

# The Costs of Commuting: Identifying the Effect of Transit Subsidies on Employment

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UCLA Applied Proseminar, Spring 2022

# Introduction

*With low income and limited mobility, I just felt trapped by my environment- but being able to afford a trip and back all over the Puget Sound region for work, interviews or just to get away is tremendously freeing. It's so good to get out of the cage of foot travel.*

*(ORCA LIFT Participant)*

# Introduction

**Research question:** Do public transit subsidies for low-income riders improve their employment outcomes?

**Setting:** ORCA LIFT subsidy program launched in 2015 to offer up to a 50% subsidy on many transit agencies in the greater Seattle area.

**Motivation for studying this type of policy:**

- ▶ Relevant for current transit policy discussions
- ▶ Rising inequalities within cities
- ▶ Spillover effects of increased ridership

# Outline

1. Contribution to the Literature
2. Institutional Setting
3. ORCA LIFT Program Overview
4. Data
5. Empirical Strategy
6. Next Steps

## Contribution to the Literature

A growing literature on public transportation includes studies on the effect of transit expansions on local economic outcomes.

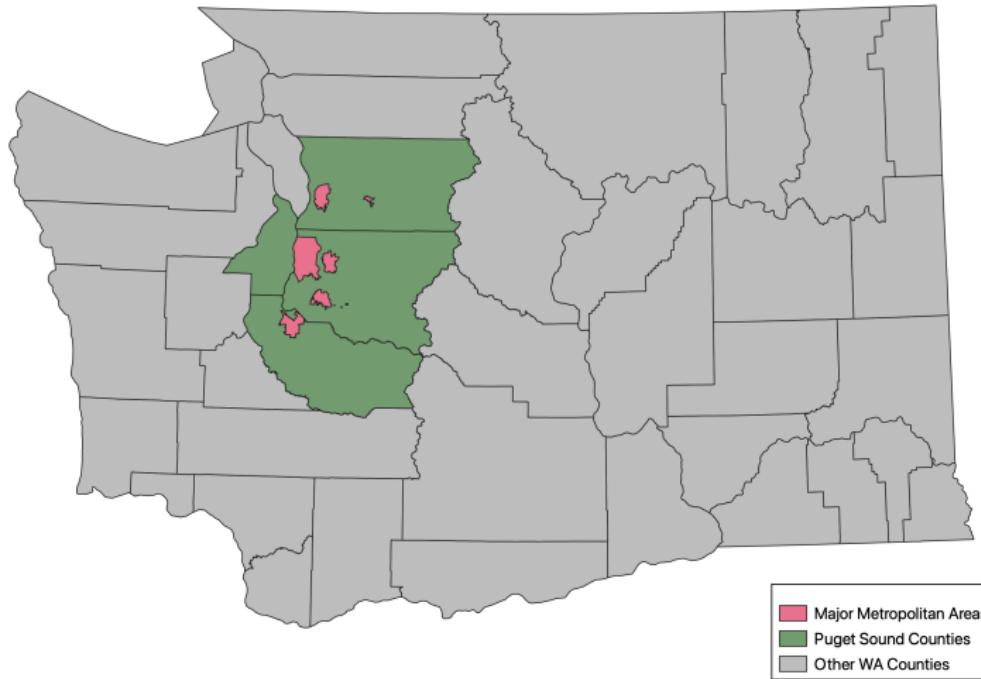
Baum-Snow and Kahn (2000) estimate the effect of building new light rail stations on local home values, while Tyndall (2017), Sari (2015), and Holzer et al. (2003) all study the local employment effects of expanding train lines into new neighborhoods.

- ▶ Contribution: Focus on price changes as a tool to expand transit access rather than infrastructure investment.

The spatial mismatch literature studies the effect of housing segregation on employment of minorities. See Kain (1968) or Ihlanfeldt and Sjoquist (1990).

- ▶ Contribution: New empirical estimates will reveal whether spatial mismatch problems persists today and the extent to which public transit can help alleviate them.

# Institutional Setting



# Institutional Setting

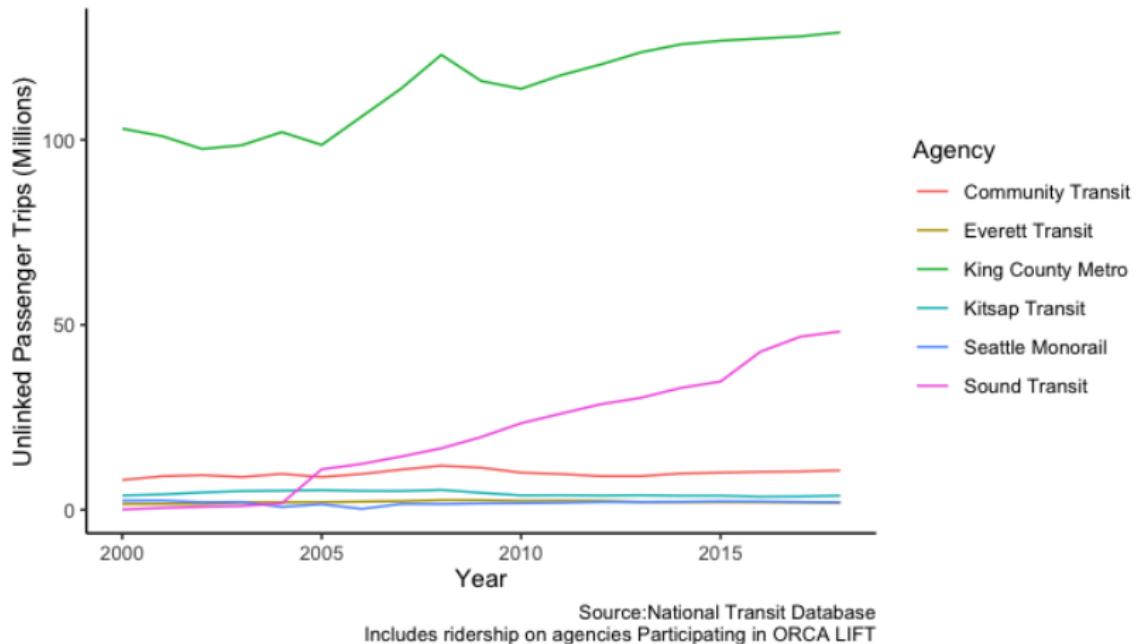


Figure: Annual Ridership by Participating Transit Agency

# ORCA LIFT Program Overview



- ▶ Initiated and run by King County Metro – the largest transit agency in the region
- ▶ Households with income up to 200 percent of the federal poverty level are eligible dollar values
- ▶ Must reapply after 24 months
- ▶ Initially, 4 agencies offered discounted fares
- ▶ Over 25,000 enrolled participants in the first year alone

# ORCA LIFT Program Overview

	Off-Peak All Zones		Peak One Zone		Peak Two Zone	
	Before	After	Before	After	Before	After
<b>Adult</b> age 19-64	\$2.25	\$2.50	\$2.50	\$2.75	\$3.00	\$3.25
<b>Senior</b> with Regional Reduced Fare Permit	\$0.75	\$1.00	\$0.75	\$1.00	\$0.75	\$1.00
<b>Riders with disabilities and Medicare card holders</b> with Regional Reduced Fare Permit	\$0.75	\$1.00	\$0.75	\$1.00	\$0.75	\$1.00
<b>ORCA LIFT Reduced Fare</b> eligibility required	.	\$1.50	.	\$1.50	.	\$1.50
<b>Youth</b> age 6-18	\$1.25	\$1.50	\$1.25	\$1.50	\$1.25	\$1.50
<b>Children</b> age 0-5	Free	Free	Free	Free	Free	Free
<b>Access Transportation</b>	\$1.25	\$1.75	\$1.25	\$1.75	\$1.25	\$1.75

Peak times: 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m.

Zones: The city of Seattle is one zone and all areas outside the city, but within King County, are a second zone.

**Table:** King County Metro Fare Changes on March 1, 2015

other agencies

# ORCA LIFT Program Overview

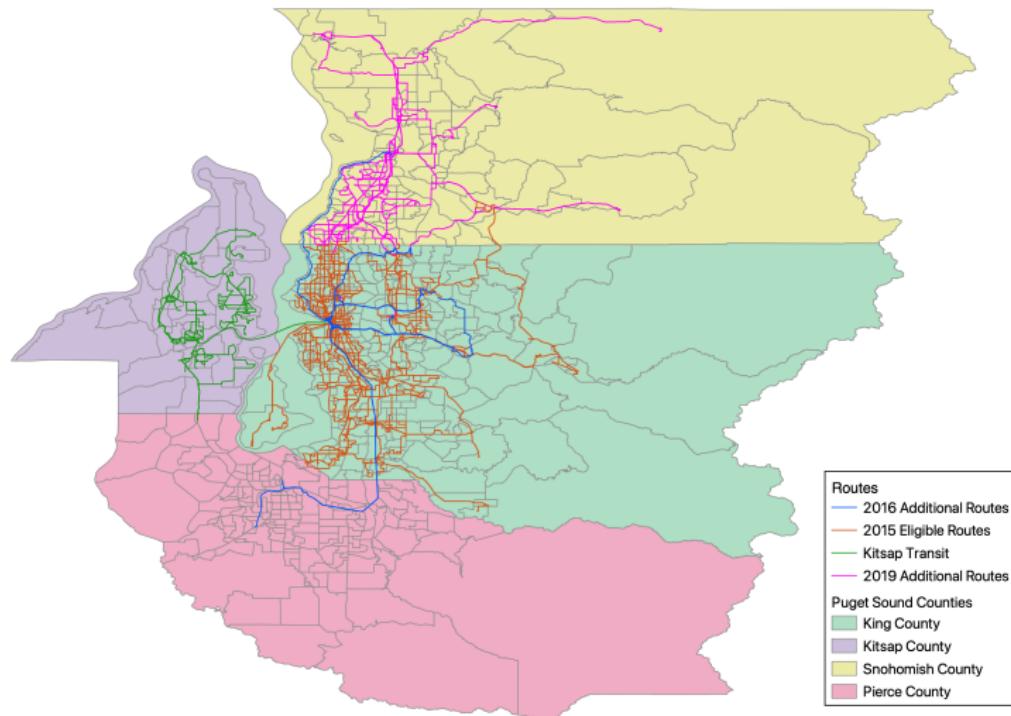


Figure: Participating Agency Routes

## ORCA LIFT Program Overview

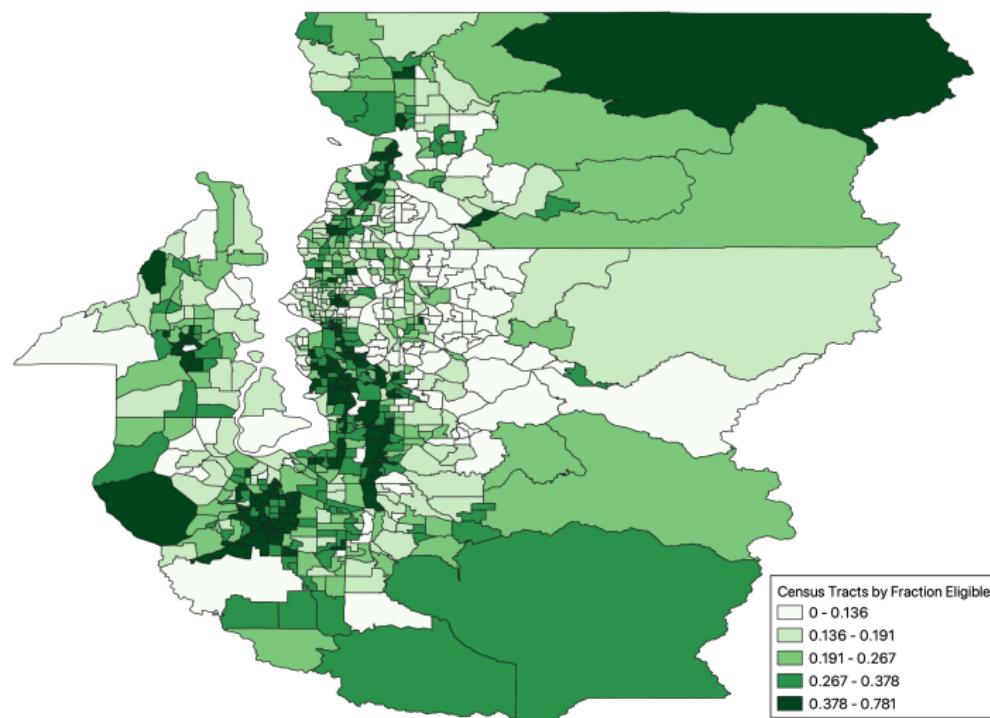
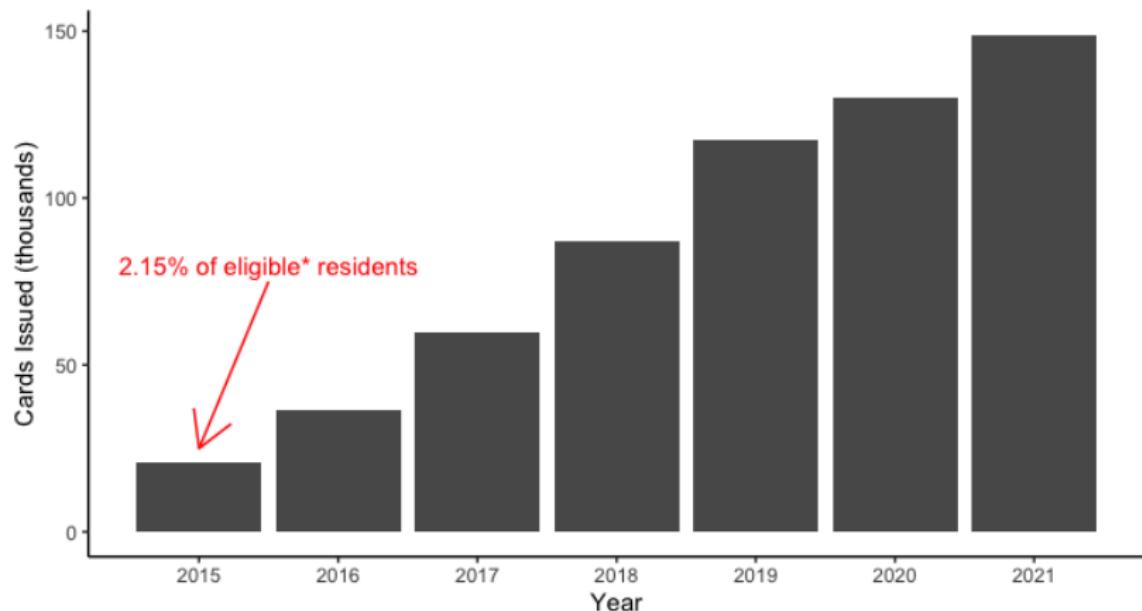


Figure: ORCA LIFT Eligibility by Census Tract (2014)

## Data - Program Level



\*includes King, Pierce, Snohomish, and Skagit Counties (around 4% of eligible King County residents enrolled in 2015)

Figure: Cumulative ORCA LIFT Cards Issued

## Data - ACS

Publicly available census tract level data is available as 5-year estimates. I will use the following variables to measure program outcomes:

- ▶ Mode of transportation to work
- ▶ Median income
- ▶ Labor force participation
- ▶ Unemployment

# Data - Washington State DOT

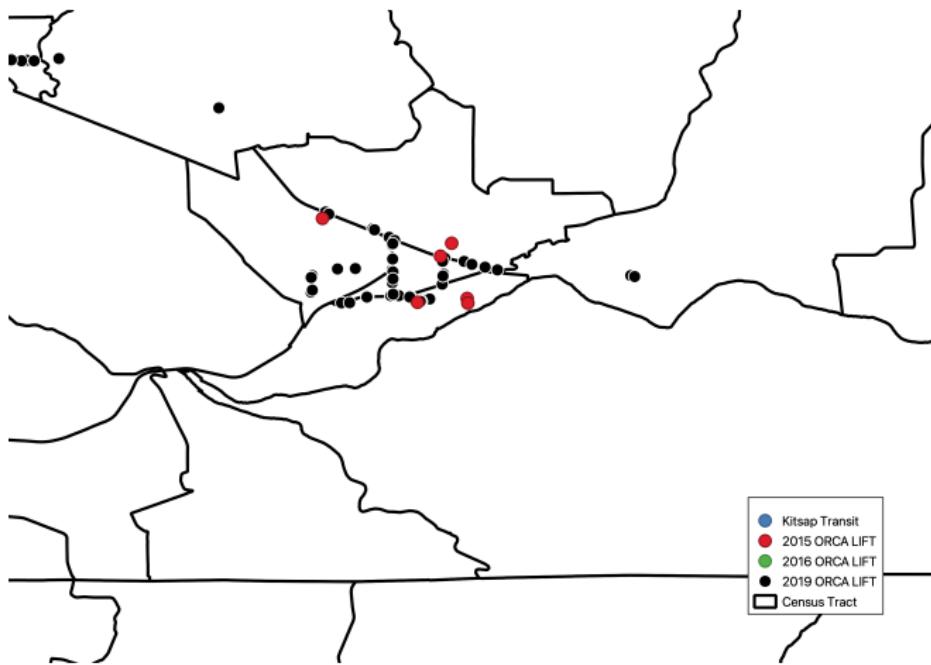


Figure: Transit Stops by Agency Type

# Empirical Strategy

## Terminology

- ▶ **Subsidized Stop** – A transit stop is subsidized at time  $t$  if it belongs to an agency which offers subsidized fares to ORCA LIFT participants.
- ▶ **Treated Census Tract** – Census tract  $i$  is treated at time  $t$  if there is a subsidized stop within its boundaries.

## Definitions

- ▶ Let  $\mathbb{G}$  be the set of program expansions, ordered by time and starting with the Kitsap subsidy program which predated ORCA LIFT.
- ▶ Census tract  $i$  is in treatment group  $g \in \mathbb{G}$  if it first becomes treated with program expansion  $g$ .

## Empirical Strategy

I can run the following two-way fixed effect regression to estimate the Difference in Differences estimate:

$$Y_{it} = \alpha_i + \alpha_t + \beta^{DiD} D_{it} + \varepsilon_{it} \quad (1)$$

where  $Y_{it}$  can be tract  $i$ 's median income, unemployment rate, or labor force participation rate at time  $t$ ,  
 $\alpha_i$  and  $\alpha_t$  are tract and year fixed effects,  
and  $D_{it} = \mathbb{1}\{\text{tract } i \text{ is treated at } t\}$ .

$\beta^{DiD}$  gives a weighted average of all possible Difference in Differences estimates between any  $g, h \in G$  such that  $g \neq h$ .

## Next Steps

- ▶ Build evidence for lack of GE effects
- ▶ Explore how participants differ from eligible residents as a whole
- ▶ Look into changes in transit network over the study period
- ▶ Justify parallel trends assumption
- ▶ Resolve bias due to time-heterogeneous treatment effects

# Appendix

200% of federal poverty level	
Family Size	Monthly
1	\$2,265
2	\$3,052
3	\$3,839
4	\$4,625
5	\$5,412
6	\$6,199
7	\$6,985
8	\$7,772

Table: Current ORCA LIFT Gross Income Thresholds

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# Appendix

	<b>Adult Fare*</b>	<b>ORCA LIFT Fare</b>
<b>King County Metro</b>	\$3.25	\$1.50
<b>Link Light Rail</b>	\$3.00	\$1.50
<b>Kitsap Transit**</b>	\$2.00	\$1.00
<b>Seattle Streetcar</b>	\$2.25	\$1.50
<b>King County Water Taxi</b>	\$4.75	\$3.00
West Seattle Route		
<b>King County Water Taxi</b>	\$5.50	\$3.75
Vashon Route		

\*Maximum fare

\*\*Low-income subsidy predates ORCA LIFT

Table: Participating Agency Fares as of March 1, 2015

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## Appendix

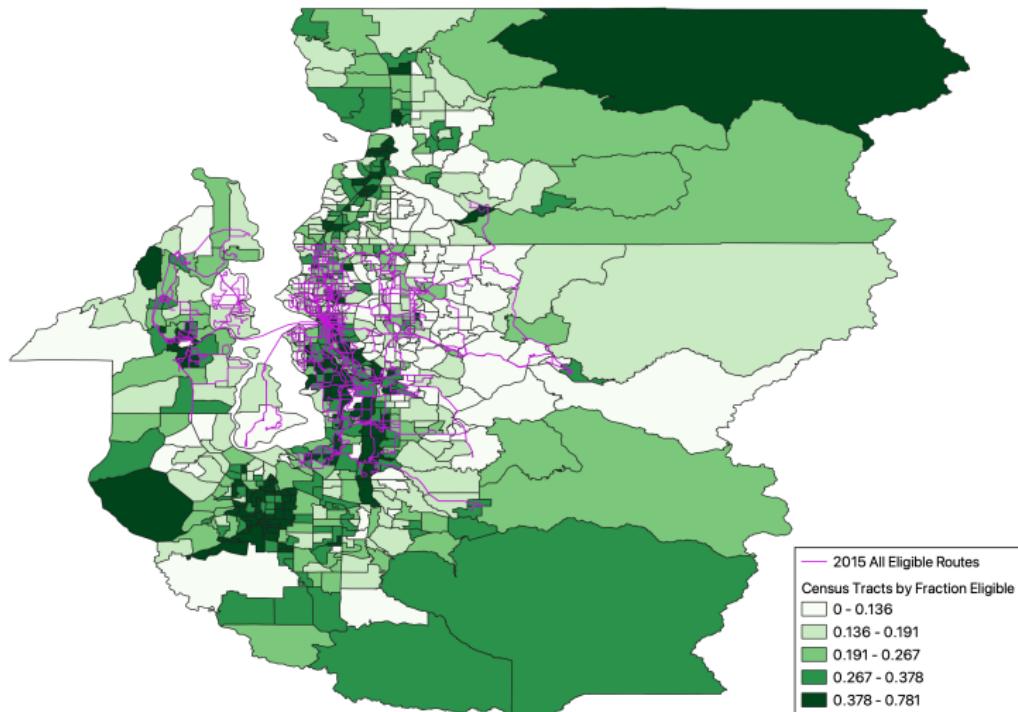


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