

# Forecasting in an Era of High Uncertainty: Predicting the Geographic Spread of Car-Sharing

Ali Darwiche

Senior Planner, Forecasting  
TransLink

Eric Petersen

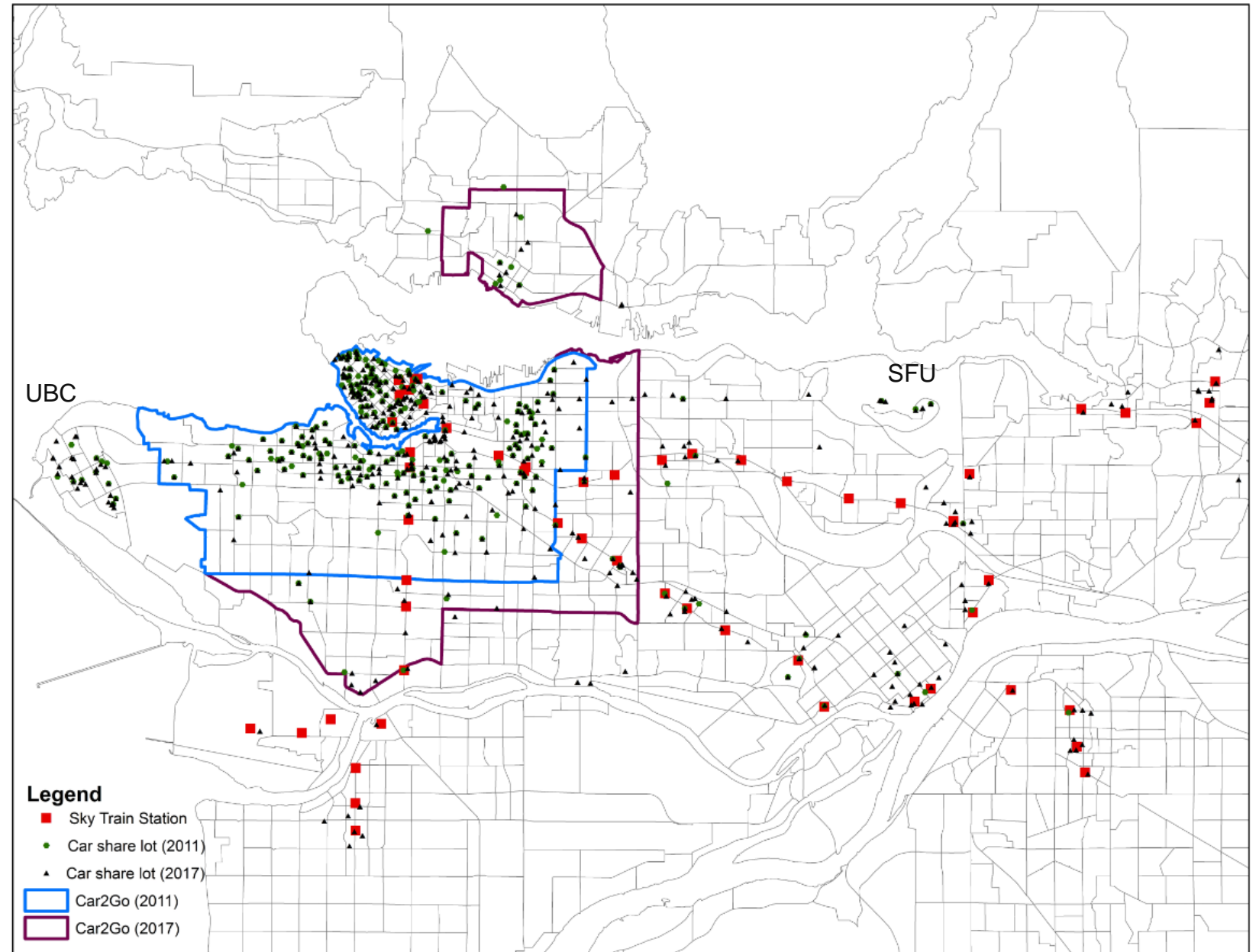
Senior Advisor, Systems Planning  
Metrolinx

## WHY MODEL CAR-SHARING LOT LOCATION?

- In Metro Vancouver, investigation of car-sharing indicated strong relationship between proximity to car sharing lots and **car ownership** and **mode choice** even after controlling for:
  - transit accessibilities
  - zone density
  - other subregional characteristics
  - household income
  - household size
  - workers in household
- Thus, TransLink's regional travel demand model includes car-share lot proximity measure in car ownership and mode choice models
  - Requirement to forecast future car-share lot location
  - Also further investigations into car-share membership at the household level (more direct impact on auto ownership)

# CAR-SHARING SERVICES IN METROPOLITAN VANCOUVER (2011 TO 2017)

- Car sharing services are expanding rapidly
  - Car2Go boundary covers almost all of Vancouver
  - Outside of Vancouver, ZipCar and Modo largely clustered near SkyTrain stations
- Geographic reach already (2017) extends into areas that, in 2011, were not considered candidates for car share until 2025 or beyond:
  - Car2Go in North Vancouver
  - Modo in Coquitlam and Port Coquitlam



# CHALLENGES

- Rapid changes in car-sharing environment
  - Ride-sourcing (Uber, Lyft) currently banned in Vancouver – unclear impact if they enter market)
  - New car-share firms might enter market with new offerings (EVs)
  - Shared AV would push car-sharing into “zoned” approach and probably eliminate one-way car-sharing (ZipCar, Modo)
- More than ever before, past performance does not automatically translate into the future.
- Scenario planning useful under conditions of high uncertainty, especially to consider extreme scenarios
  - Double or triple one-way car-share lots
  - Consider case where every zone treated as if in Car2Go boundary
  - Eliminate car-sharing entirely and replace with private AV fleet

# UPDATING THE FORECASTING APPROACH

Model 1: Binary choice

Any Car-share lot in zone		
lot A.S.C.	-2.973	***
Vancouver/UBC	2.233	***
Burnaby/New West	1.829	***
North Shore	1.666	***
pop density	0.026	***
emp density	0.016	***
%large HH in zone	-4.676	***
Distance nearest SkyTrain station (Vancouver)	-0.358	***
Distance nearest SkyTrain station (not Vancouver)	-0.163	***

R-square = 0.73

Model 2: Trinary choice

ZipCar or Modo lot in zone		ZipCar and Modo lot in zone	
1 lot A.S.C.	-2.83	2 lots A.S.C.	-5.86
Vancouver/UBC	2.05	Vancouver/UBC	3.14
Burnaby/New West	1.82	Burnaby/New West	2.05
North Shore	1.68	North Shore	1.73
pop density	0.02	pop density	0.04
emp density	0.01	emp density	0.02
%large HH in zone	-4.25	%large HH in zone	-8.15
Distance nearest SkyTrain station (Vancouver)	-0.35	Distance nearest SkyTrain station (Vancouver)	-0.35
Distance nearest SkyTrain station (not Vancouver)	-0.27		
		% seniors in zone (Vancouver only)	-4.27

R-square = 0.76

## BACK-CASTING RESULTS

- For simplicity, used binary choice model (any car-share lot in zone)
- In 2017, 323 zones (out of 1700) had ZipCar or Modo car-share lot
- Backcasting to 2011, the model generates 307.
- There were actually 220.
- This rate of change far beyond any changes in zonal characteristics, suggesting underlying business model of car-sharing companies has shifted.
- Forecasts using the updated car-sharing model still likely to be conservative
  - The challenge is knowing when this accelerated rate of change has slowed!
- Best approach may be to consider high and low forecasts, as well as use expert judgement to determine minimum density thresholds for hosting car-share lot.

# Questions?

Contact:

[Eric.Petersen@metrolinx.com](mailto:Eric.Petersen@metrolinx.com)

[Ali.Darwiche@TransLink.ca](mailto:Ali.Darwiche@TransLink.ca)