

# Vers. 2.3 travel model, trip generation: Development of internal-to-external trip extraction sub-model

Presented to the Travel Forecasting Subcommittee  
of the TPB Technical Committee  
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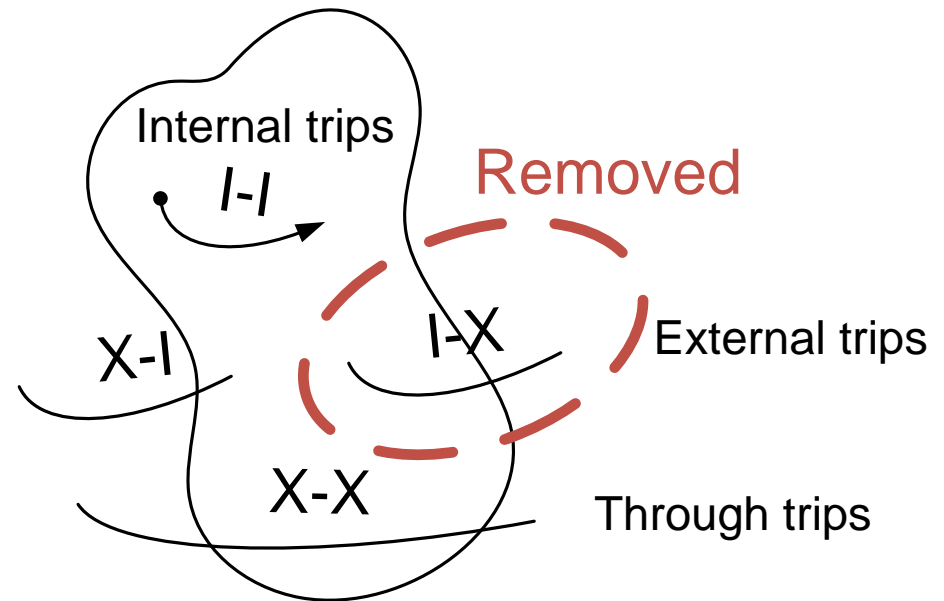
National Capital Region Transportation Planning Board (TPB)  
Metropolitan Washington Council of Governments (COG)

# Acknowledgements

- Analysis performed by Hamid Humeida
- Production assistance by Mary Martchouk

# Motivation

- External travel (I-X and X-I) is entered exogenously into the trip generation process and is passed through to the final trip-ends unaltered
- Since the trip production rates reflect both internal (I-I) and internal-to-external (I-X) travel generated by households in the modeled area, it is necessary to remove the I-X portion of total trip productions to avoid double counting

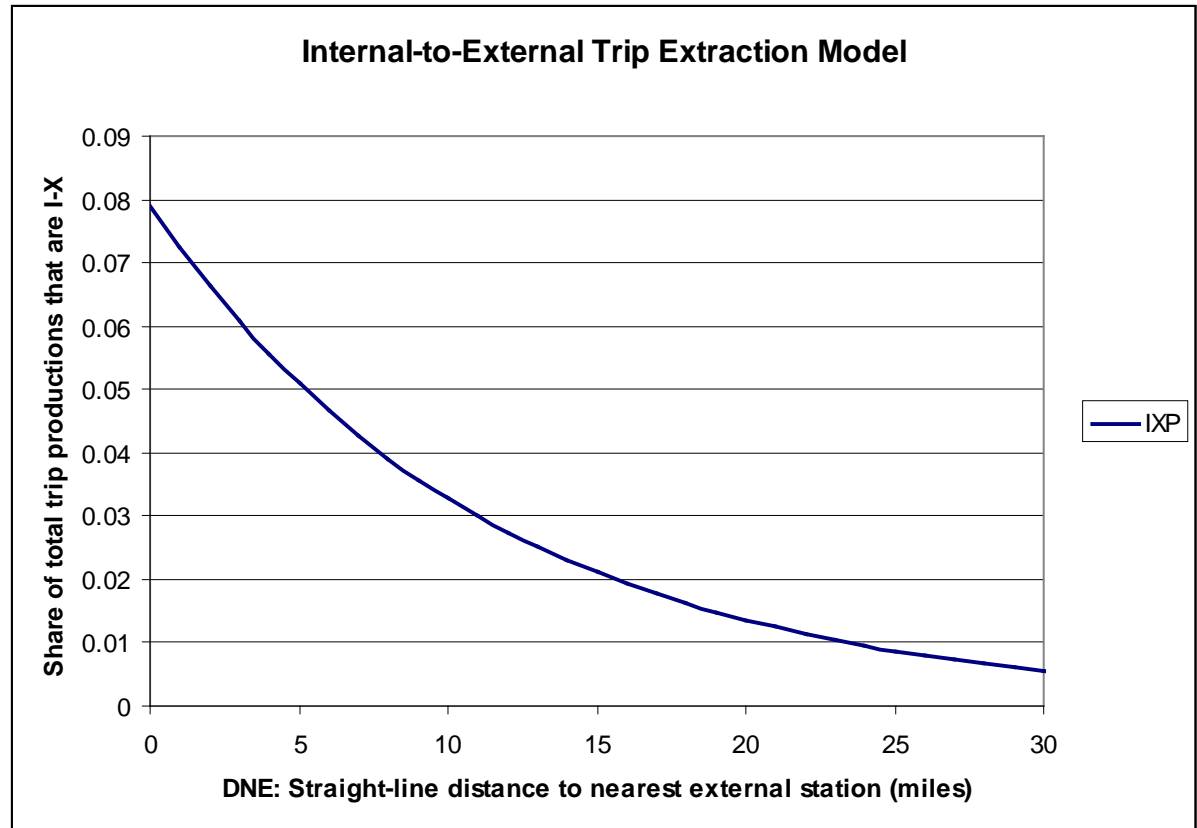


# History

- The first IX trip extraction sub-model was estimated by Bill Allen in early 1990s when the modeled area expanded from 1478 to 2191 TAZ
- The current IX trip extraction sub-model was estimated by TPB staff in 1999 using the 1994 Household Travel Survey
- This is the third time estimated

# Concept

- The share of IX trips is inversely related to the distance between the production zone centroid and the nearest external station



# Methodology for development

- Estimation file
  - Developed from 2007/2008 HTS
  - Each record includes
    - production zone
    - I-I productions by purpose
    - I-X productions by purpose
    - distance (in miles) to the nearest external station
  - 3,675 records, one for each internal zone

# Methodology for development

- 2007 HTS
  - total productions: 19,400,578
  - I-X productions: 425,308 => 2.19%
- Because of the small sample of I-X trips at the zone level, the data was aggregated into larger analysis units based on uniform two-mile distance ranges, e.g.,
  - first unit: all zones within 0 to 1.999 miles
  - second unit: all zones within 2 to 3.999 miles, etc.
- It was decided to delete all records in the first group (46 records) because the records were considered as outliers (next slide)

# Methodology for development

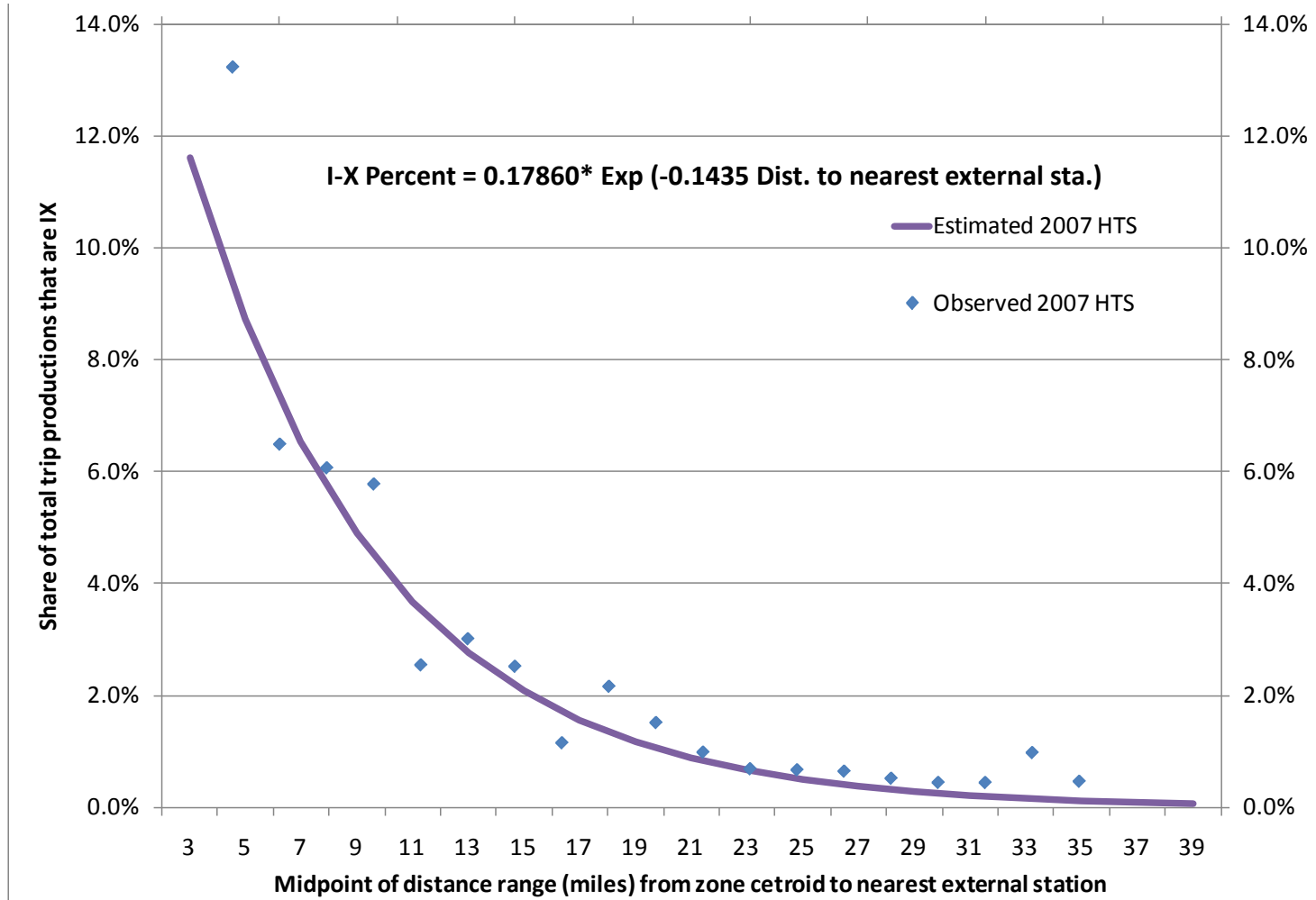
Midpoint Dist. (mi.)	Number of Zones	2007 HTS Productions		Estimated Pct of I-X Pr
		I- X	Total	Observed 2007 HTS
3	83	79,323	599,475	13.2%
5	89	56,566	870,893	6.5%
7	90	53,581	882,468	6.1%
9	95	41,330	714,718	5.8%
11	96	15,273	598,483	2.6%
13	101	15,897	526,638	3.0%
15	115	11,985	474,248	2.5%
17	163	8,441	726,969	1.2%
19	185	17,557	809,293	2.2%
21	237	11,339	745,056	1.5%
23	305	15,414	1,550,233	1.0%
25	354	10,570	1,516,063	0.7%
27	370	14,019	2,066,907	0.7%
29	318	10,842	1,658,845	0.7%
31	287	7,131	1,353,666	0.5%
33	309	6,422	1,421,818	0.5%
35	254	6,671	1,480,121	0.5%
37	143	10,483	1,063,372	1.0%
39	35	765	161,758	0.5%
	3,629	393,608	19,221,023	2.0%



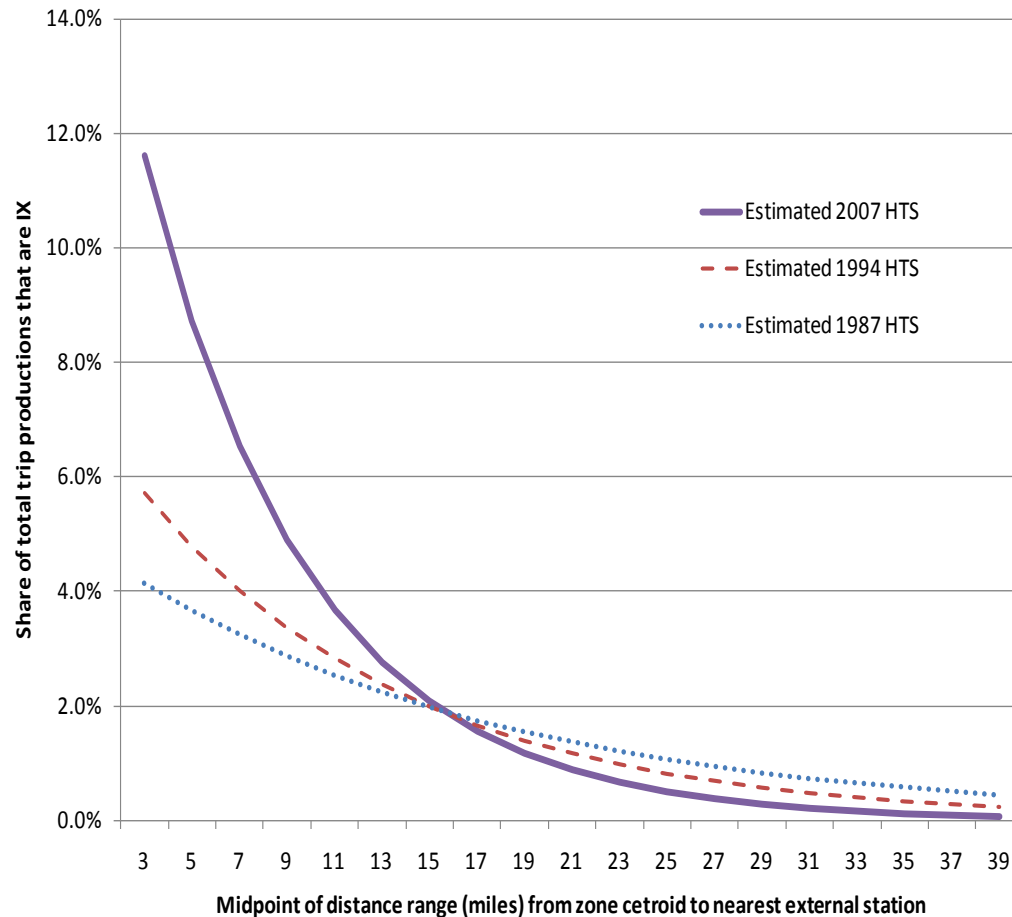
# Methodology for development

- Because an initial plot of the data revealed an inverse relation between productions and distance to the nearest external station, several nonlinear regression specifications were tested against the observed data
  - exponential decay
  - log linear
  - Gamma function
- The exponential specification was selected as the most appropriate

# Estimated model



# Comparison with previous models

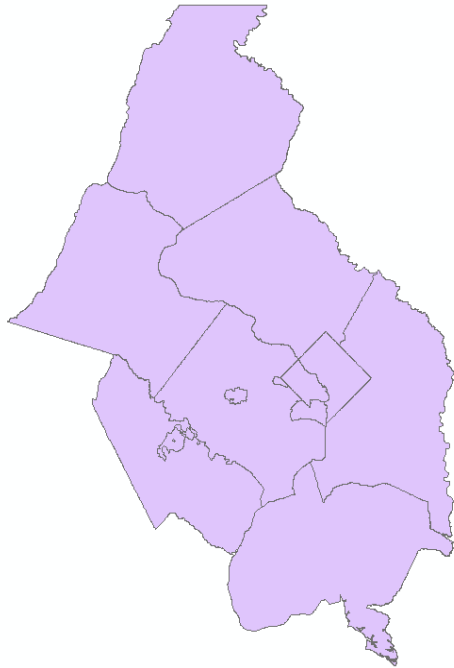


- Observations
  - 2007 curve is the steepest
  - 1994 & 2007 had the same cordon, but 2007 HTS included 22 jurisdictions and 1994 HTS included only 13 jurisdictions
  - Steep 2007 curve could be the result of jurisdictions in Baltimore/Wash. corridor, such as Anne Arundel & Howard counties (see next slide)

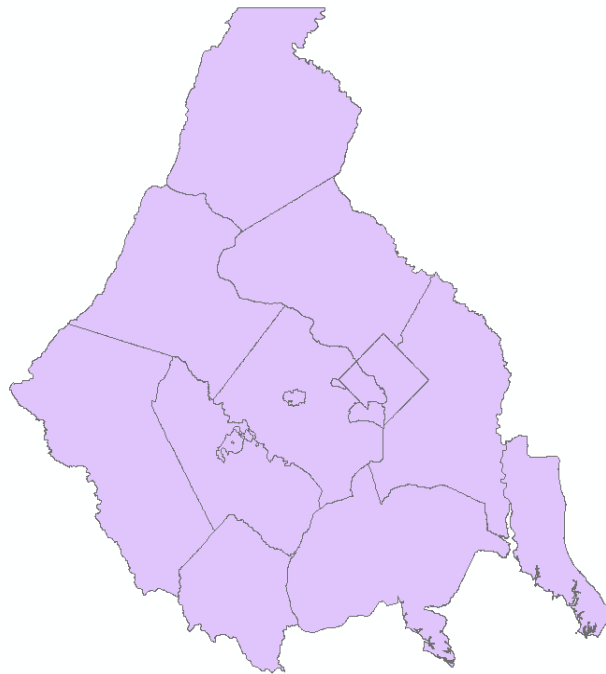
# Expanding areas:

Jurisdictions included in both the modeled area  
and the three latest household interview/travel surveys

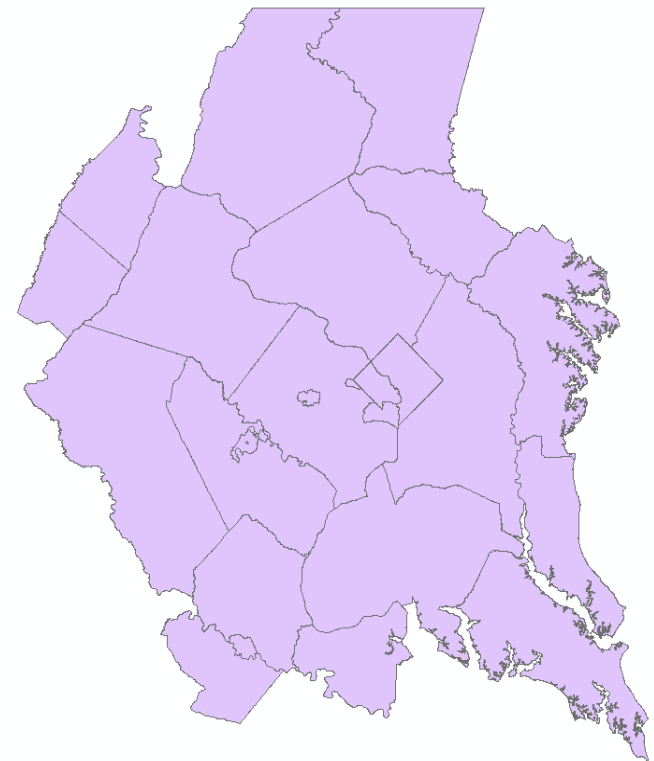
**1987 HIS**  
(10 juris.)



**1994 HTS**  
(13 juris.)



**2007 HTS**  
(22 juris.)



# Summary and conclusions

- This is the third time in recent history that the IX trip extraction model has been estimated with HTS data
  - 1987 HIS, 1994 HTS, 2007/2008 HTS
- 2007 curve is steeper than in previous estimations, likely due to the fact that the region has been growing and the jurisdiction surveyed in the HTS have been increasing
- A technical memo is being prepared which will have added detail