A Proposed Tool for Transit Fare Structure Evaluation: Integration of Smart Card Data with Regional Demand Models

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Background and Motivation

- In 2016, TransLink migrated to Compass

- TransLink, commissioned a comprehensive review of its transit fare system

Metro Vancouver Fare Map

Fare Zone Map

Number of Zones Crossed	Fare ($)
0	$2.10
1	$3.15
2	$4.20

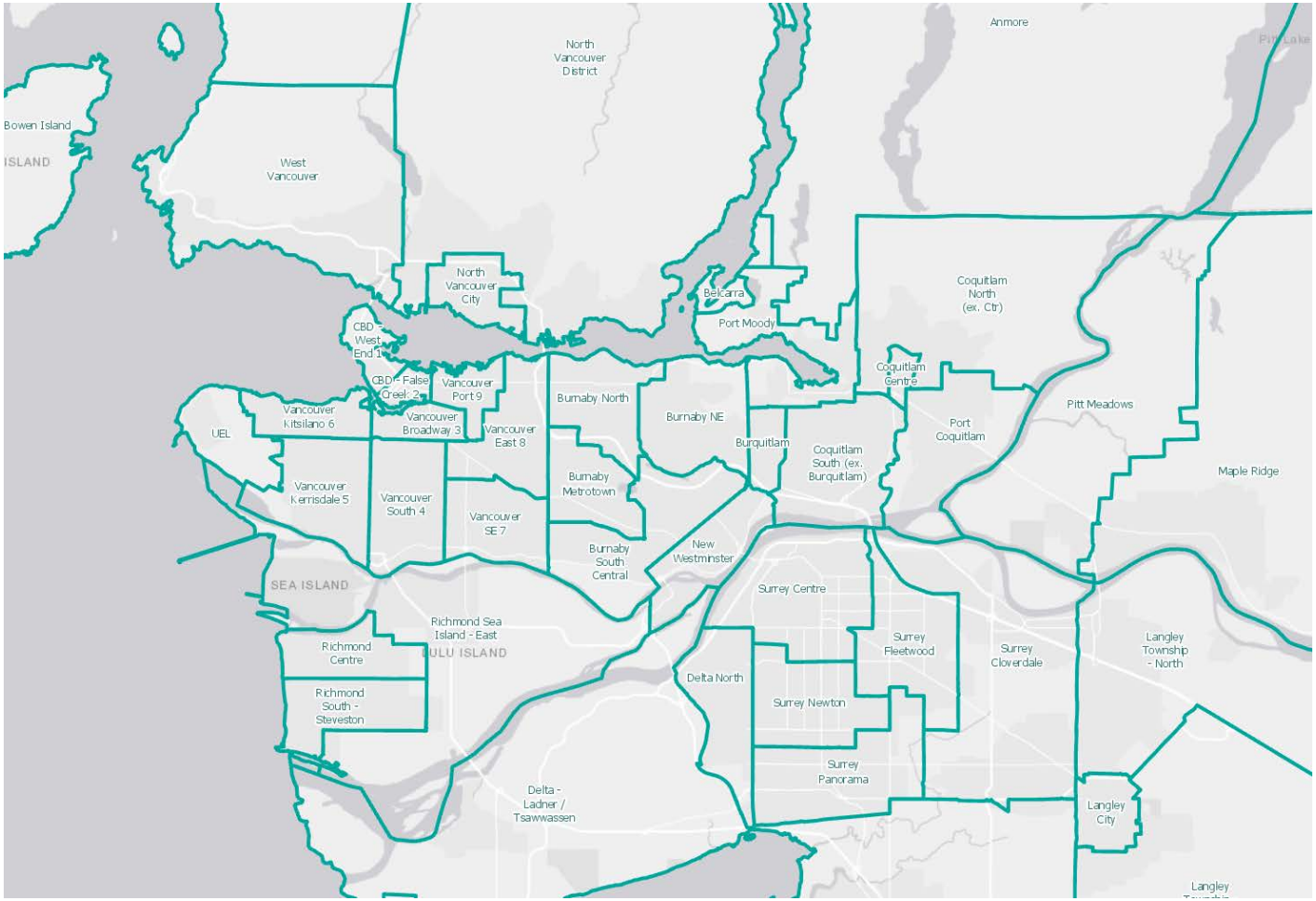
Background and Motivation

- TransLink Policy Team hired Steer to develop a Nested-Logit mode choice model from the travel diary
  - https://www.translink.ca/Plans-and-Projects/Transit-Fare-Review.aspx
- In parallel we developed another model/tool for triangulation combining:
  - RTM 3
  - Compass data

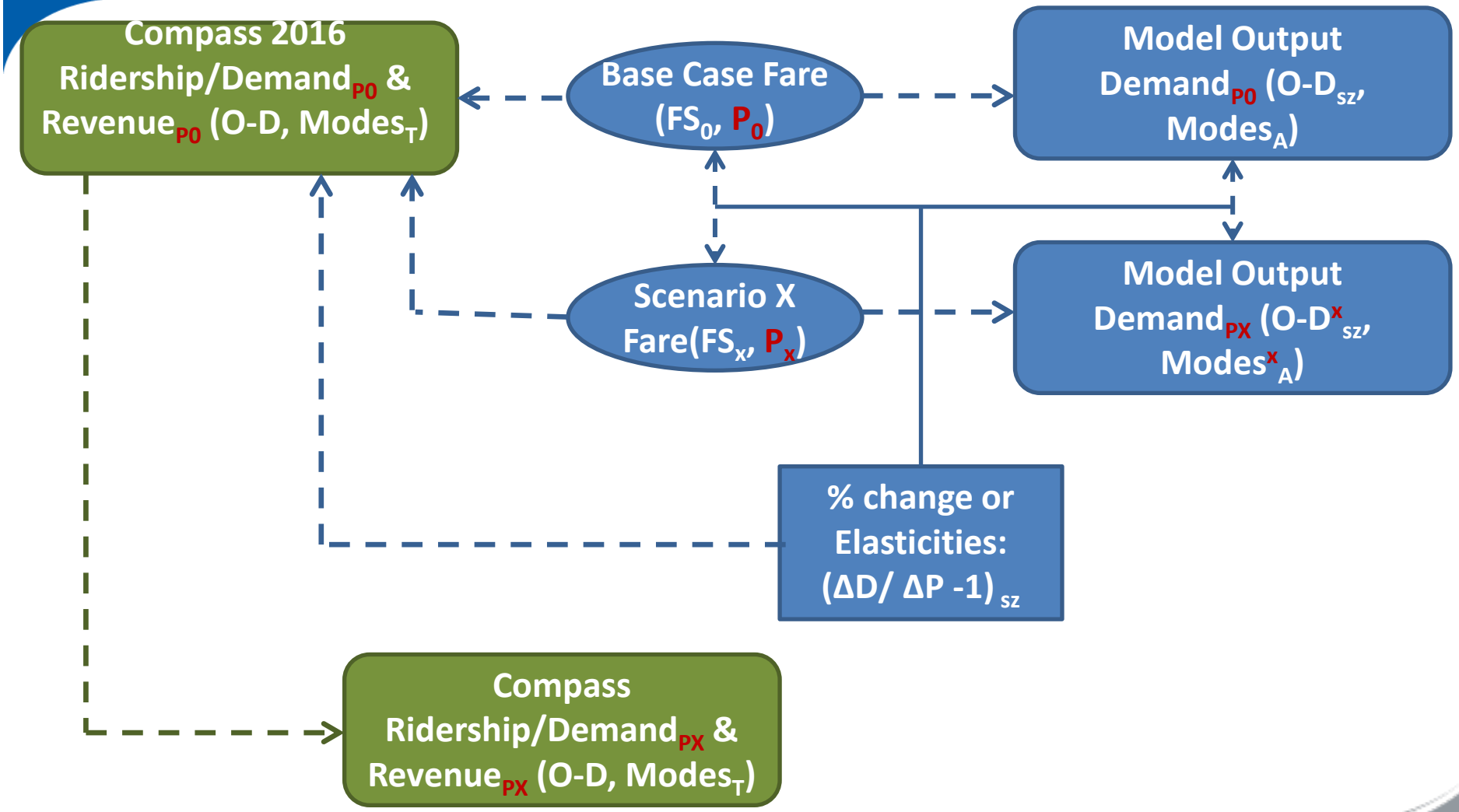
What does the tool bring to the table?

- **Takes advantage of observed, real and stable dataset**
  - More than two years worth of data
  - Ability to **'pivot'** from observed data
- Visualize (Tableau) impact of fare policies by various dimensions:
  - Geography
  - Equity

Tool Description



Tool Description



Scenarios Tested

By distance

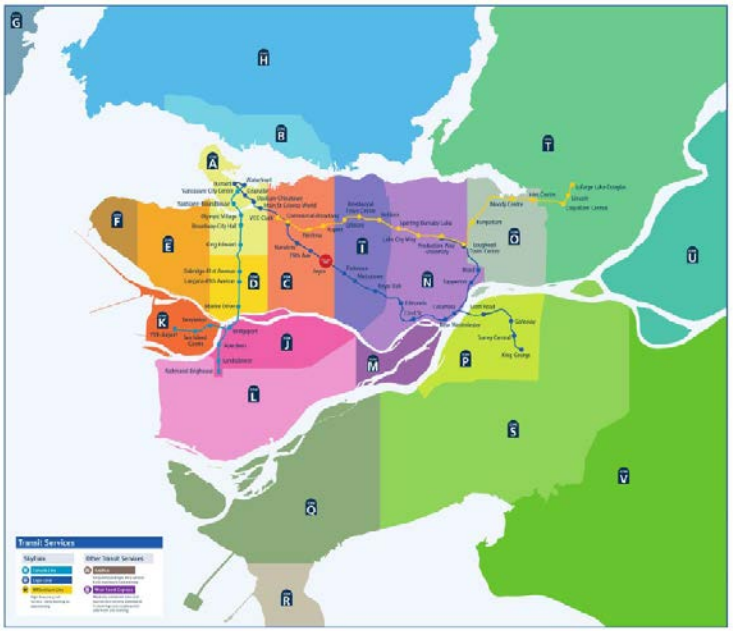
Total Distance Travelled	Adult Stored Value	Concession Stored Value
0-5km	$1.90	$1.60
6	$2.08	$1.74
7	$2.26	$1.88
8	$2.44	$2.02
9	$2.62	$2.16
10	$2.80	$2.30
11	$2.94	$2.41
12	$3.08	$2.52
13	$3.22	$2.63
14	$3.36	$2.74
15	$3.50	$2.85
16	$3.64	$2.96
17	$3.78	$3.07
18	$3.92	$3.18
19	$4.06	$3.29
20	$4.20	$3.40
21	$4.32	$3.49
22	$4.44	$3.58
23	$4.56	$3.67
24	$4.68	$3.76
25	$4.80	$3.85
26	$4.92	$3.94
27 +	$5.00	$4.00

By distance (rail only)

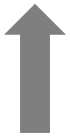
Concept 3C: Fares by Kilometer

Total Distance Travelled	Adult Stored Value	Concession Stored Value
0-5km	$2.10	$1.75
6	$2.28	$1.89
7	$2.46	$2.03
8	$2.64	$2.17
9	$2.82	$2.31
10	$3.00	$2.45
11	$3.14	$2.56
12	$3.28	$2.67
13	$3.42	$2.78
14	$3.56	$2.89
15	$3.70	$3.00
16	$3.84	$3.11
17	$3.98	$3.22
18	$4.12	$3.33
19	$4.26	$3.44
20	$4.40	$3.55
21	$4.52	$3.64
22	$4.64	$3.73
23	$4.76	$3.82
24	$4.88	$3.91
25+	$5.00	$4.00

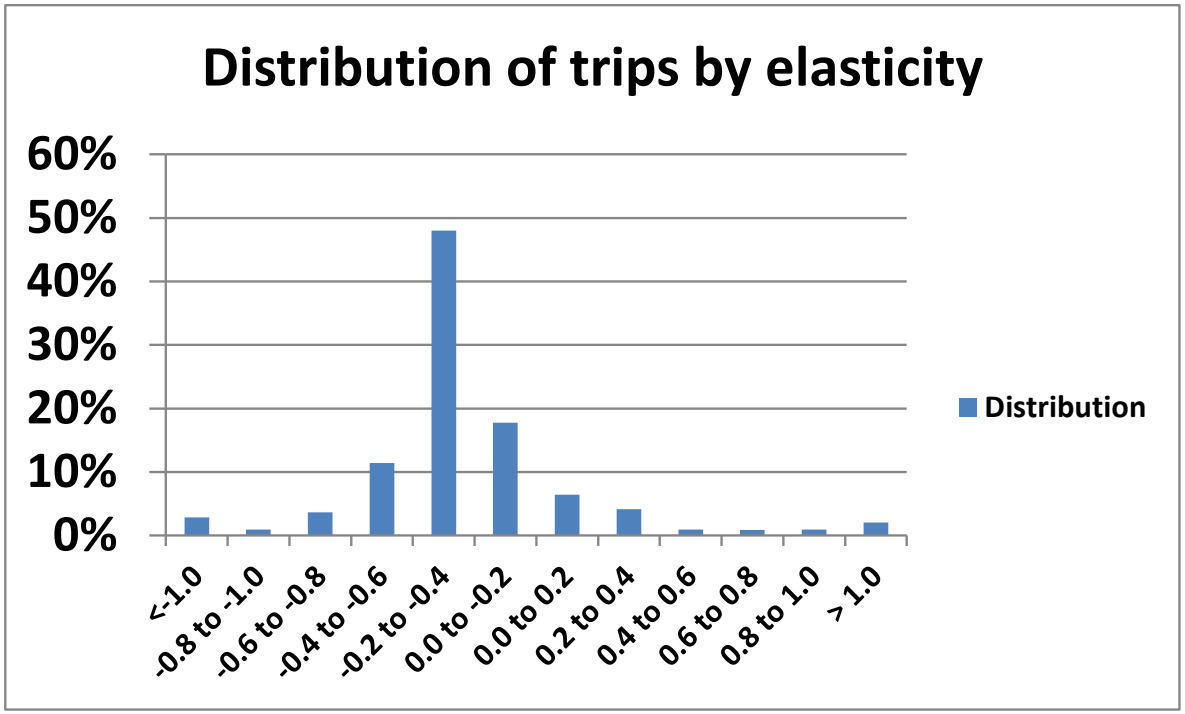
Many Fare zones



Example Results

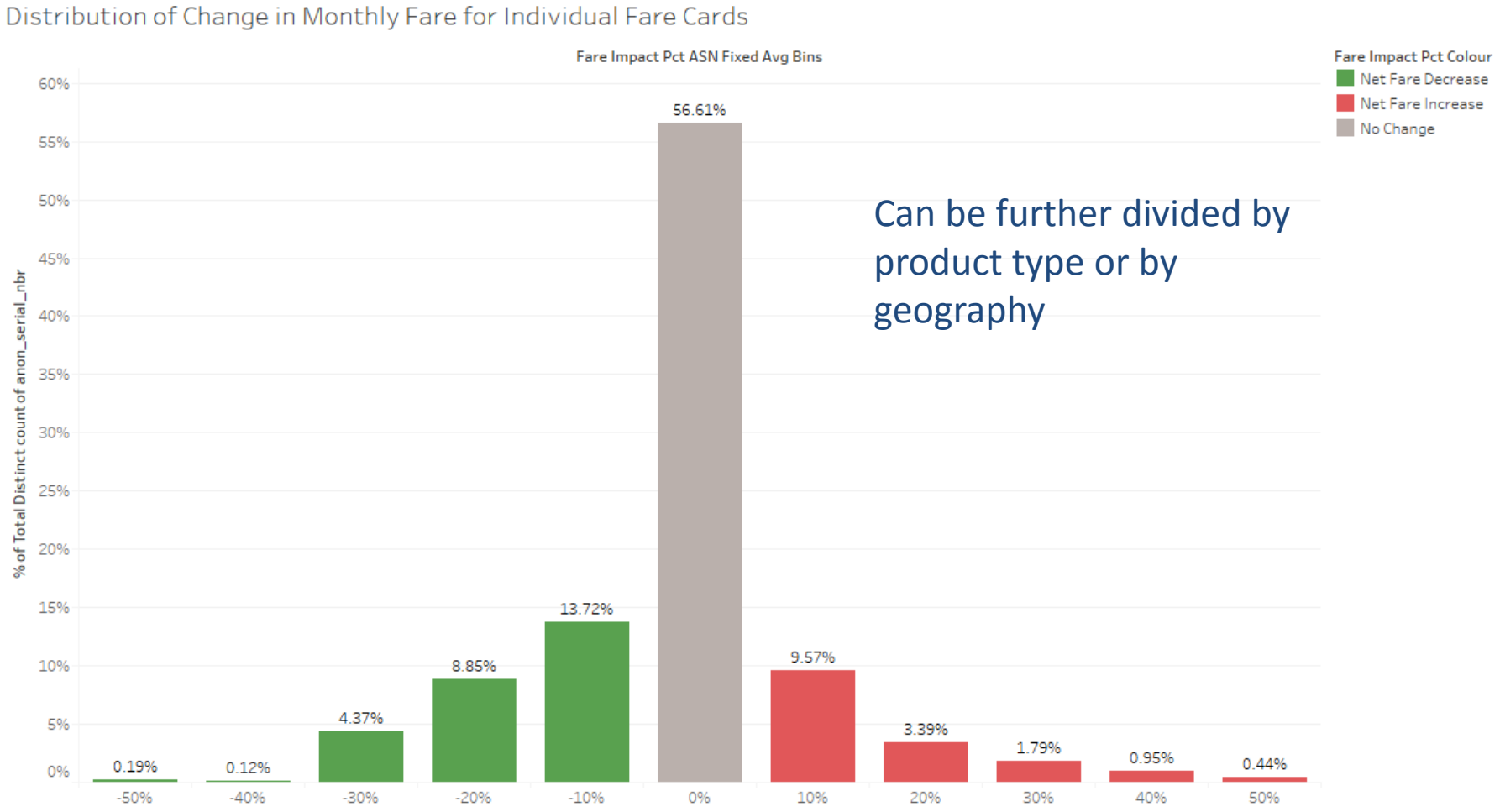
Change (vs current fare structure)	Distance-based	Distance-based (Rail only)	Many Zones
Ridership			
Revenue			

Full Measured Distance Example



- Elasticity ranges are within expectation.
- Almost 50% of the trips have elasticities between -0.2 and -0.4

In a month, which fare cards faces a fare increase vs. a decrease?



Can be further divided by product type or by geography

Easily change fare parameters and test scenarios

Scenario	1	2	3	4	5
Base fare	$2.10	$1.80	$2.10	$2.10	$2.10
When distance charge applies	5 km	5 km	0 km	5 km	5 km
Distance charge constant?	Yes	Yes	Yes	No, increasing	No, decreasing

Easily change fare parameters and test scenarios

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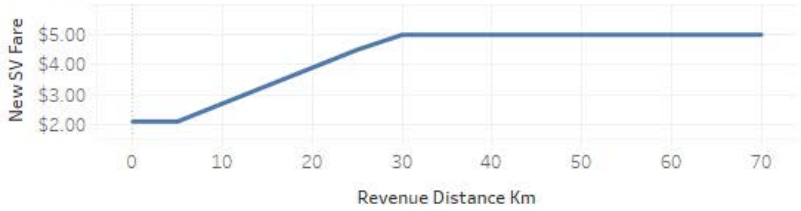
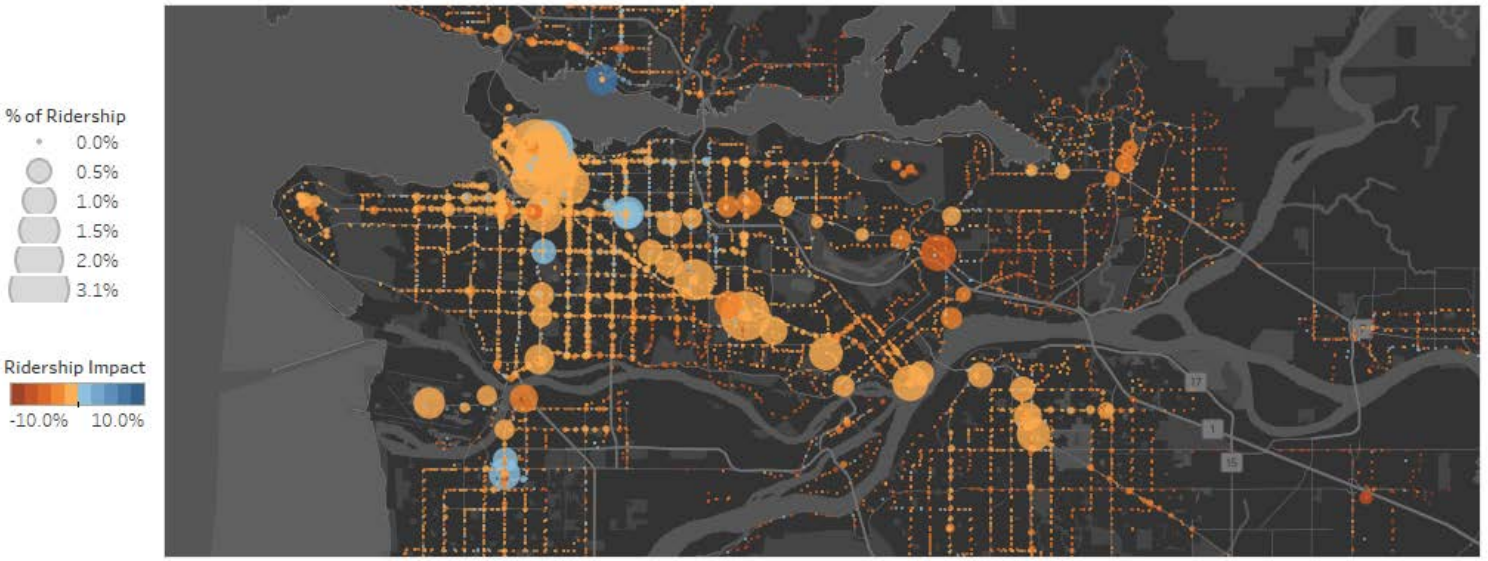
Fare by Distance



Summary of Key Impacts

Revenue Impact	3.98%
Ridership Impact	-1.41%
PKT Impact	-3.02%

Ridership Impact by Journey Origin



Base Fare	Price 0 to 5 km	Price 5 to 10 km	Price 10 to 15 km	Price 15 to 20 km	Price 20 to 25 km	Price 25 to 30 km	Price 30 to 35 km	Price 35 to 40 km
2.1	0	0.12	0.12	0.12	0.12	0.1	0	0

Distance fares only applied on weekday service before 6:30 pm

Scenario 1

Easily change fare parameters and test scenarios

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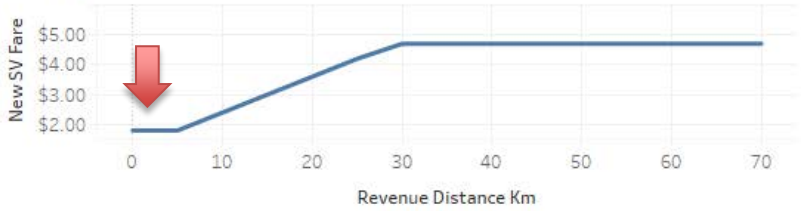
Fare by Distance



Summary of Key Impacts

Revenue Impact	-2.51%
Ridership Impact	0.12%
PKT Impact	-1.77%

Ridership Impact by Journey Origin

Base Fare	Price 0 to 5 km	Price 5 to 10 km	Price 10 to 15 km	Price 15 to 20 km	Price 20 to 25 km	Price 25 to 30 km	Price 30 to 35 km	Price 35 to 40 km
1.8	0	0.12	0.12	0.12	0.12	0.1	0	0

Distance fares only applied on weekday service before 6:30 pm

Scenario 2

Easily change fare parameters and test scenarios

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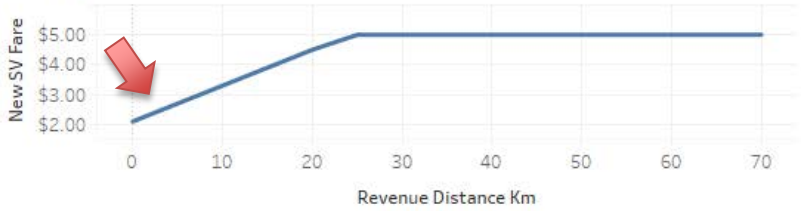
Fare by Distance



Summary of Key Impacts

Revenue Impact	12.00%
Ridership Impact	-3.23%
PKT Impact	-4.52%

Ridership Impact by Journey Origin

Base Fare	Price 0 to 5 km	Price 5 to 10 km	Price 10 to 15 km	Price 15 to 20 km	Price 20 to 25 km	Price 25 to 30 km	Price 30 to 35 km	Price 35 to 40 km
2.1	0.12	0.12	0.12	0.12	0.1	0	0	0

Distance fares only applied on weekday service before 6:30 pm

Scenario 3

Easily change fare parameters and test scenarios

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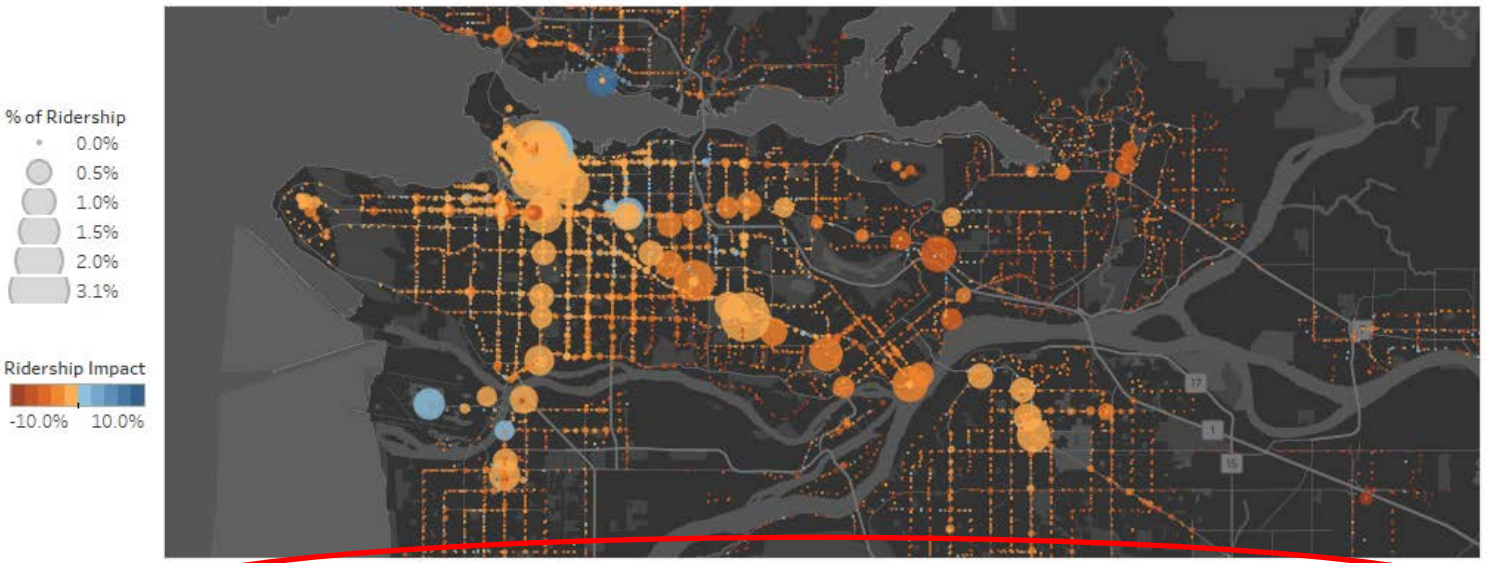
Fare by Distance

Summary of Key Impacts

Revenue Impact	7.88%
Ridership Impact	-2.14%
PKT Impact	-3.95%

Ridership Impact by Journey Origin



Base Fare	Price 0 to 5 km	Price 5 to 10 km	Price 10 to 15 km	Price 15 to 20 km	Price 20 to 25 km	Price 25 to 30 km	Price 30 to 35 km	Price 35 to 40 km
2.1	0	0.2	0.16	0.1	0.06	0.04	0.04	0.02

Distance fares only applied on weekday service before 6:30 pm

Scenario 4

Easily change fare parameters and test scenarios

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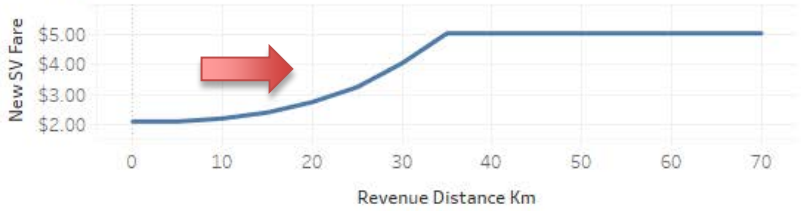
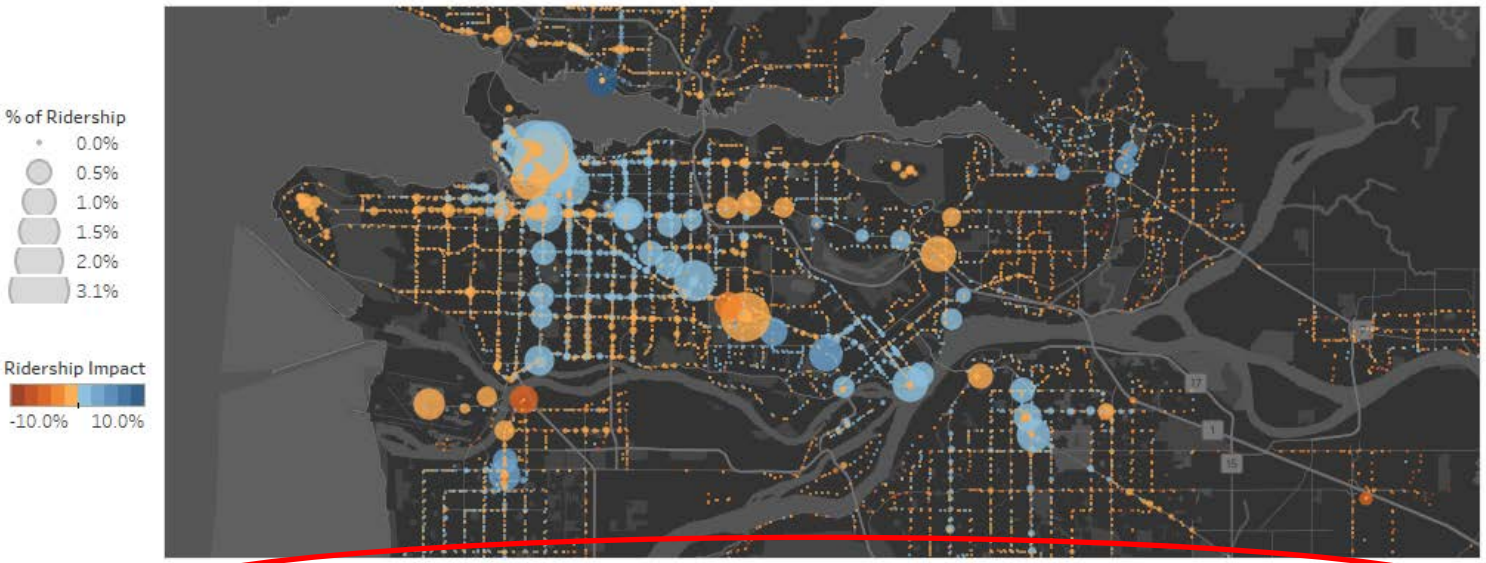
Fare by Distance



Summary of Key Impacts

Revenue Impact	-4.29%
Ridership Impact	0.01%
PKT Impact	-0.91%

Ridership Impact by Journey Origin



Base Fare	Price 0 to 5 km	Price 5 to 10 km	Price 10 to 15 km	Price 15 to 20 km	Price 20 to 25 km	Price 25 to 30 km	Price 30 to 35 km	Price 35 to 40 km
2.1	0	0.02	0.04	0.07	0.1	0.16	0.2	0

Distance fares only applied on weekday service before 6:30 pm

Scenario 5

Limitations

- Does not have a fare product component
- Best used for short term projections