

Developing Trip Generation Models Using Secondary Data



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Trip attraction, Trip production, Residential, COVID-19 impact

BACKGROUND

- Trip generation modelling is an **important aspect** of **transportation planning**.
- Traffic impact assessments of **individual developments** to travel demand modelling of **larger metropolitan areas** use these models.

RESEARCH GAP

- The new and **emerging secondary data sources** on transport provide an opportunity of using them in the development of trip generation models.
- Evaluating the **impact of COVID-19 pandemic** on **trip generation**.

FINDINGS

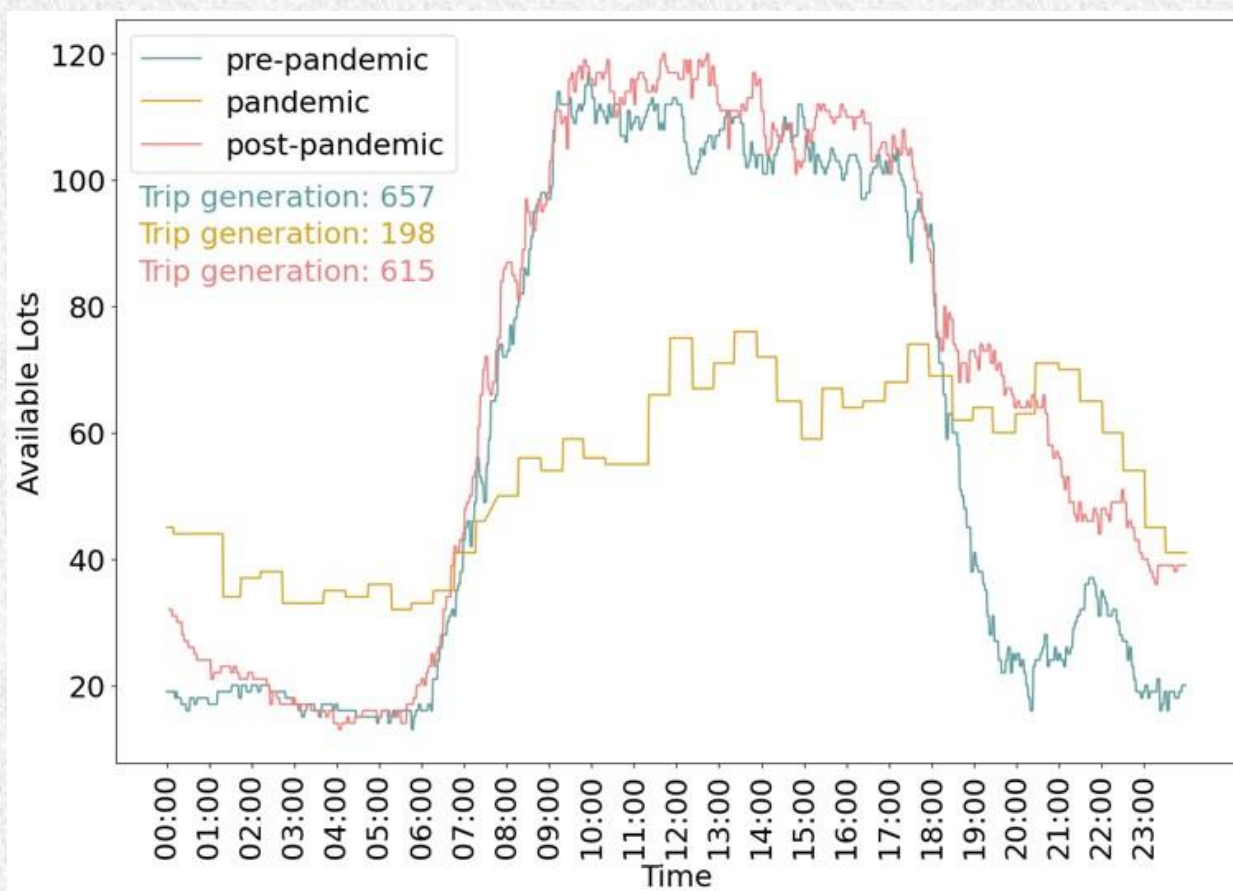


Figure 2. Carpark lot availability plot

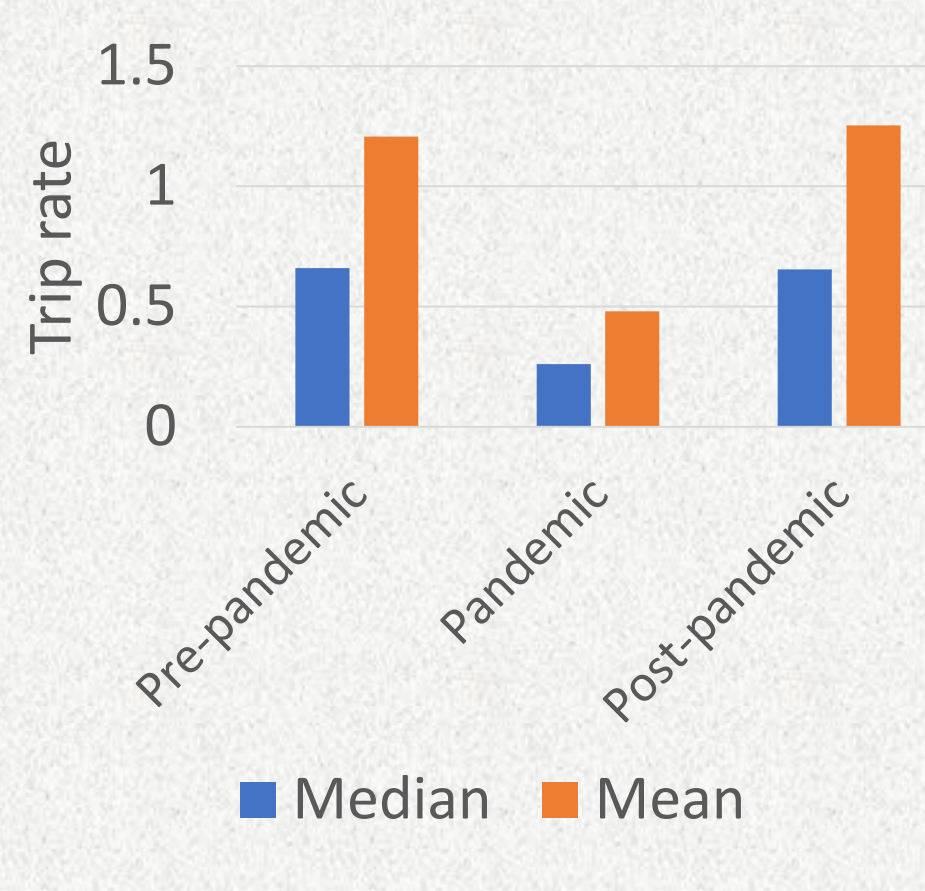


Figure 3. Trip-rates in average trip ends per weekday

Table 2. Results of the regression model for trip generation

Variable	Pre-pandemic		Pandemic		Post-pandemic	
	Coef	t-stat	Coef	t-stat	Coef	t-stat
constant	4.48	46.54	3.06	35.36	4.49	45.29
log (overnight car park occupancy)	0.36	20.69	0.44	27.72	0.36	19.87
log (total of 3, 4, 5 room dwelling units)	0.02	2.4	0.01	2.49	0.01	2.14
log (no. of hawker stalls in walking distance)	0.01	3.77	0.01	5.56	0.01	3.56
Public Transport Accessibility Index (PTAL)	-0.02	3.99	-0.004	-1.03	-0.02	-3.85
Summary statistics						
No. of observations	827		827		786	
R-squared	0.38		0.5		0.37	
Adjusted R-squared	0.37		0.45		0.36	

- The figure shows the **observed and predicted trip generation** per weekday for HDB blocks.
- Also show the corresponding **Pearson correlation coefficient**.

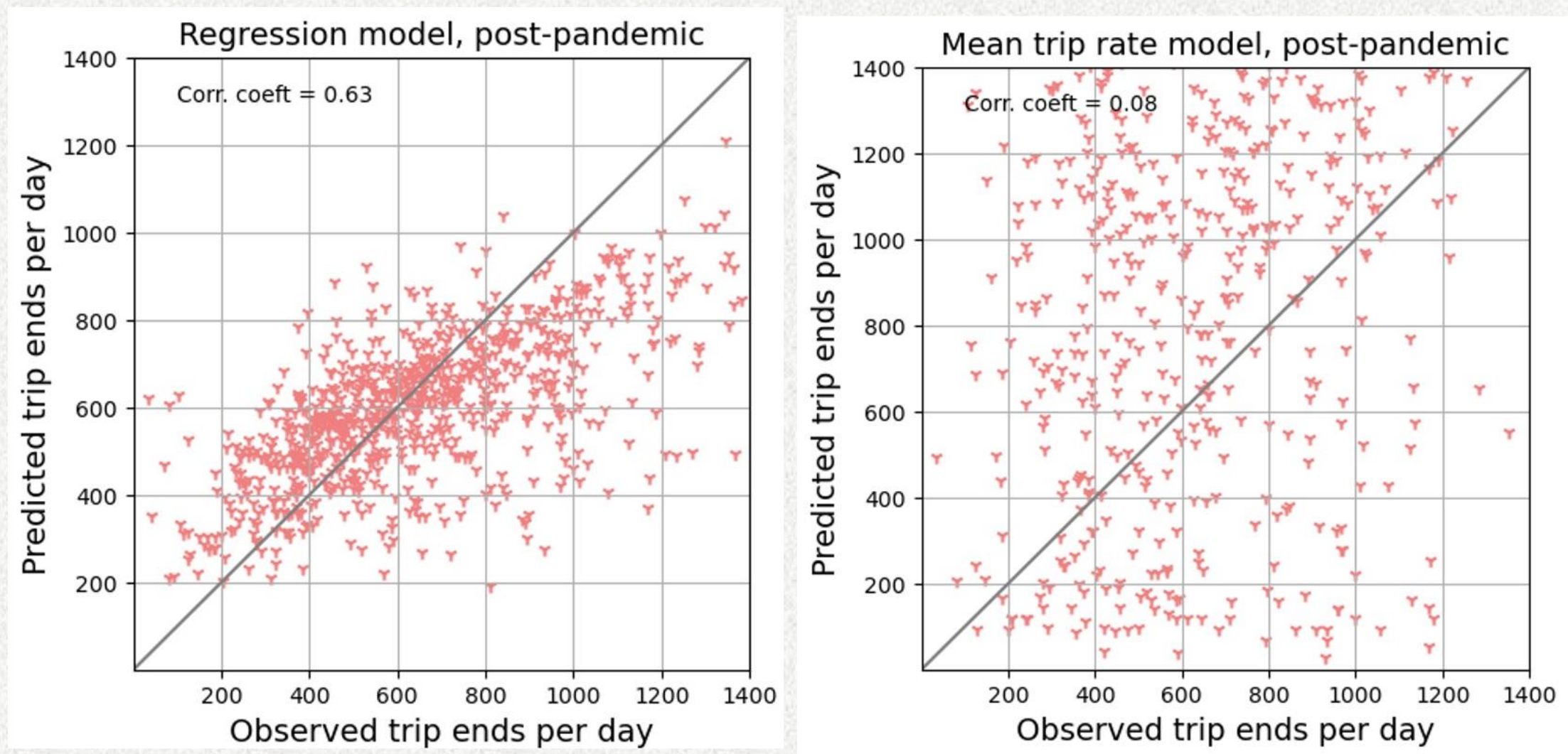


Figure 4. Comparison of model performance

CONCLUSIONS

- This study has developed both **trip rates** and **regression-based trip generation** models for public housing blocks in Singapore at **pre-pandemic, pandemic and post-pandemic stages** of the COVID-19 pandemic using secondary data sources.
- While the industry standard is to use average **trip rate** by land use type in applications of Traffic Impact Assessment studies, this study shows how the **higher errors** in adopting these rates can be **reduced** using readily available **secondary data**.

AIM

- Demonstrate the **usability** of the emerging data source of **car park lot availability** in trip generation modelling
- Investigate the **changes** in the private **car trip generation** of Housing Development Board (HDB) estates in Singapore due to the COVID-19 pandemic.

METHODS

- Total number of trip ends, which is the **sum of production and attraction ends** used to represent the trip generation.
- Number of trip ends **estimated** using the HDB **carpark lot availability data**.
- **Car ownership** of residents are **inferred** from the **overnight car occupancy** at these carparks.
- Other **open datasets** listed in Table 1 are also **used** in the modelling.
- Average weekday **trip rates** and **regression models** for trip generation are estimated.



Figure 1. Location of Housing Development Board (HDB) car parks in Singapore

Table 1. Datasets used in the study

Data sets	Source	Description
Car park lot availability	Land transport Datamall	Available car parking lots at HDB and other car parks in Singapore at 1 min interval.
HDB property information	Data.gov.sg	Details of HDB properties such as the number and type of dwelling units, age, etc.
HDB resale price	Data.gov.sg	Resale transactions data providing block address and other details of the unit along with the transaction price.
Markets and Hawker centers data	Data.gov.sg	The address and number of stalls for cooked food and market produce.

- Predictive **performance** of the model has **slightly improved** during the **pandemic** stage, has gone back to its **original performance** level at the **post-pandemic** stage.
- As expected, **regression model** has a much **better** predictive **performance** than the **trip rates** model.
- Comparison of the regression model at different stages of the pandemic show that the model at the **pandemic stage** has the **best performance**, potentially due to **lesser variability** in **trip generation** during that period.

- The results from the study show that the inclusion of variables related to **land use, built environment, transit accessibility** is **improving the performance** of the trip generation model.
- Use of the **overnight car park occupancy** as an **indicator** for the **vehicle ownership** in the area **improves the model** fit considerably.

Future applications

- Extension of the models can be explored **making use of other potential secondary data sources** that were not used in this study such as **the retail activity**.

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