



AGENT

Advanced travel demand modeling with Agent
Not for re-distribution

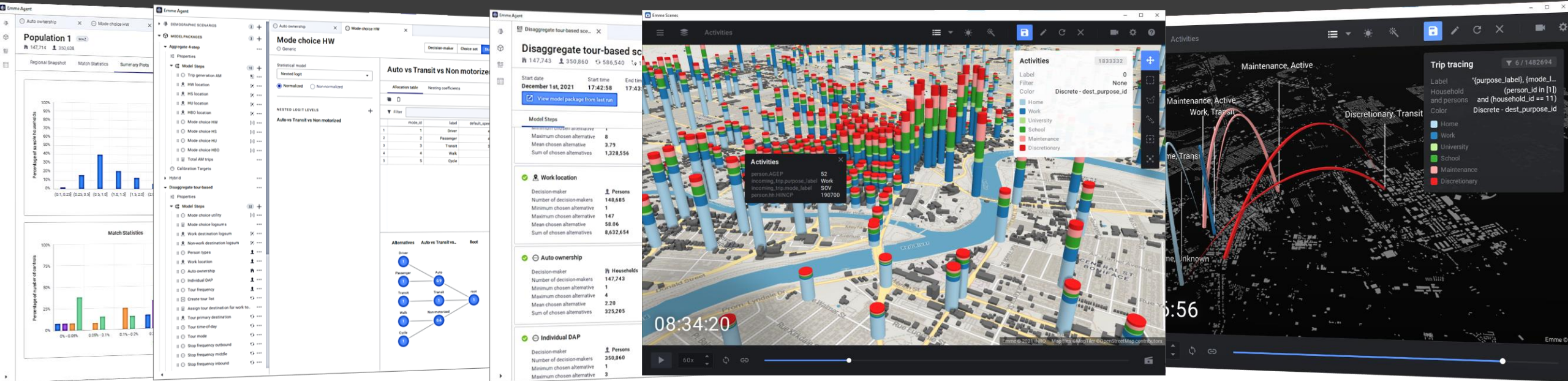
Bentley[®]
Advancing Infrastructure

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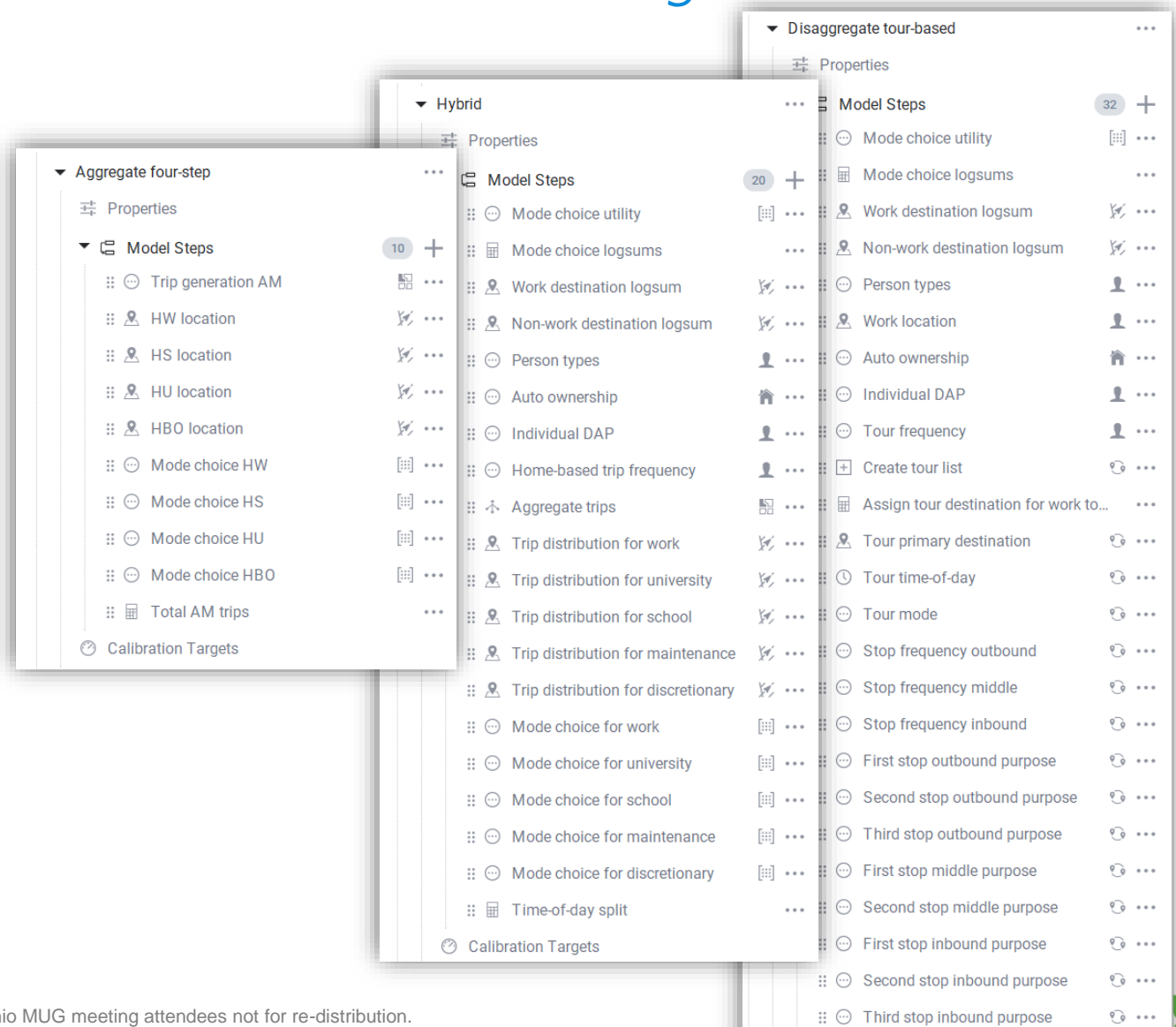
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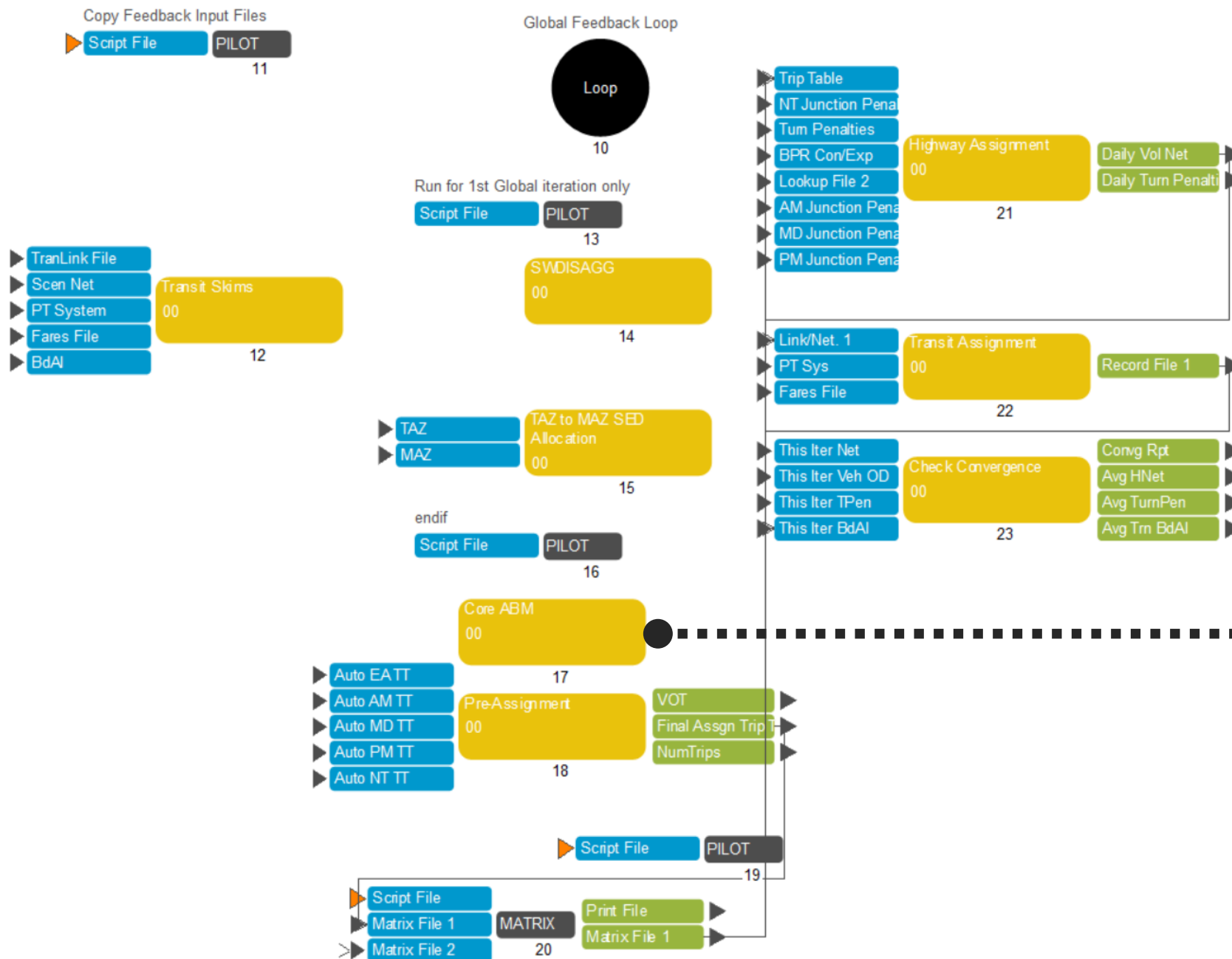
Agent is a flexible platform to assemble, calibrate and apply activity-based (ABM) and advanced travel demand models including 4-step for improved forecasting



An advanced platform for travel demand modeling

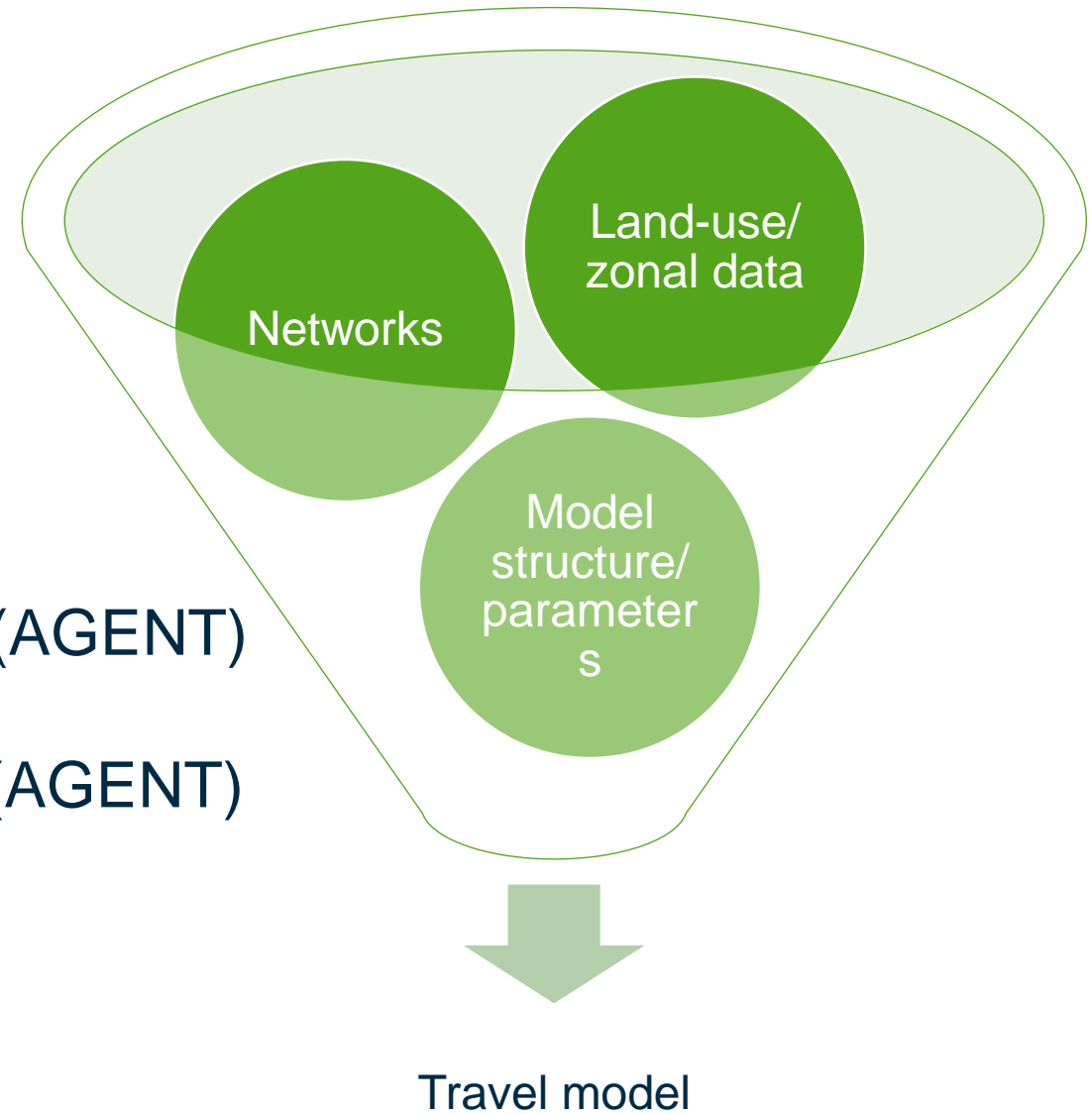
- **Assemble** virtually any travel demand model structure from 4-step to ABM
- **Maintain** different model structures or versions in parallel
- **Leverage automated calibration** procedures to combine disparate data sources for improved model results
- **Upgrade and advance** models over time with new features
- **Enjoy ease-of-use** and transparent access to a full travel demand model UI





AGENT replaces existing
ABM/Demand model box in
your current CUBE application

Typical inputs for travel model



Network inputs → CUBE network

Land-use/zonal data → Demographic scenario (AGENT)

Model structure/parameters → Model package (AGENT)

Demographic scenario



Demographic scenario

Groups together multiple zones (zone hierarchy) with associated data, samples and synthetic population

Zonal inputs preparation:

- Existing CUBE scripts
- Prepare inputs in CSV format
- Create a new demographic scenario

Model package



Model package

- Demand model can be decomposed as a sequence of choice models and intermediate data processing
- Model package is the sequence of choice model and data processing configuration

The screenshot displays the 'Emme Agent' software interface. On the left, a vertical tree structure lists various model components. The 'MODEL PACKAGES' section is expanded, showing sub-items like 'Aggregate 4-step', 'Hybrid', 'Properties', 'Model Steps', 'Calibration Targets', 'Disaggregate tour-based', and another 'Properties'. The 'Model Steps' item is further expanded, revealing a list of specific model steps: 'Mode choice utility', 'Mode choice logsums', 'Work destination logsum', 'Non-work destination logsum', 'Person types', 'Work location', and 'Auto ownership'. Each item in the tree is accompanied by an icon and a count in a grey circle, indicating the number of items or steps associated with it. For example, 'MODEL PACKAGES' has a count of 5, 'Model Steps' has 21, and the expanded 'Model Steps' list shows 31 items. The interface is clean and modern, with a light blue and grey color scheme.

Emme Agent

- ▶ DEMOGRAPHIC SCENARIOS 2 +
- ▼ MODEL PACKAGES 5 +
 - ▶ Aggregate 4-step ...
 - ▼ Hybrid ...
 - ▶ Properties
 - ▶ Model Steps 21 +
 - ▶ Calibration Targets
 - ▼ Disaggregate tour-based ...
 - ▶ Properties
 - ▼ Model Steps 31 +
 - ▶ Mode choice utility ...
 - ▶ Mode choice logsums ...
 - ▶ Work destination logsum ...
 - ▶ Non-work destination logsum ...
 - ▶ Person types ...
 - ▶ Work location ...
 - ▶ Auto ownership ...

Model package: Examples

Demo:

- 4-step model
- Lima ABM

▼ Aggregate four-step

Properties

▼ Model Steps

Calculate utilities by mode, purpose, tod

Compute size terms

TOD mode choice logsums

Destination choice logsums

Trip generation

Constrained home-based distribution

Unconstrained trip distribution

Time of day by direction

PA to OD

Mode choice

Matrices for assignment

Calibration Targets

▼ Basic ABM

Properties

▼ Model Steps

Calculate utilities by mode, purpose, tod

Compute size terms

TOD mode choice logsums

Destination choice logsums

Person types

TAG pt workers

Work location

School location

Tour frequency

Create tour list

Assign tour destination for work and school tours

Non mandatory tour destination

Tour time-of-day

Tour mode choice

Stop frequency outbound

Stop frequency inbound

Stop frequency middle

Create insert into trip attributes

Create trip list

Tag trip directions

Trip destination

Integration of different data sources in systematic calibration of travel demand model system



Behavioral data: HTS



Non-behavioral data:
traffic counts, big data,
etc.



Partially-behavioral
data: transit on-board,
special generators



Model
calibration

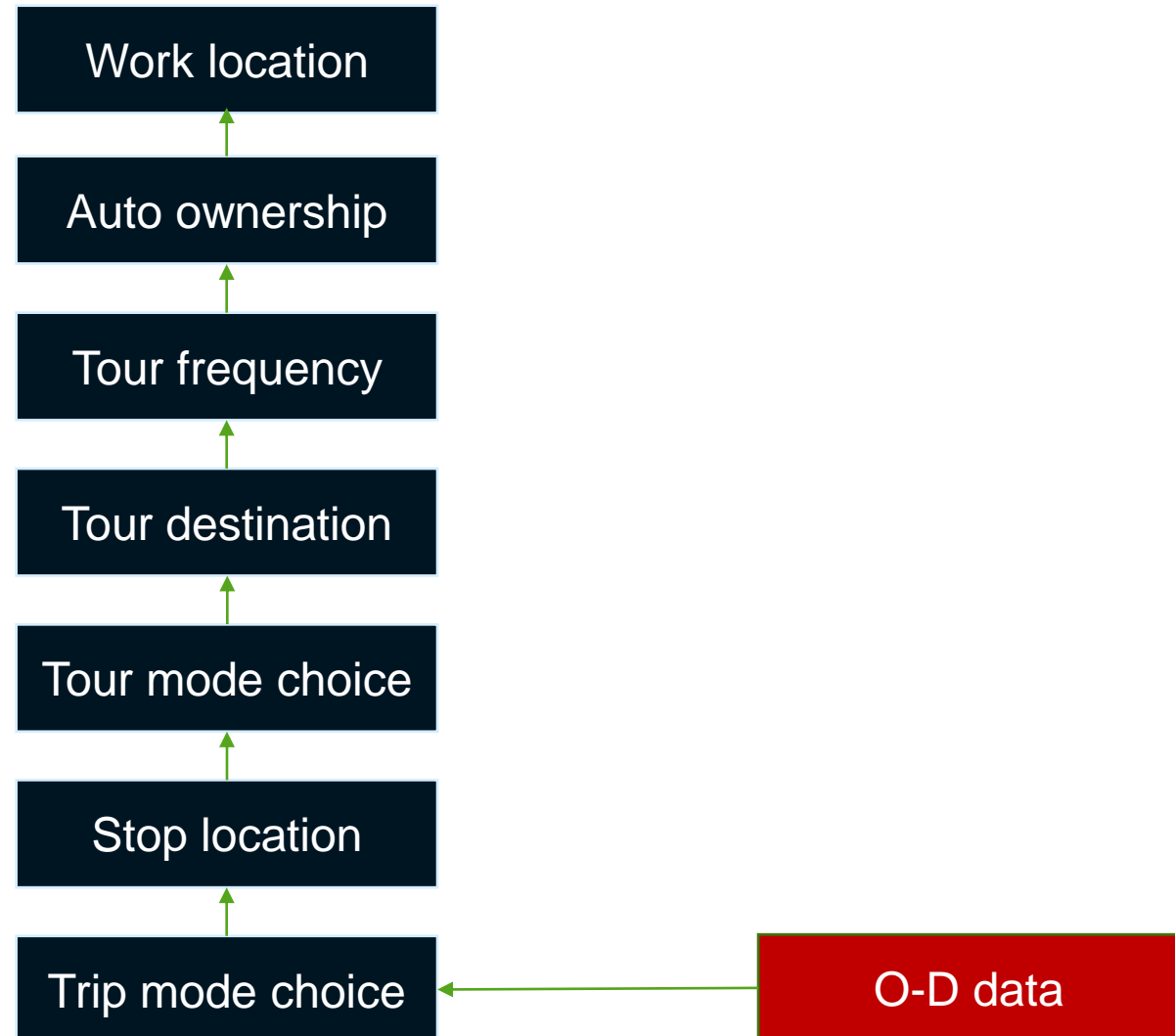
Integration of data sources,
instead of using them one-by-one

Working example using Lima ABM

- Calibration to StreetLight O-D data
- Ongoing steps:
 - Configuration of calibration to counts
 - Configuration of calibration to StreetLight data + counts (data integration)

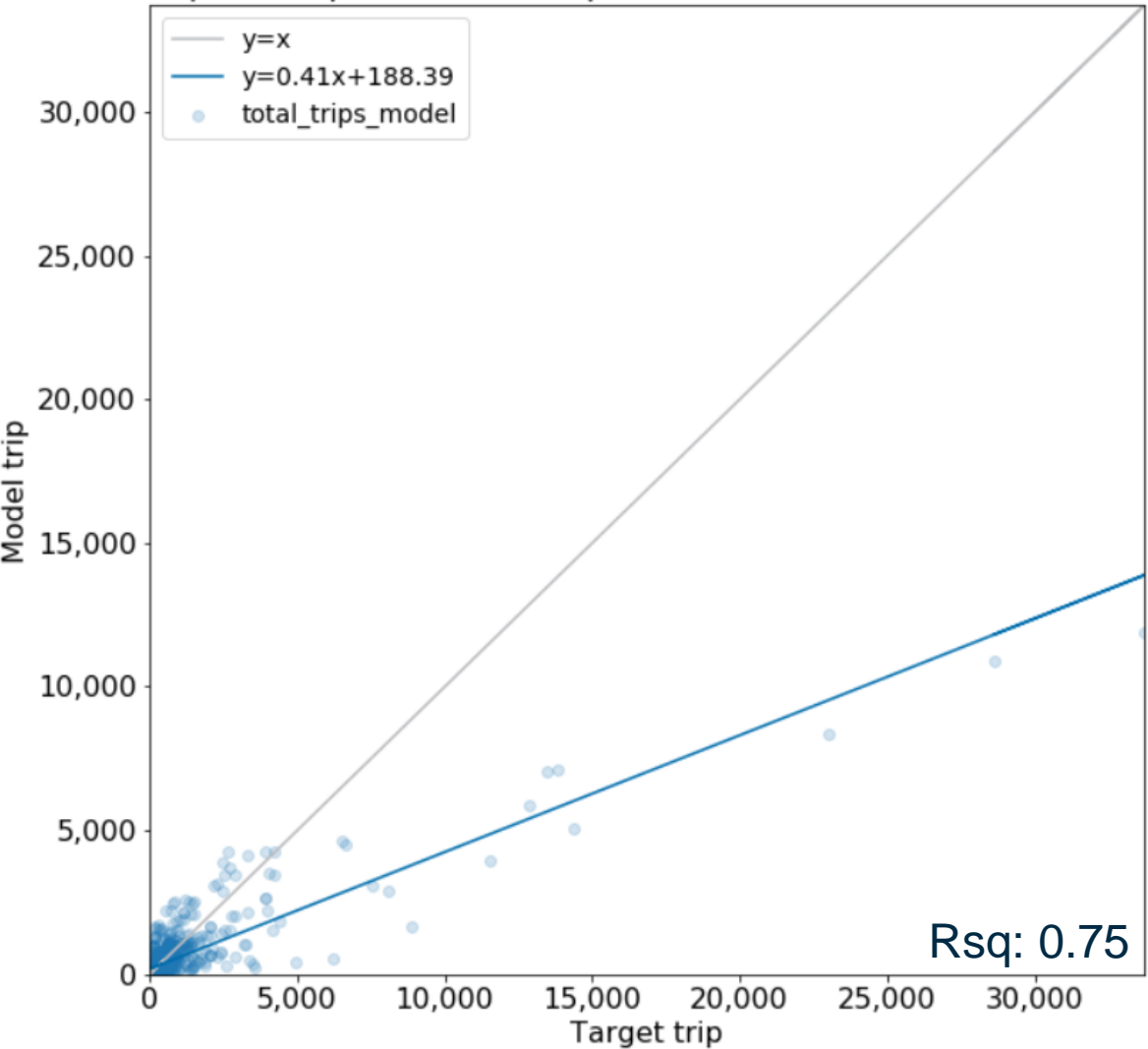
What model parameters are affected by the StreetLight data?

- Dispersion coefficient
- Intra-zonal preference
- Auto ownership constants
- Tour frequency constants
- Dispersion coefficient
- Intra-zonal preference
- Attraction rates
- Dispersion coefficient
- Intra-zonal preference
- Attraction rates

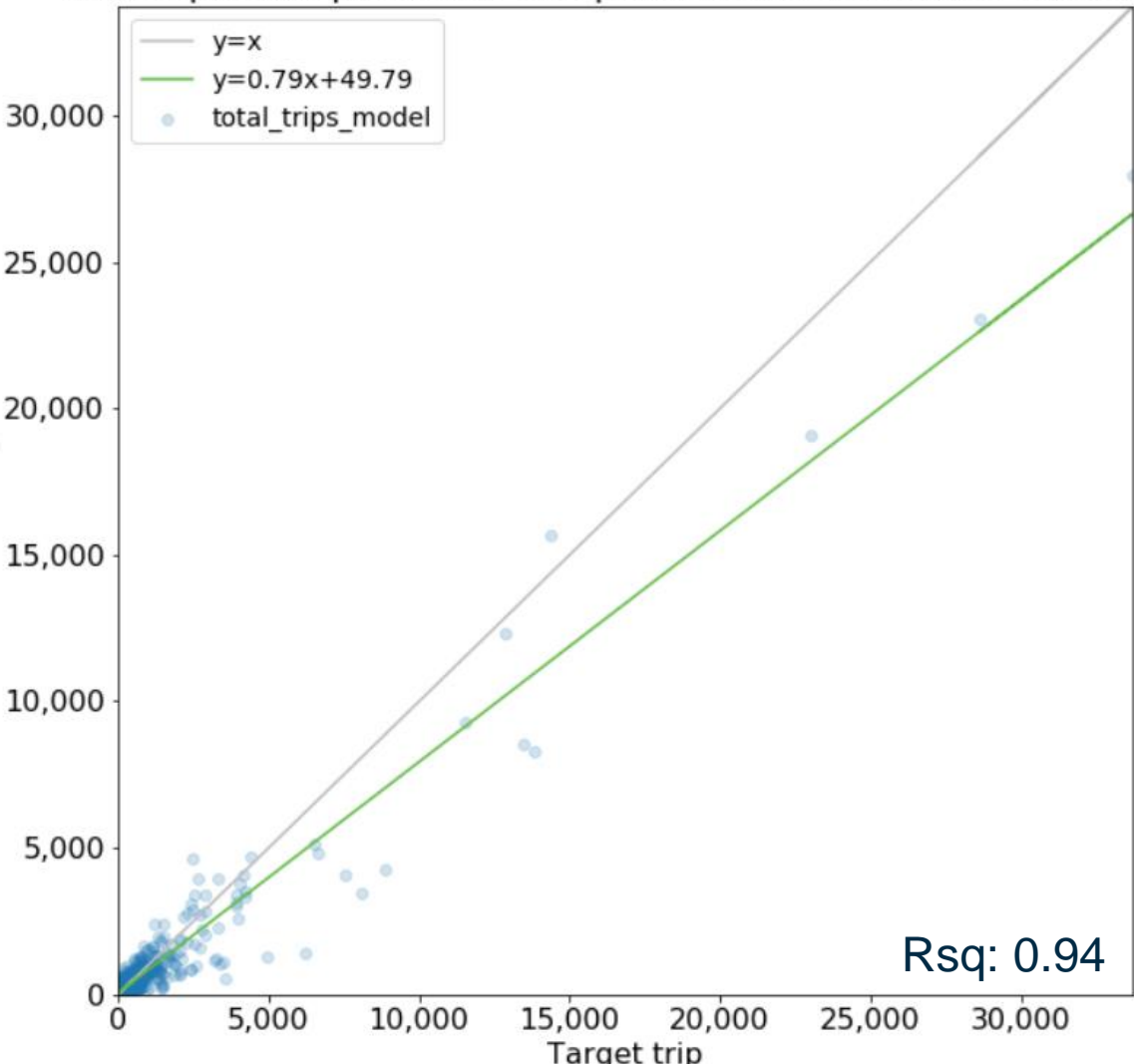


Calibration results: Validation of district level flow

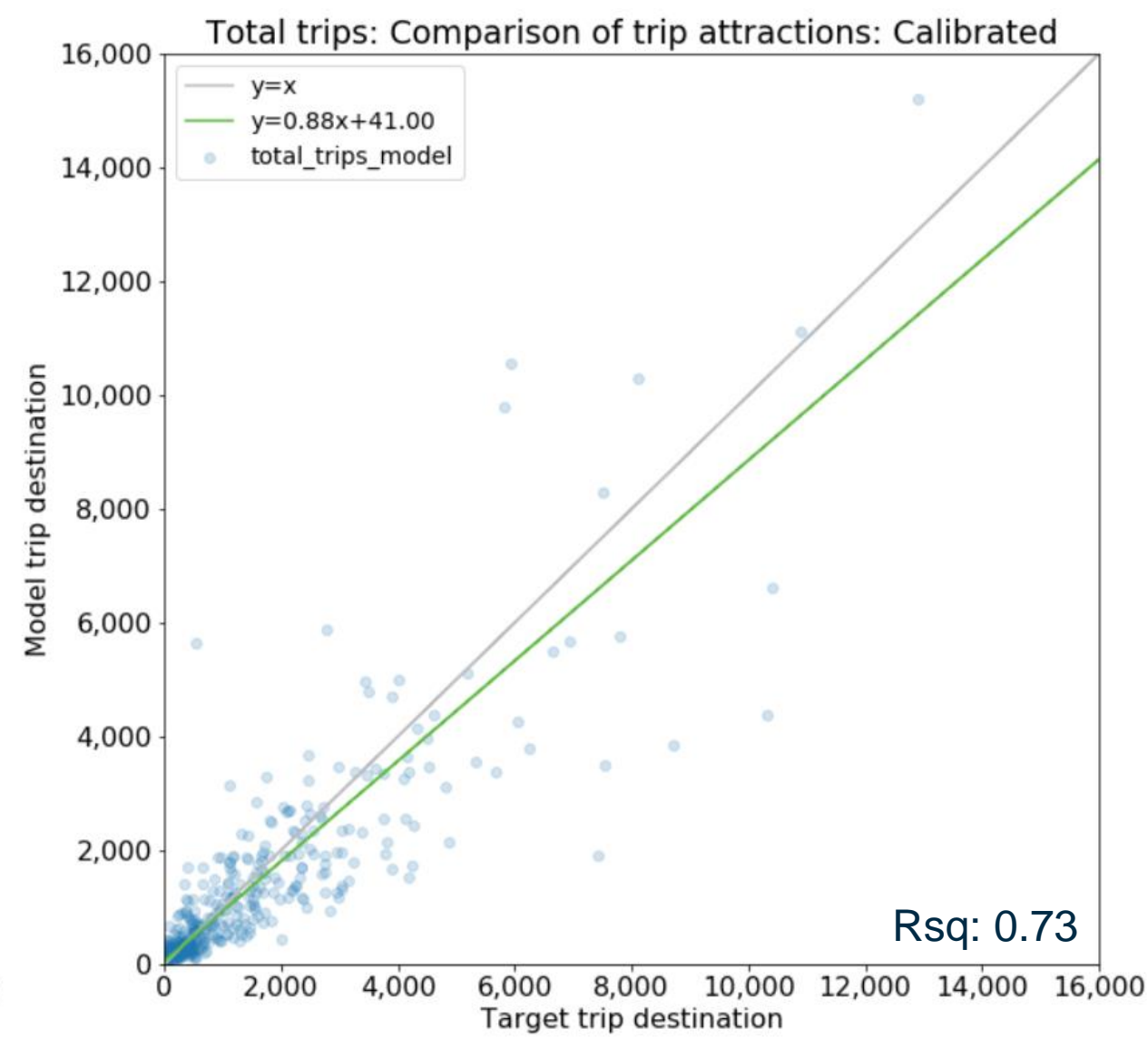
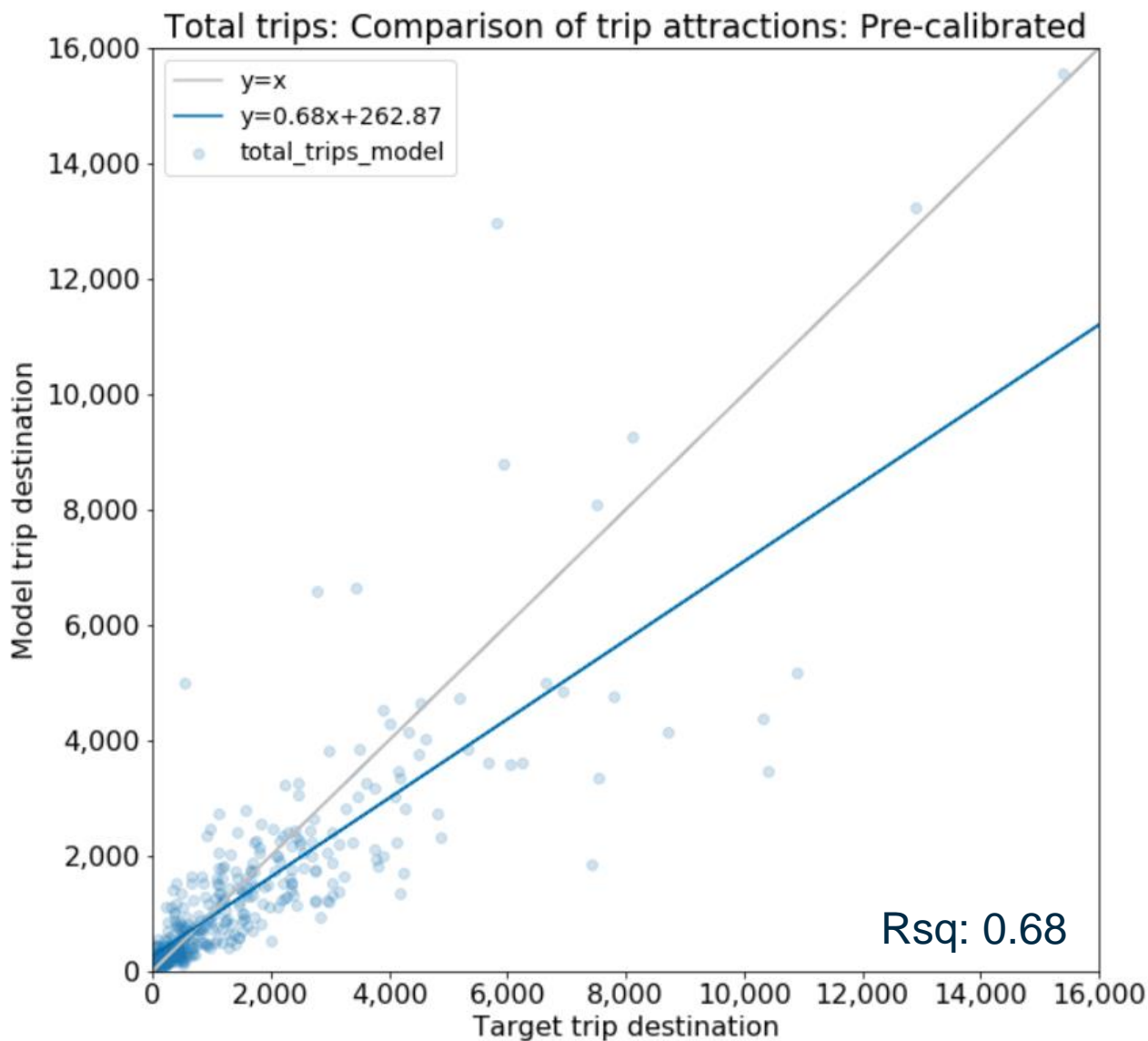
Total trips: Comparison of O-D pattern at district level: Pre-calibrated



Total trips: Comparison of O-D pattern at district level: Calibrated

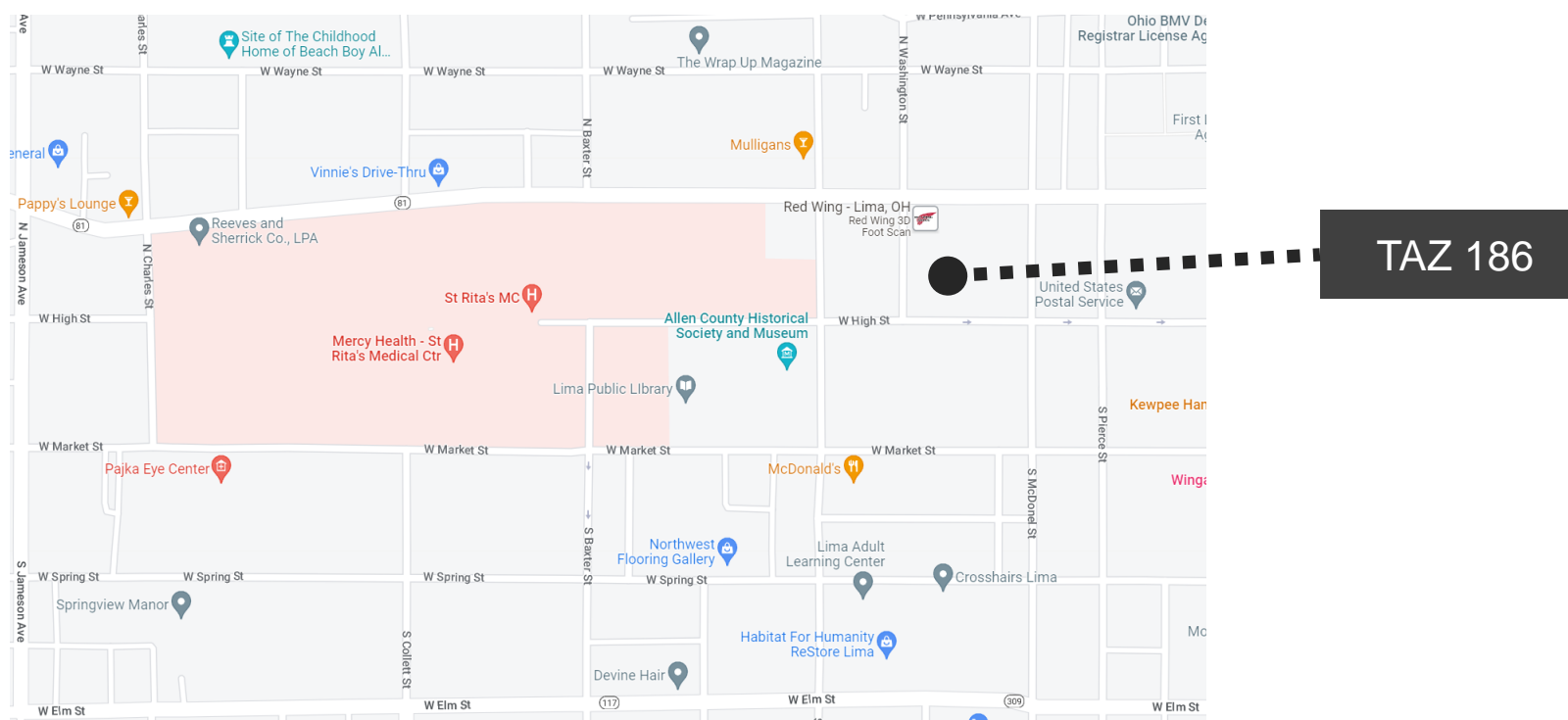


Calibration results : Validation of trip attractions



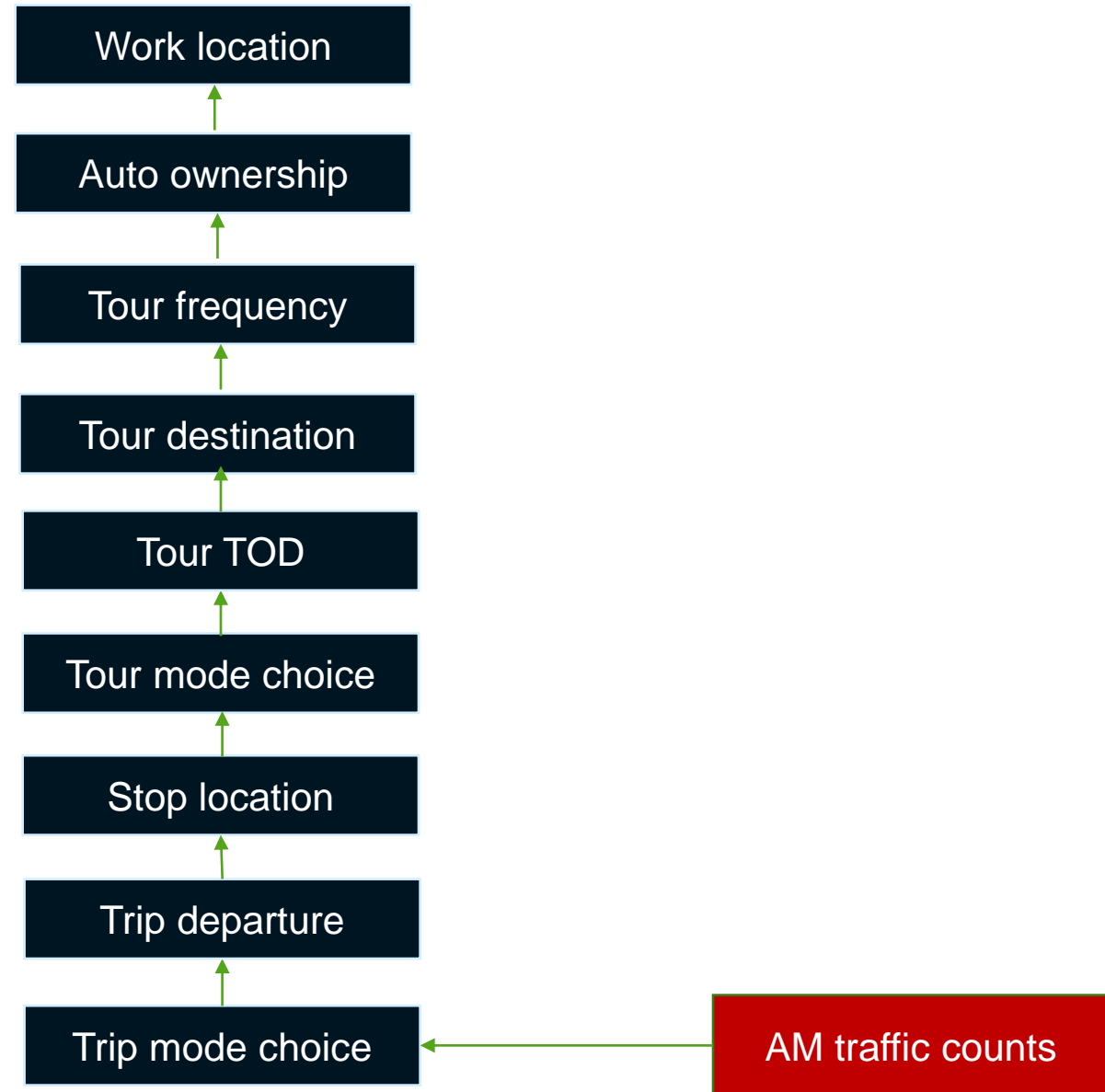
Calibration procedure as a data outlier screening tool

TAZ ID	Total trips in StreetLight data	Total trips in the model	Population	Total employment
186	533	5,235	49	1,052
319	15	89	83	150



What model parameters are affected by the AM traffic counts?

- Auto ownership constants
- Tour frequency constants
- Dispersion coefficient
- Intra-zonal preference
- Attraction rates
- AM constants
- Auto mode constants
- Dispersion coefficient
- Intra-zonal preference
- Attraction rates
- AM constants
- Auto mode constants

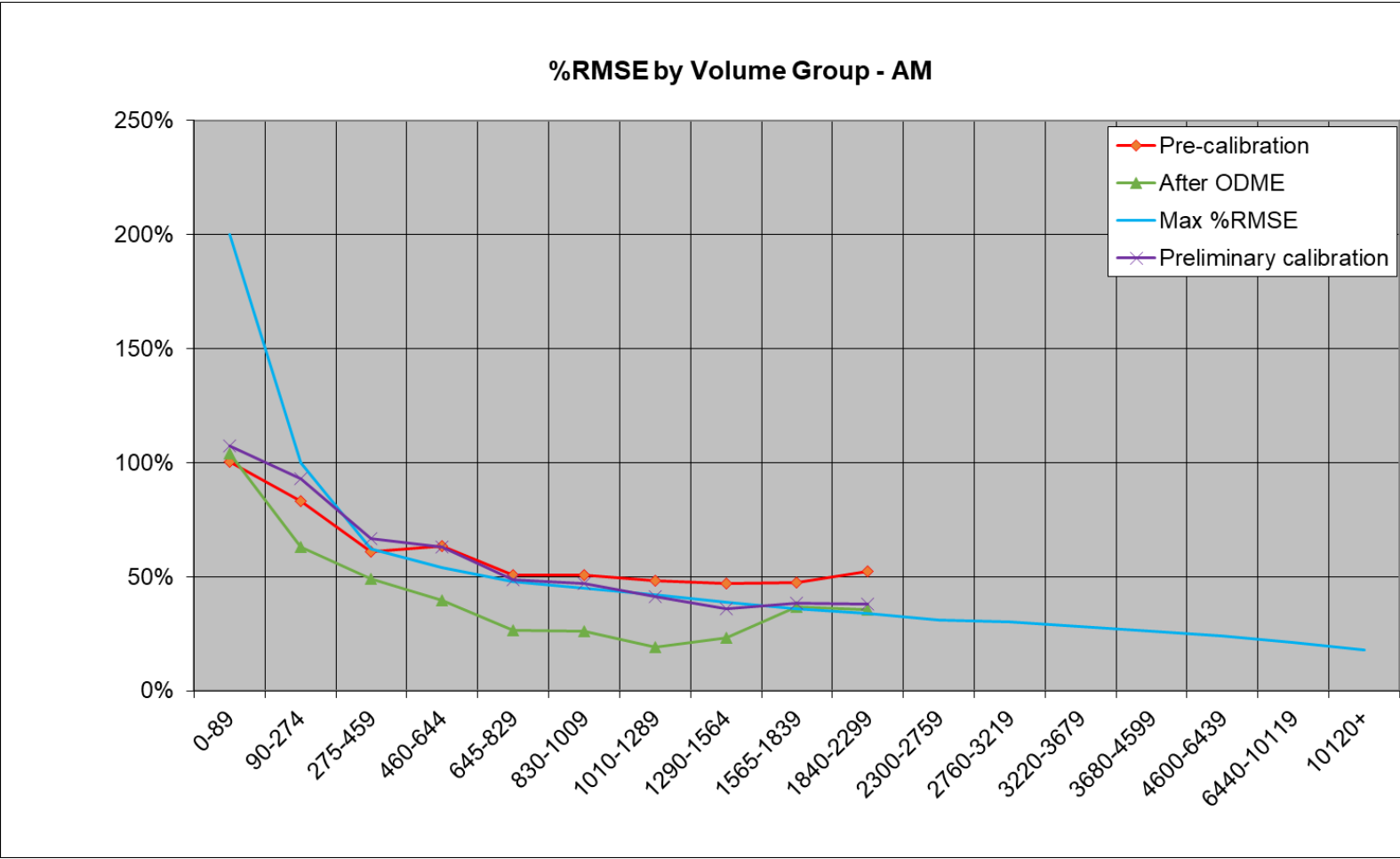


Preliminary calibration result: AM traffic counts

- 3 global iterations for updating LOS (equilibration)
- 3 internal iterations for each global iteration for updating calibration parameters

%RMSE

Pre-calibration = 91%
After ODME = 59%
Preliminary calibration = 82%



Calibrated %RMSE will always be between pre-calibration and after ODME