Modeling Impacts of Off-peak Delivery in the Greater Toronto and Hamilton Area

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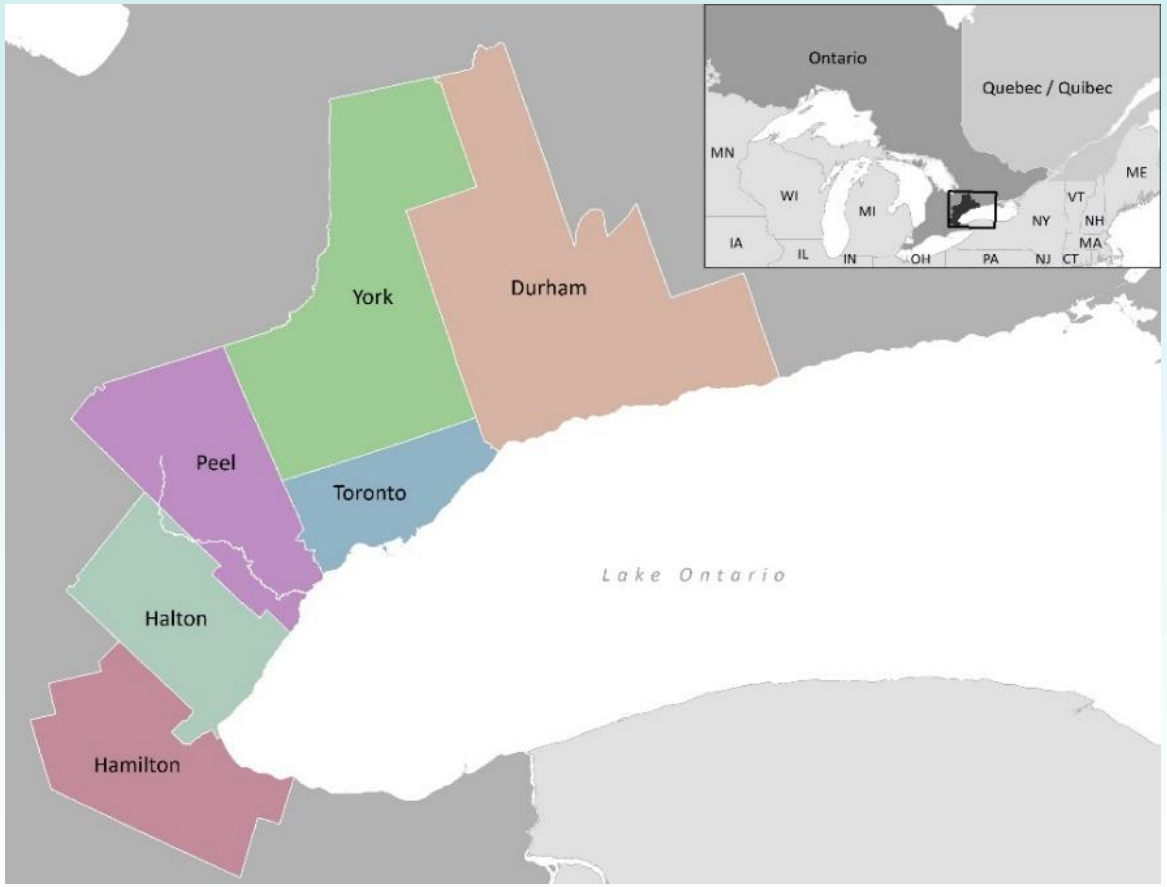

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Content

- Background and objective
- GTHA commercial vehicle model
- Passenger demand
- Off-peak delivery scenarios
- Scenario results
- Key takeaways

Background and objective

- Off-peak delivery (OPD) → delivery of goods during evening and overnight periods (7 pm – 6 am)
- Province of Ontario relaxed noise bylaws during the pandemic and wants to make this permanent to allow OPDs
- The objective is to quantify the impacts of OPD on road network

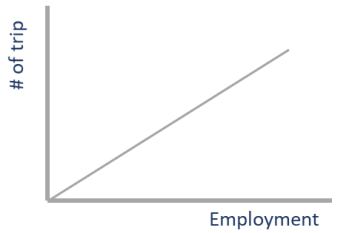
GTHA Commercial Vehicle (CV) Model

- A 3-stage model

- Regression models as opposed to trip rates
- Special generation for CP, CN terminals and YYZ
- Integrated with the GTAModel
- Calibrated for 2016
- Outputs volumes for AM, midday, PM, evening and overnight

CV model: trip generation

(A)



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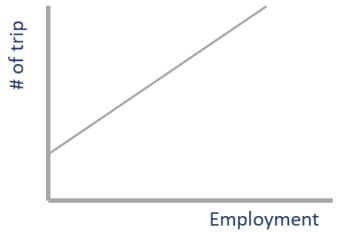
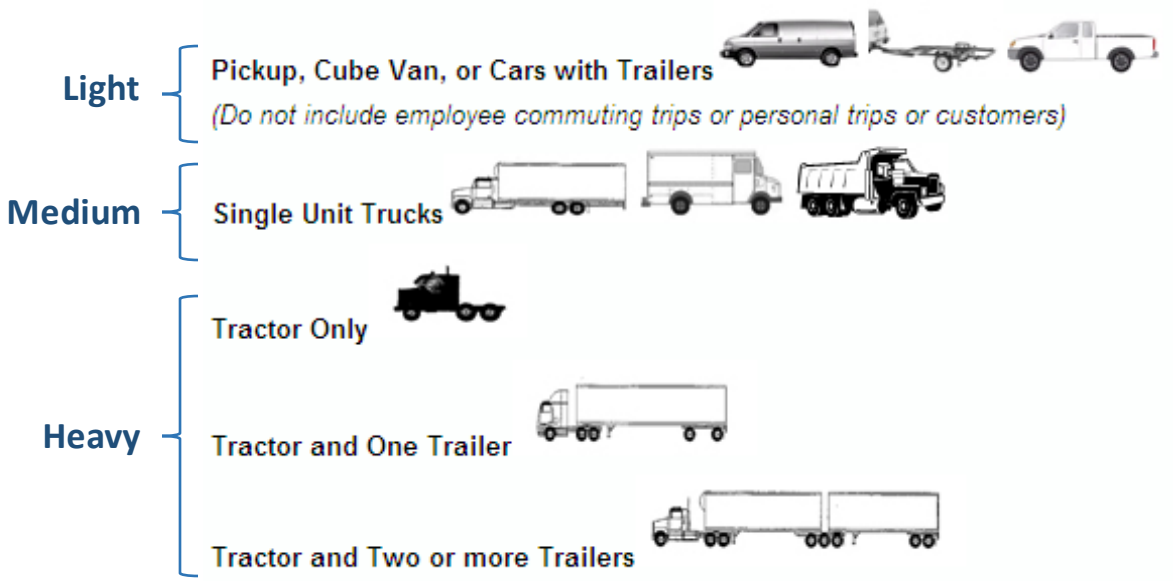


(C)

Table: Number of Industry Classes by Preferred Model

Preferred Model	Light Truck	Medium Truck	Heavy Truck	Total
A	9	6	7	**22**
B	0	0	3	**3**
C	6	9	5	**20**
Total	**15**	**15**	**15**	**45**



CV model

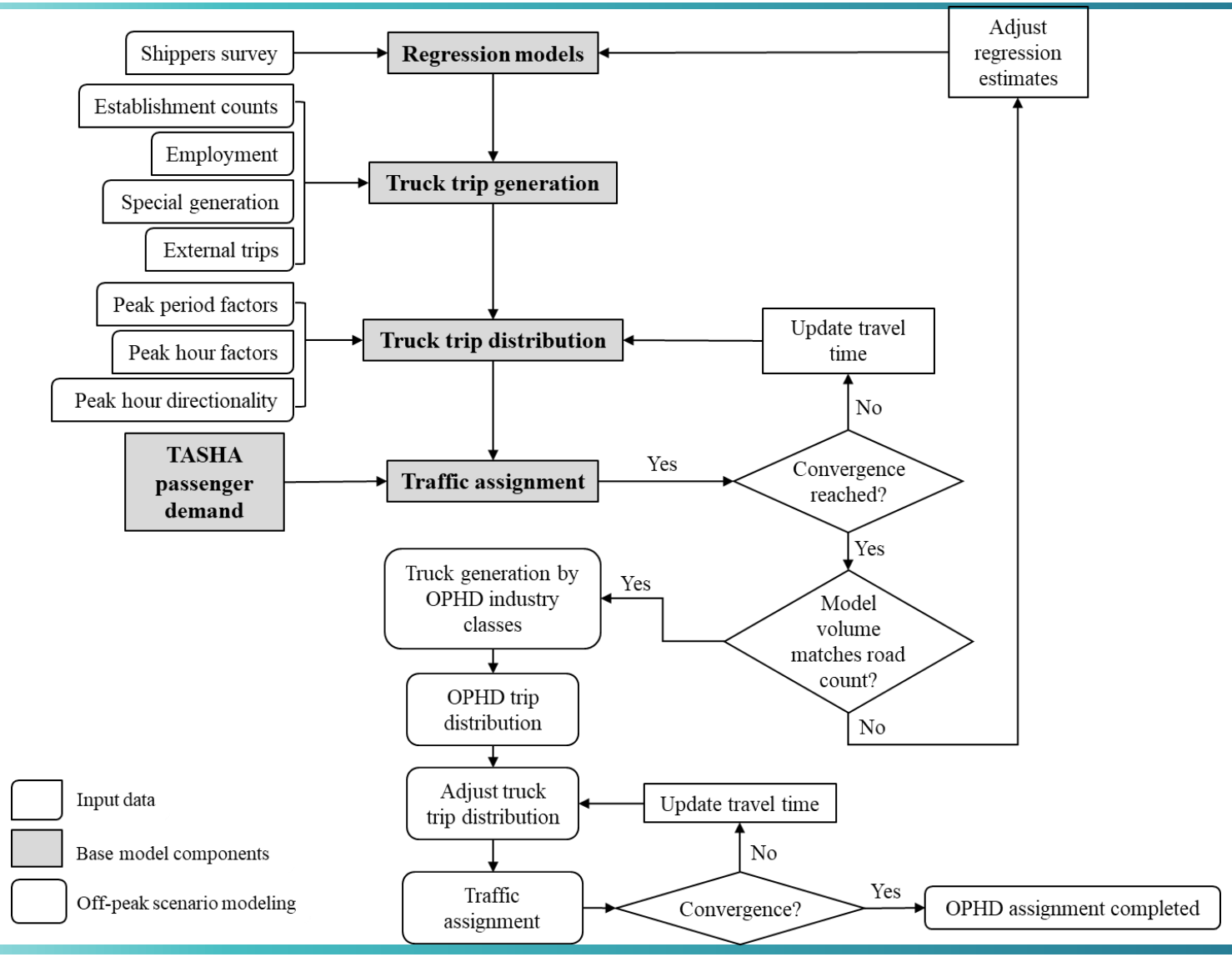
- Trip Distribution
  - Doubly constrained gravity model
  - Peak period, peak hour and AM/PM directionality

- Traffic assignment
  - Multiclass user equilibrium

Passenger demand: GTAModel V4

- An operational agent-based micro simulation model primarily used for forecasting passenger travel in the GTHA.
- Based on TASHA (Travel Activity Scheduler for Household Agents) for activity scheduling and mode choice.
- Estimated and calibrated to the 2016 Transportation of Tomorrow Survey

OPHD scenario modeling

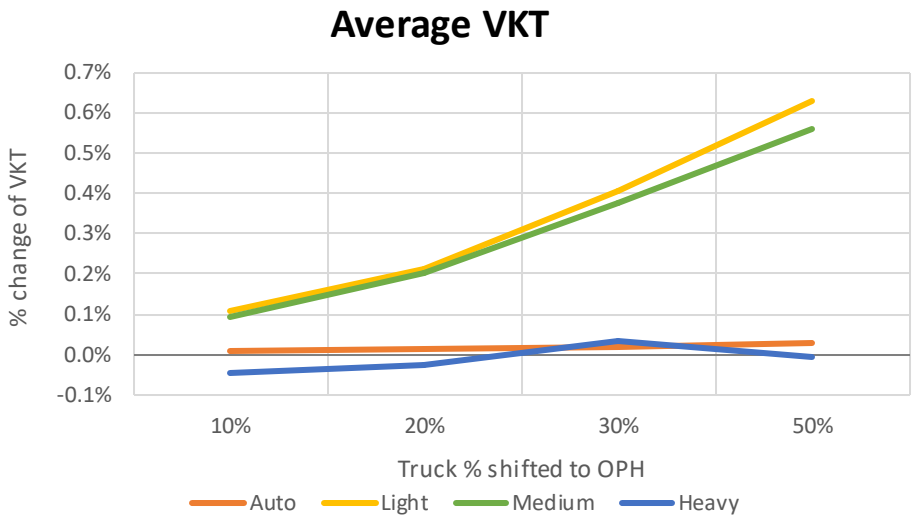


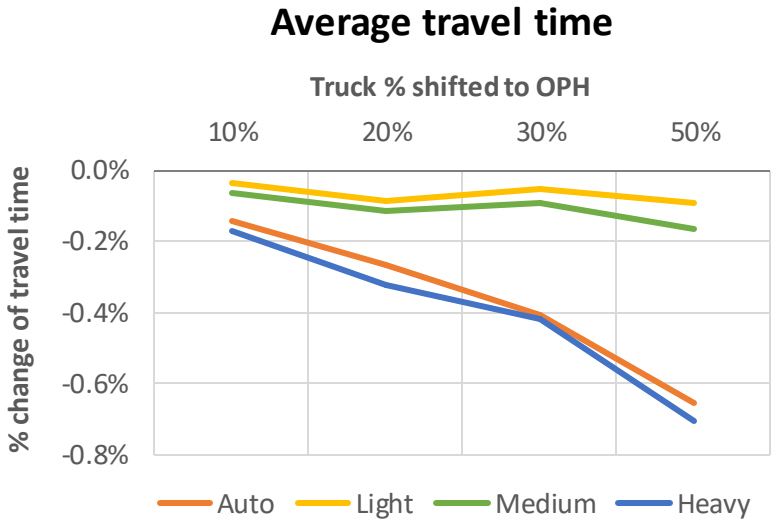
OPD scenarios

- 3 industry classes
  - Retail
  - Grocery-related wholesale
  - Accommodation and food
- 4 levels of shifts: 10%, 20%, 30%, 50%
  - With **30% shift**, 4% of all trucks (0.45% of all vehicles) are shifted
- For each shift level, two cases:
  - 1) Induced and 2) non-induced passenger demand
  - 1a) Retail and wholesale to evening 100%, 1b) 50% to evening (7-11 pm), 50% to overnight (11 pm – 6 am)

Results: daytime (6 am - 7 pm) traffic

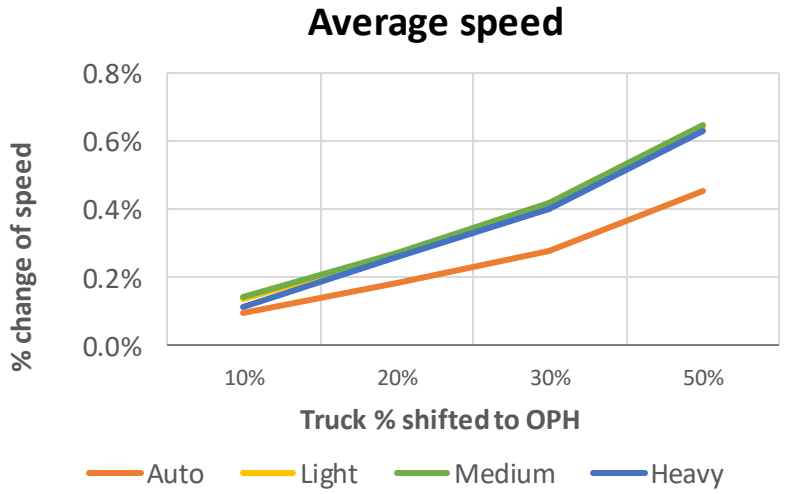
- Light and medium truck VKTs increase due to rerouting to highways





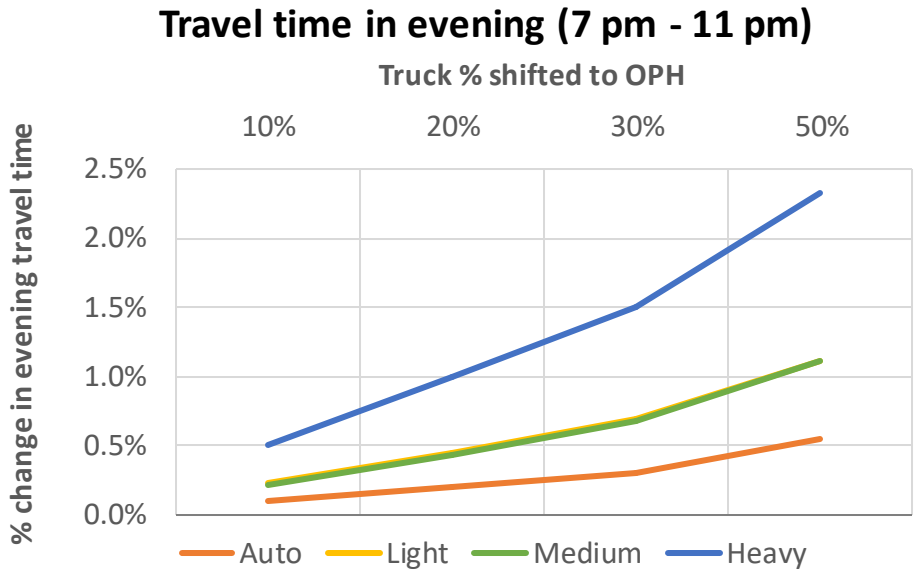
- Travel times of light and medium do not drop as much as heavy and auto

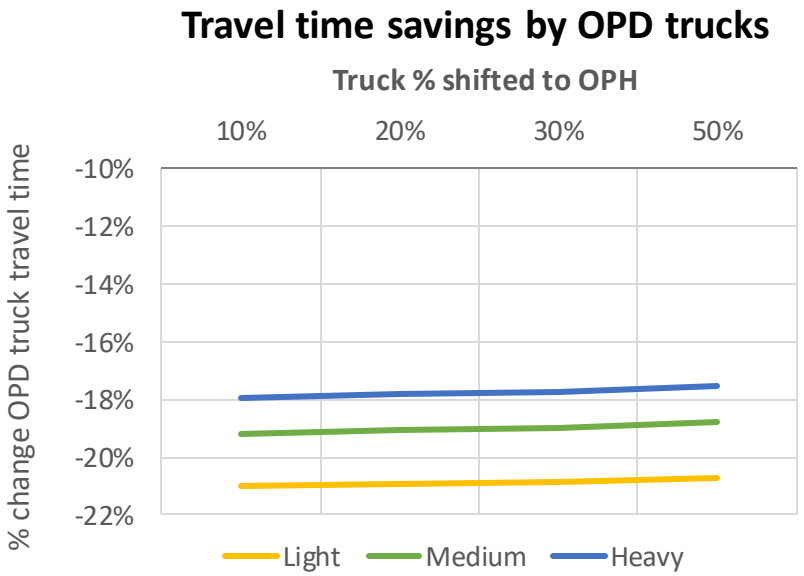
- Speed changes uniformly

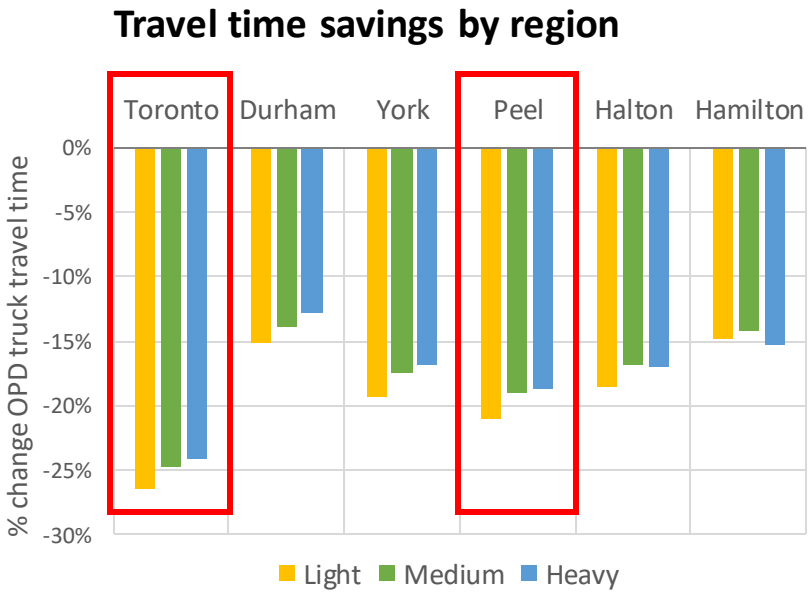


Results: off-peak traffic

- Travel time rises in the evening

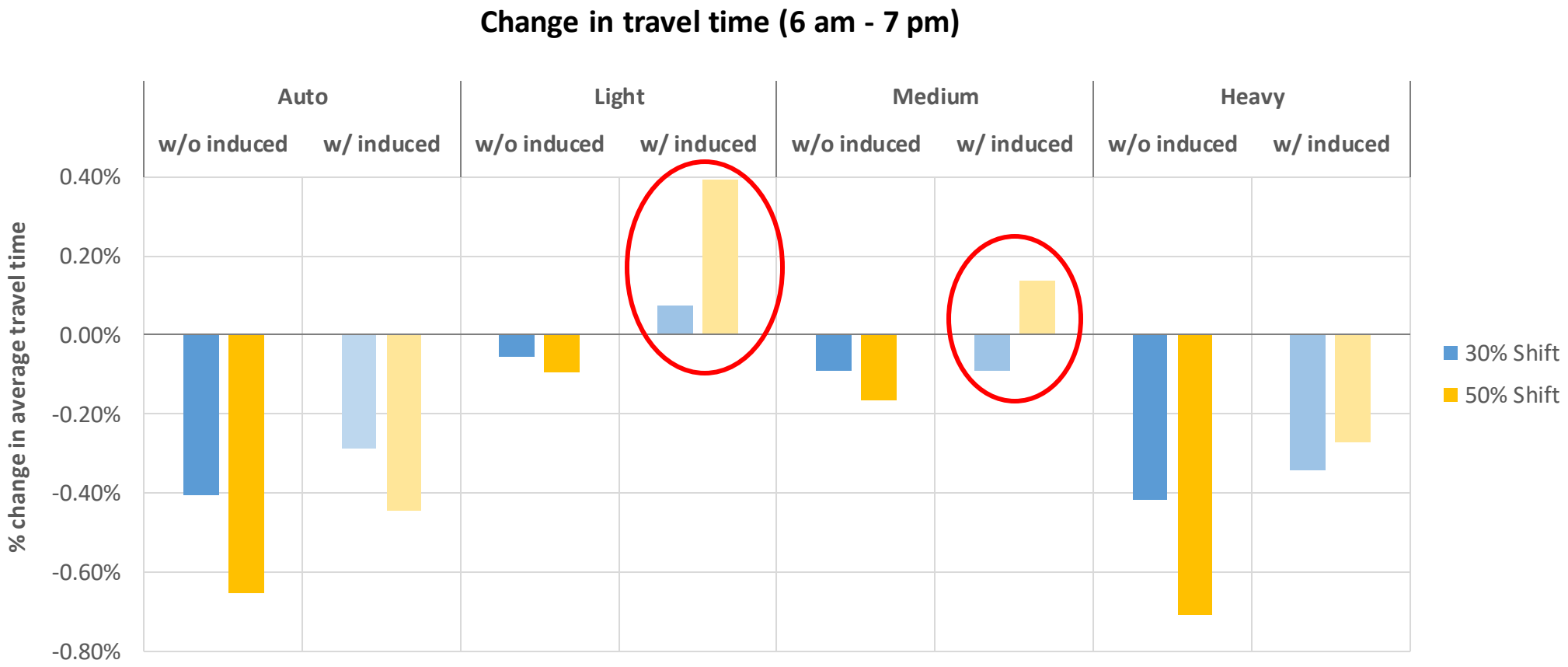






- OPD trucks have substantially better travel times

Results: impacts of induced demand



Results: system-wide net benefit

Change in total vehicle-hour with 30% of participation rate

Vehicle type	Daytime traffic (6 am - 7 pm)		Evening traffic (7 pm - 11 pm)		Trucks participating in OPHD
	w/o induced	w/ induced	w/o induced	w/ induced	
Auto	-6,021	-3,426	157	135	-
Light	-78	201	90	-25	-1,499
Medium	-46	-12	32	-8	-170
Heavy	-304	-478	176	51	-297
Total	-6,449	-3,715	454	153	-1,967
Total vehicle-hour saved	-7,962 (w/o induced)		-5,530 (w/ induced)		

Key takeaways

- Light trucks would benefit the most (followed by medium trucks)
  - Highest travel time savings in the off-peak
  - Worse off during daytime
- Carriers serving Toronto and Peel region businesses would benefit the most
- Total daily travel time savings of 5,530 vehicle-hours

Questions/comments?