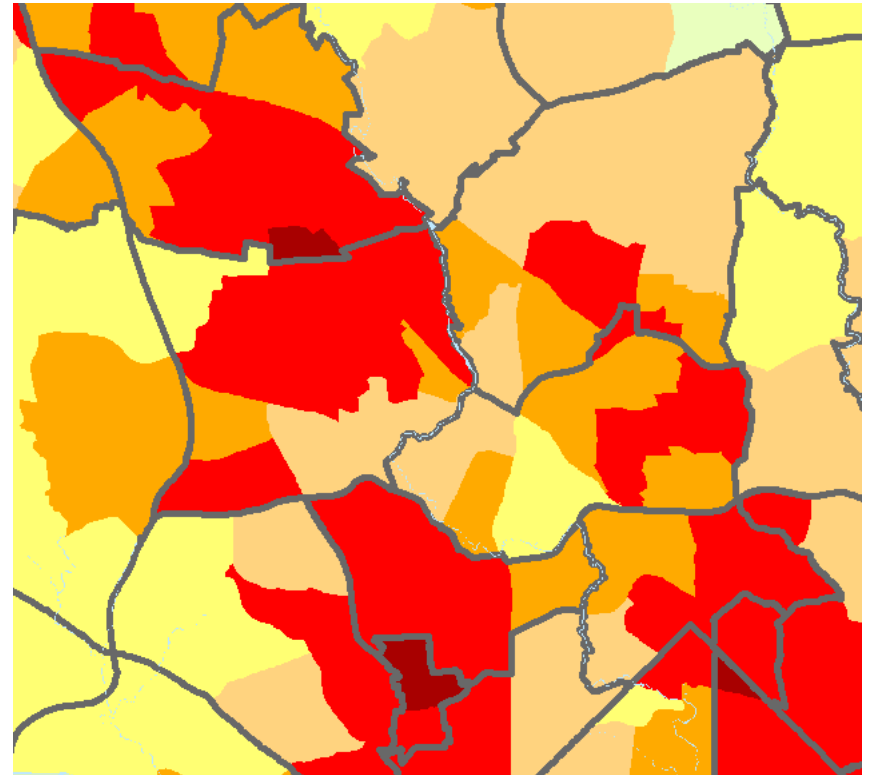
<b>Trip Purpose</b>	<b>Significant Variables</b>	<b>Adjusted R<sup>2</sup></b>
HBW	Total employment	0.89
HBS	Retail employment, population	0.72
HBO	Retail employment, non-retail employment, population	0.72
NHW	Retail employment, office employment, other employment	0.85
NHO	Retail employment, non-retail employment, population	0.73

- Significantly better fit than TAZ level models
- TAZ level models indicated that the coefficients are different by area type, so it would be desirable to split TADs by area type

# TAD Area Types

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- TADs can have different area types within them
- For the trip attraction models, TAD is assigned the area type in which most of the TAD area falls



# TAD Models with Area Types

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- Since there are only 333 TADs, it's unreasonable to estimate a model for each area type
- Instead models were estimated for area types 1-2 and 3+



# TAD Models with Area Types: HBW

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## Area Types 1-2

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
TOTEMP	Total Employment	1.118	0.03333	33.544	0	23342
Adjusted R <sup>2</sup>		0.89				
Number of Observations		62				

## Area Types 3+

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
TOTEMP	Total Employment	0.854596	0.015079	56.675	0	8689
Adjusted R <sup>2</sup>		0.88				
Number of Observations		271				

# TAD Models with Area Types: HBS

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## Area Types 1-2

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	1.994837	0.287807	6.931	0	3164
TOTPOP	Total Population	0.301198	0.054212	5.556	0	17582
Adjusted R <sup>2</sup>		0.55				
Number of Observations		62				

## Area Types 3+

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	3.10233	0.221817	13.986	0	1731
TOTPOP	Total Population	0.221084	0.027115	8.153	0	18045
Adjusted R <sup>2</sup>		0.74				
Number of Observations		271				

# TAD Models with Area Types: HBO

## Area Types 1-2

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
NREMP	Non-retail Employment	0.425167	0.064345	6.608	0	20178
TOTPOP	Total Population	1.012364	0.079666	12.708	0	17582
Adjusted R <sup>2</sup>		0.57				
Number of Observations		62				

## Area Types 3+

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
NREMP	Non-retail Employment	1.084336	0.414402	2.617	0.0094	1731
RETEMP	Retail Employment	0.588279	0.088964	6.613	0	6958
TOTPOP	Total Population	0.777184	0.048421	16.051	0	18045
Adjusted R <sup>2</sup>		0.74				
Number of Observations		271				

# TAD Models with Area Types: NHW

## Area Types 1-2

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	0.943835	0.32351	2.917	0.005	3164
OFFEMP	Office Employment	0.55734	0.057991	9.611	0	14084
OTHEMP	Other Employment	0.655759	0.141183	4.645	0	4370
Adjusted R <sup>2</sup>		0.78				
Number of Observations		62				

## Area Types 3+

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	0.806775	0.063696	12.666	0	1731
OFFEMP	Office Employment	0.522063	0.024112	21.651	0	3405
OTHEMP	Other Employment	0.507201	0.049259	10.297	0	1927
Adjusted R <sup>2</sup>		0.87				
Number of Observations		271				

# TAD Models with Area Types: NHO

## Area Types 1-2

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	1.498056	0.381136	3.931	0.0002	3164
NREMP	Non-retail Employment	0.096579	0.050561	1.91	0.061	20178
TOTPOP	Total Population	0.30018	0.047537	6.315	0	17582
Adjusted R <sup>2</sup>		0.50				
Number of Observations		62				

## Area Types 3+

Variable	Definition	Coefficient	Std. Error	T- stat.	P-value	Avg. value
RETEMP	Retail Employment	2.783524	0.216666	12.847	0	1731
NREMP	Non-retail Employment	0.178362	0.046514	3.835	0.0002	6958
TOTPOP	Total Population	0.183994	0.025316	7.268	0	18045
Adjusted R <sup>2</sup>		0.78				
Number of Observations		271				

# Trip Attraction Model Results

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- Trip attraction models applied at TAZ level
- Estimated/Observed at TAZ level

Area Type	HBW	HBS	HBO	NHW	NHO	Total
1	0.91	1.25	0.98	0.88	1.04	0.96
2	1.16	0.94	0.92	1.14	0.93	1.00
3	1.02	0.89	0.95	1.07	0.96	0.96
4	0.89	1.17	0.99	0.67	1.12	1.01
5	0.99	1.09	0.95	0.89	0.95	0.97
6	0.94	1.98	1.26	0.97	1.43	1.31
Total	1.02	1.05	0.98	0.99	1.01	1.00

# Conclusions

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- Trip attraction models developed at TAD level, but applied at TAZ level
- Models are split by trip purpose and area type (area types 1-2 and 3+) groups
- Good results when compared to observed trip attractions at the TAZ level