Assessing the transferability of the Pedestrian Index of the Environment

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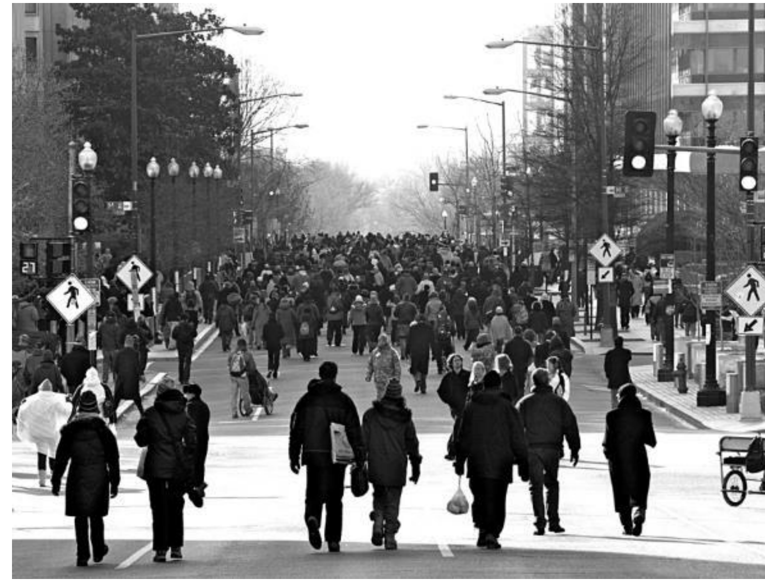
Metro

Outline

- Background
- Pedestrian Index of the Environment (PIE)
- Transferability of PIE



Adapted from: http://www.flickr.com/photos/takomabibelot/3223617185

- Comparing metropolitan areas
- Conclusions & future work

Why model pedestrians?

plan for pedestrian investments
& non-motorized facilities

mode shifts

health & safety

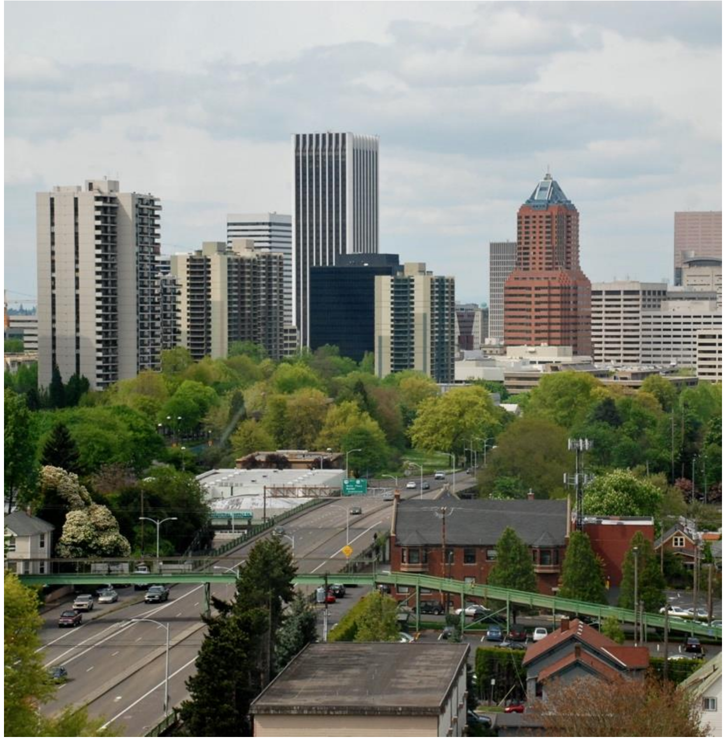
greenhouse
gas emissions

new data

How do cities estimate walking?

Among 48 large MPOs in US:

- 35% did not estimate any non-motorized travel
- 27% combine walk & bike modes
- 38% estimate walking



Adapted From : https://upload.wikimedia.org/wikipedia/commons/f/f8/Downtown_Portland_from_on_board_the_Portland_Aerial_Tram_%282008%29.jpg

Source: Singleton, P., et al. (in progress). Pedestrians in regional travel demand forecasting models: State-of-the-practice.

Research goals

Understand how transferrable measures and models are across various locations

- Develop and test the transferability of measures of the pedestrian environment

- Assess the degree of variability in the relationships between behavior and the environment across a number of different urban contexts

Methodology

1. Construct a unique data set for each metro region based on the trip ends at the same scale level
   - Regional household travel surveys
   - Demographic and built environment characteristics
2. Identify the key variables influencing the travel patterns
   - Pedestrian Index of the Environment (PIE)
3. Estimate univariate binary logits for walking related to each key variable
4. Compare results across and within metro areas

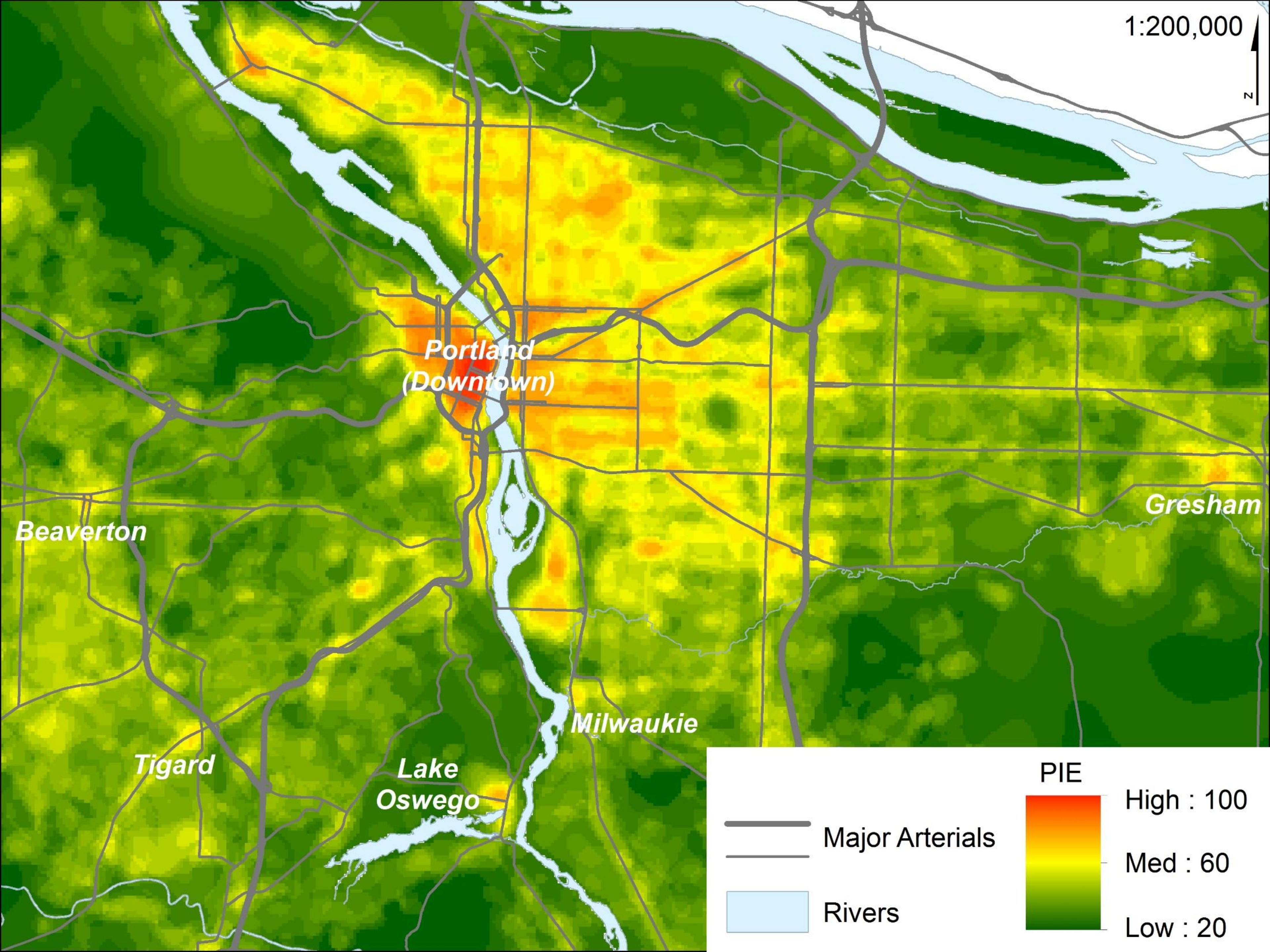
The Pedestrian Index of the Environment

PIE

20–100 score = calibrated ∑(6 dimensions)

- People & job density
- Transit access
- Urban living infrastructure
- Block size
- Sidewalk extent
- Comfortable facilities

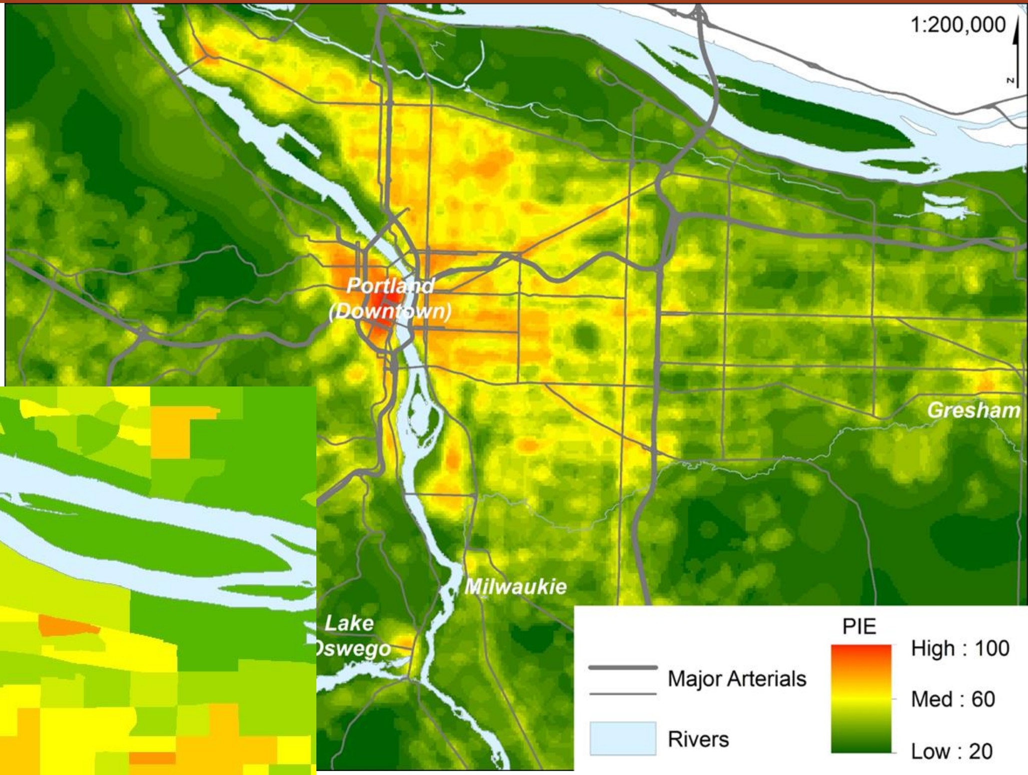
ULI = Urban Living Infrastructure: pedestrian-friendly shopping and service destinations used in daily life.

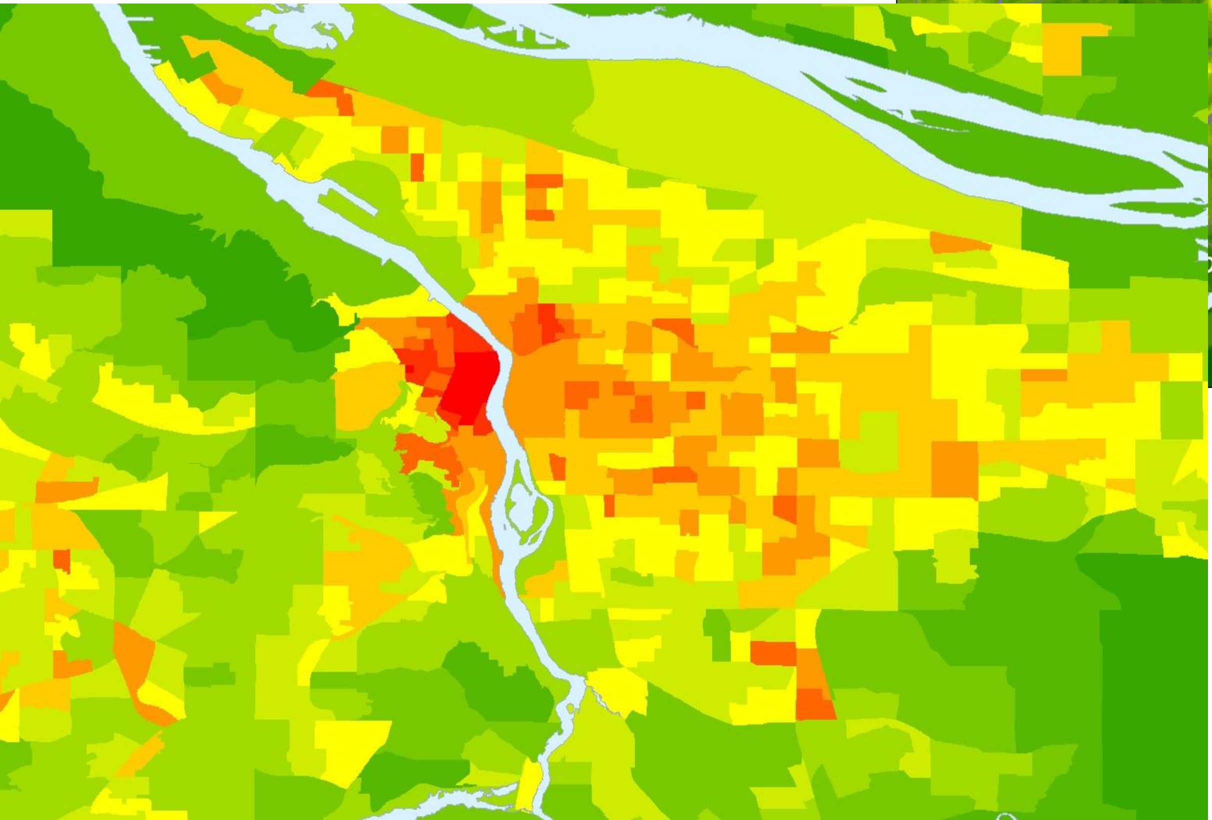

1:200,000
N
Portland
(Downtown)
Beaverton
Gresham
Milwaukie
Tigard
Lake
Oswego
Major Arterials
Rivers
PIE
High : 100
Med : 60
Low : 20

Data and Scale

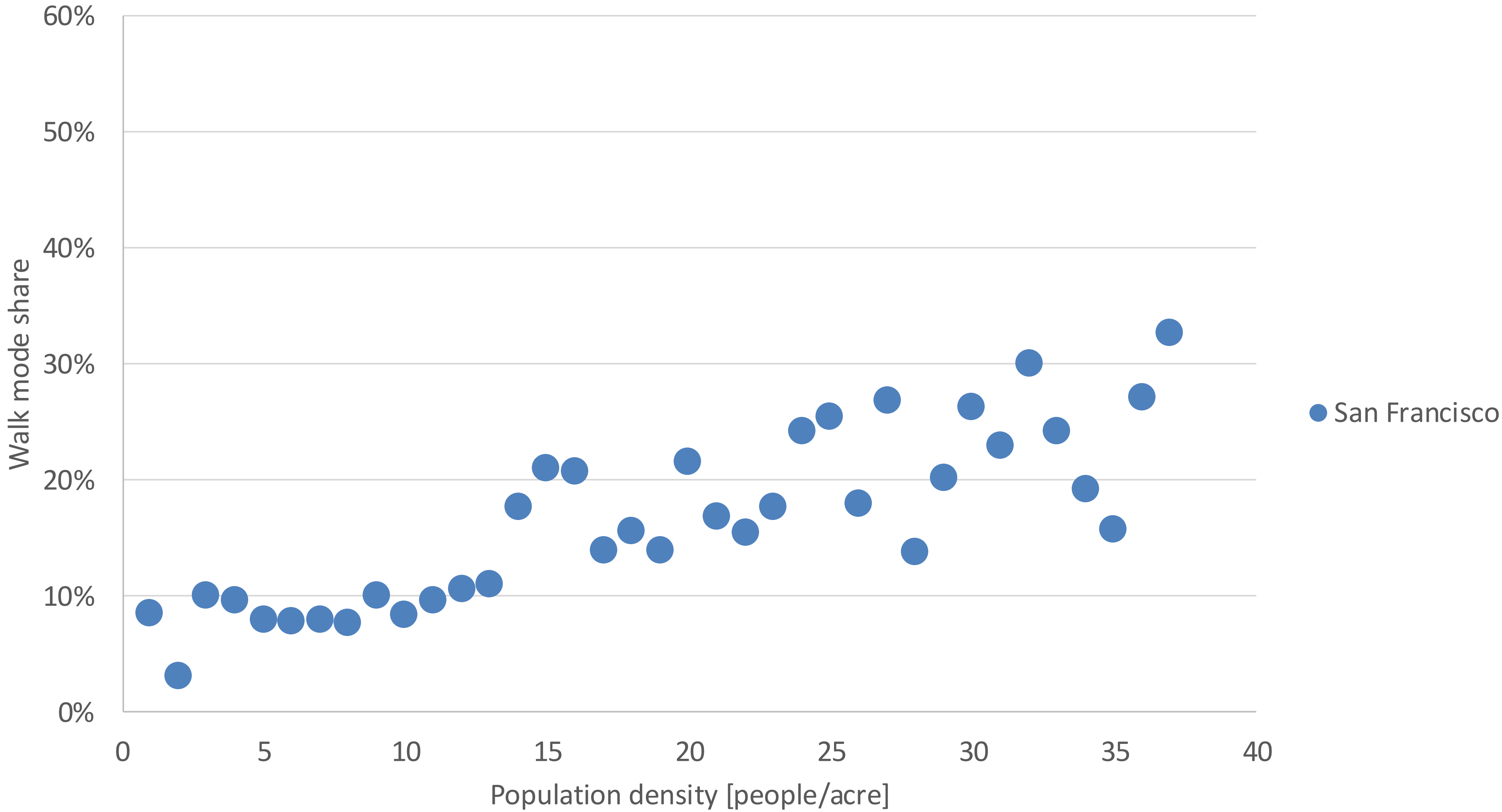
- Portland Metro provided specific data at a very small spatial scale (80mX80m)
- Not all urban areas have behavior and environmental data at this resolution
- At what scale can travel behavior be captured without losing prediction capabilities?
  - Appropriate scale must be consistent with the cost of collecting data or the available data sources
  - Are **census block groups** a suitable scale?

Changing the Scale of PIE





Walk mode share across density levels



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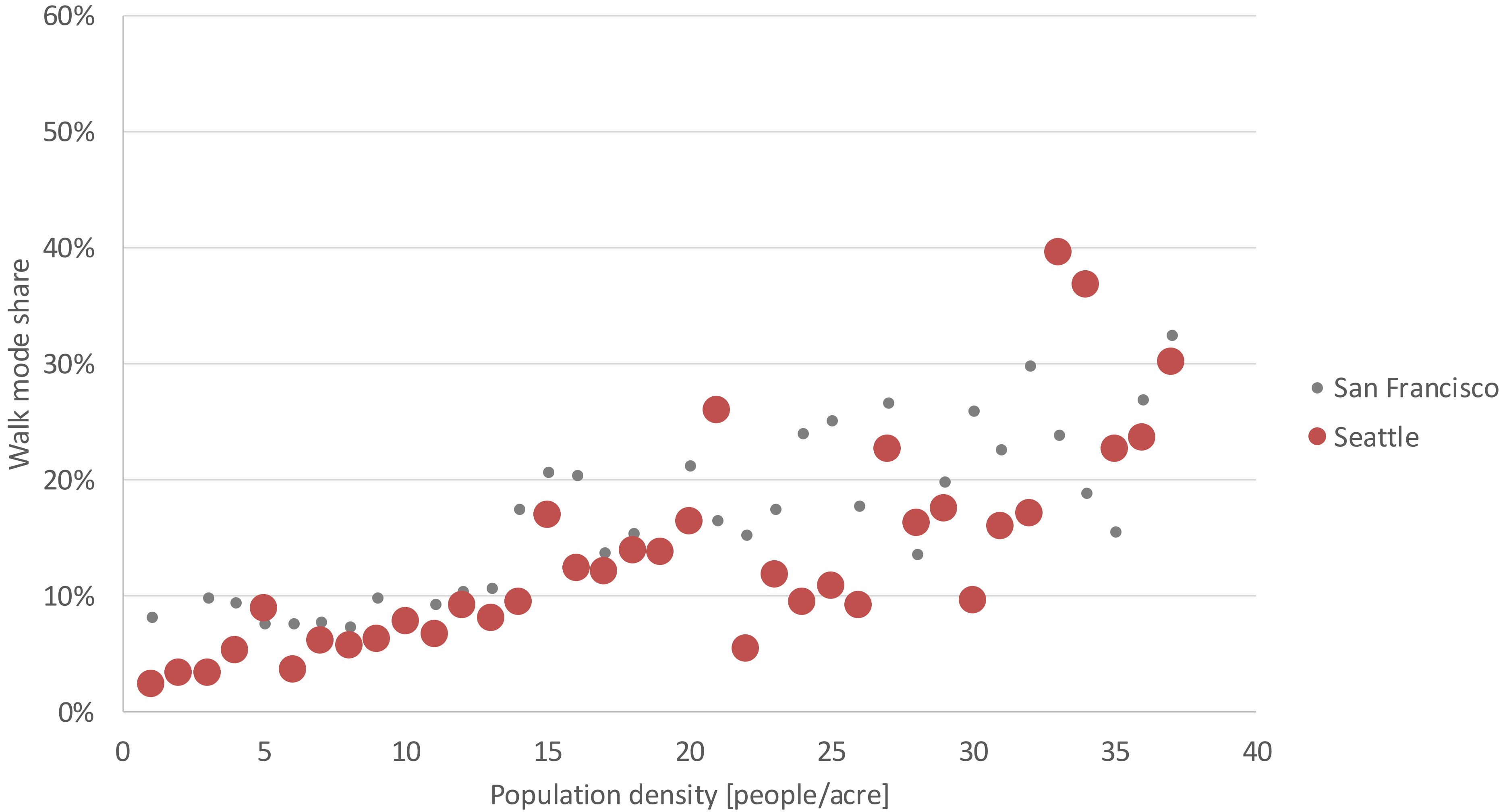

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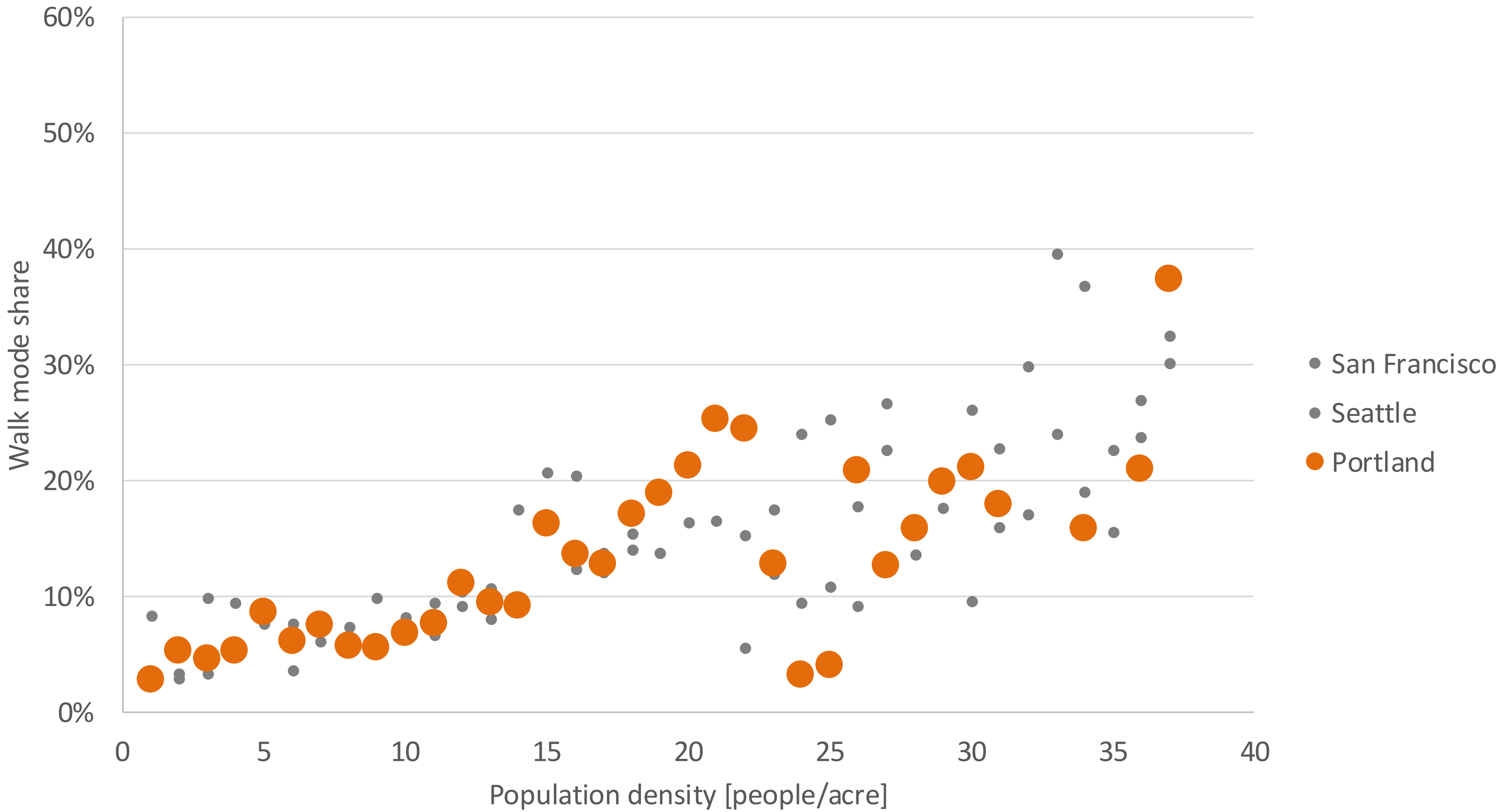

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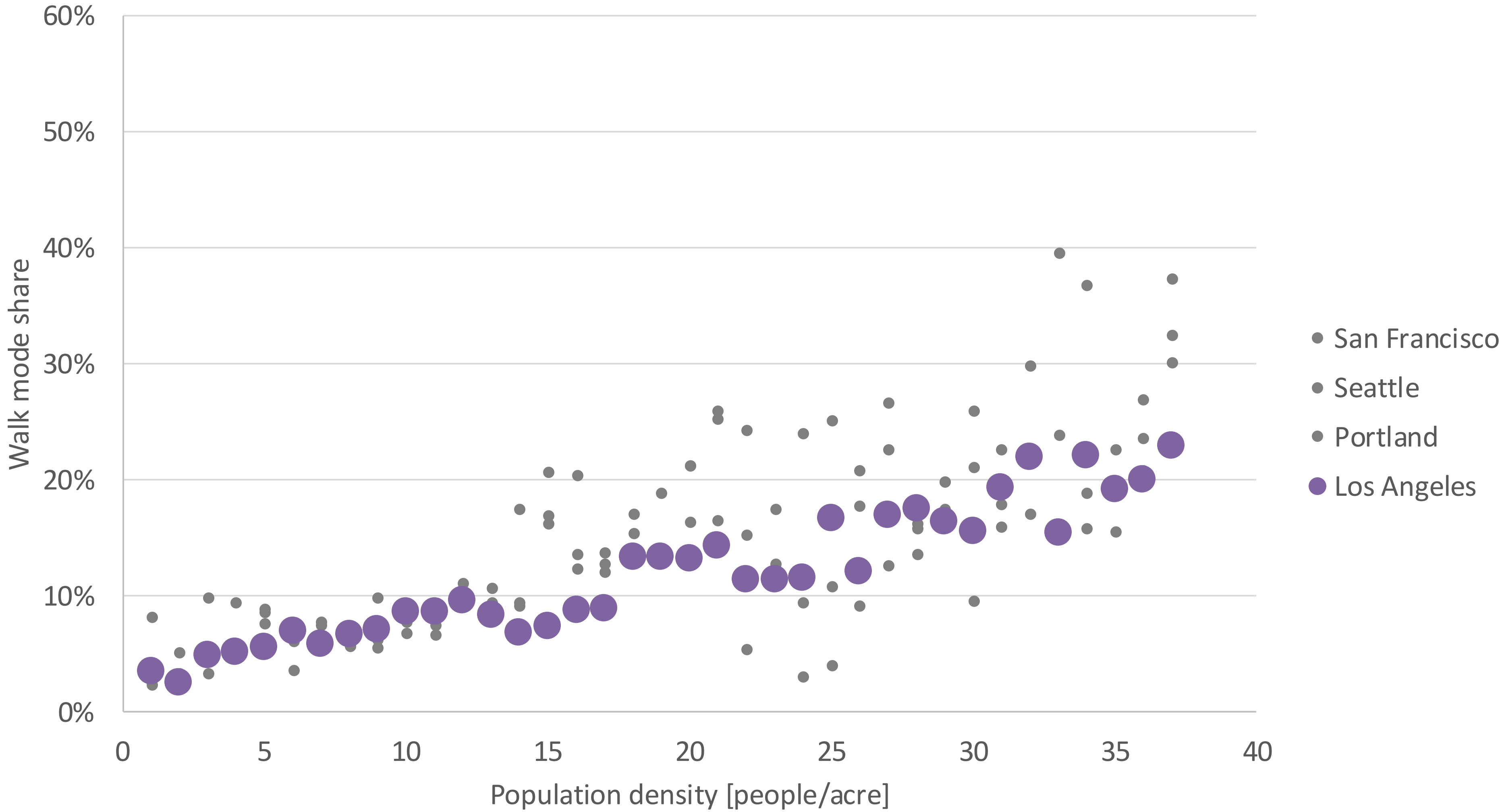

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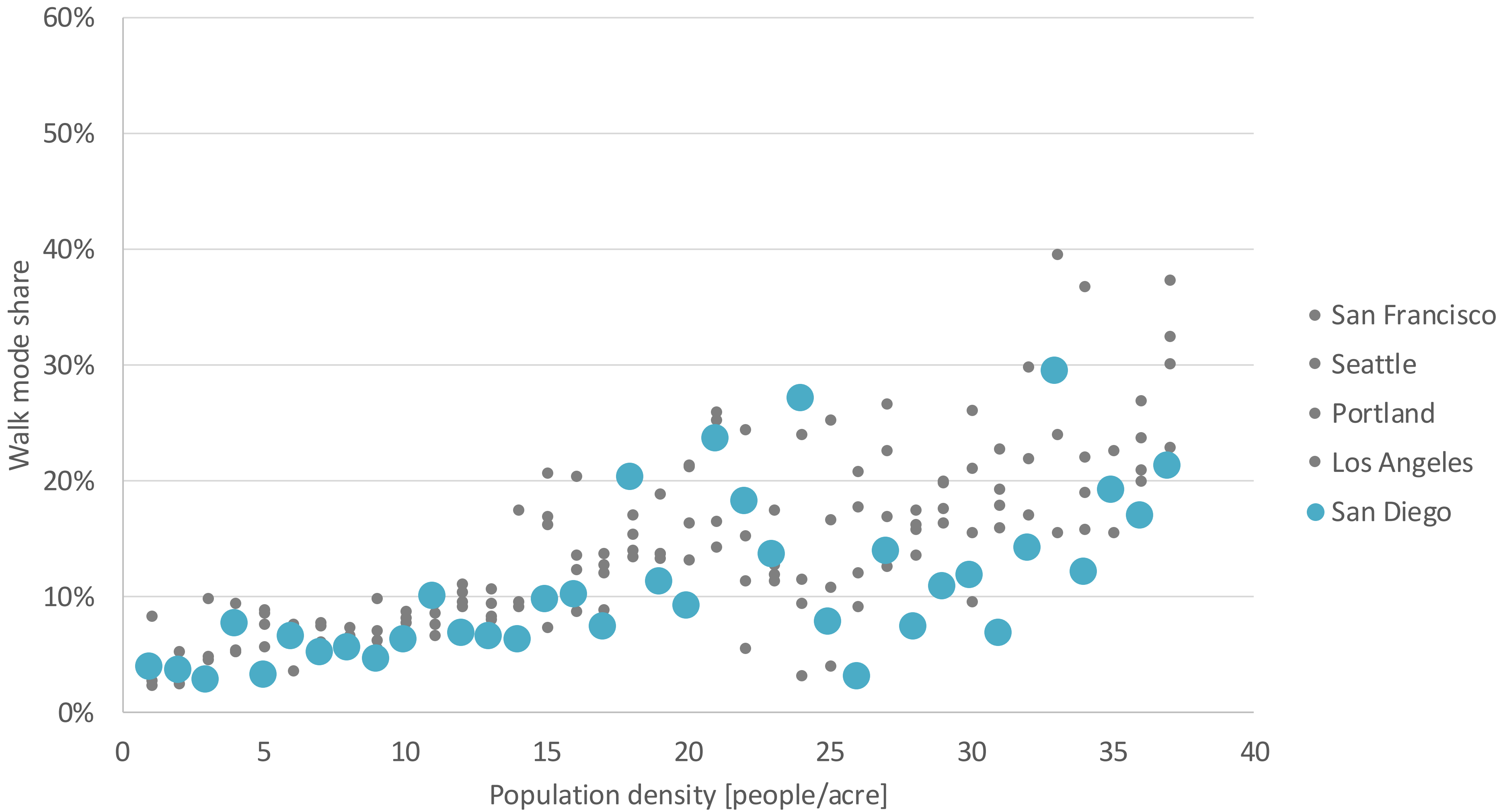
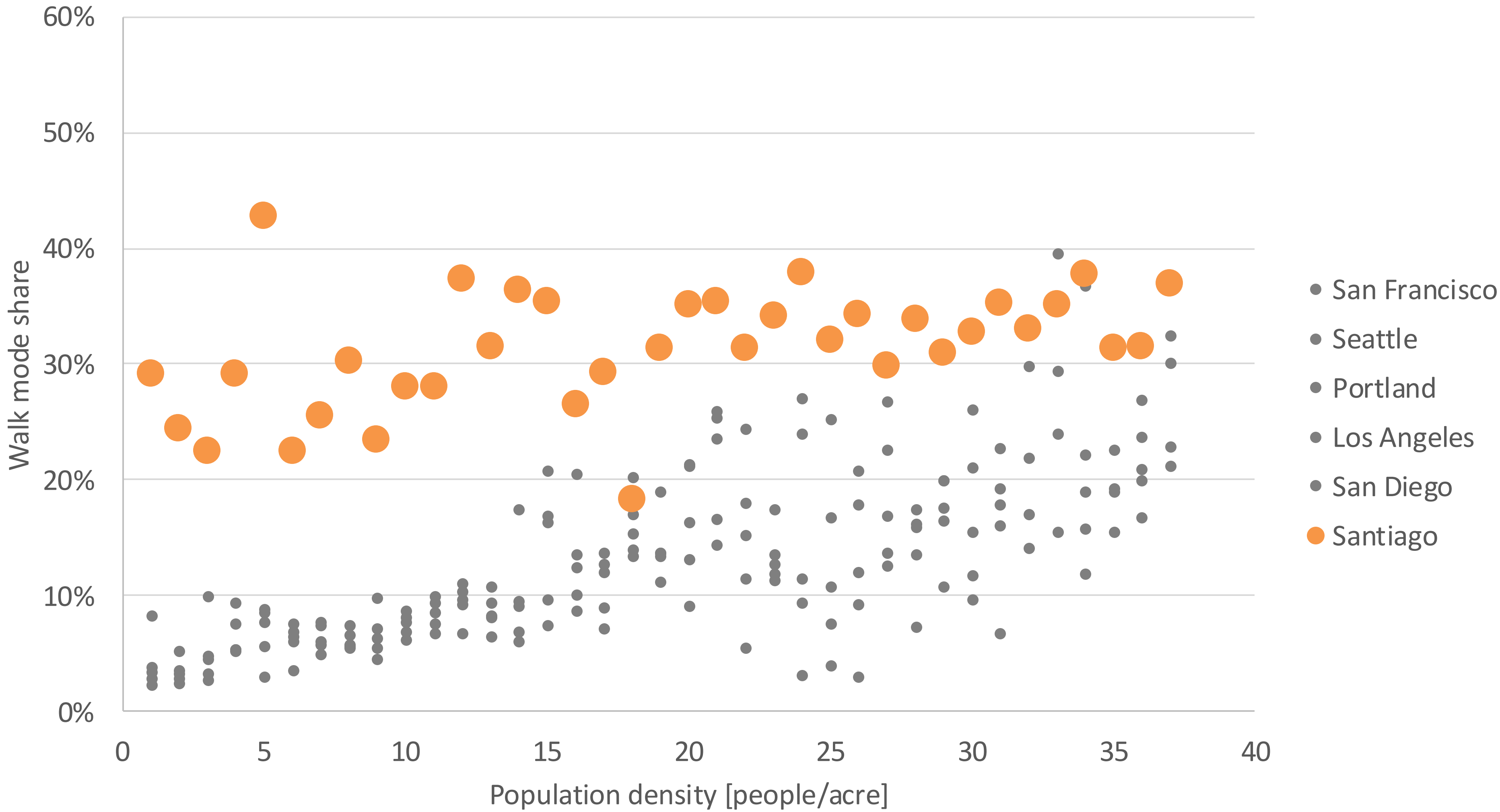
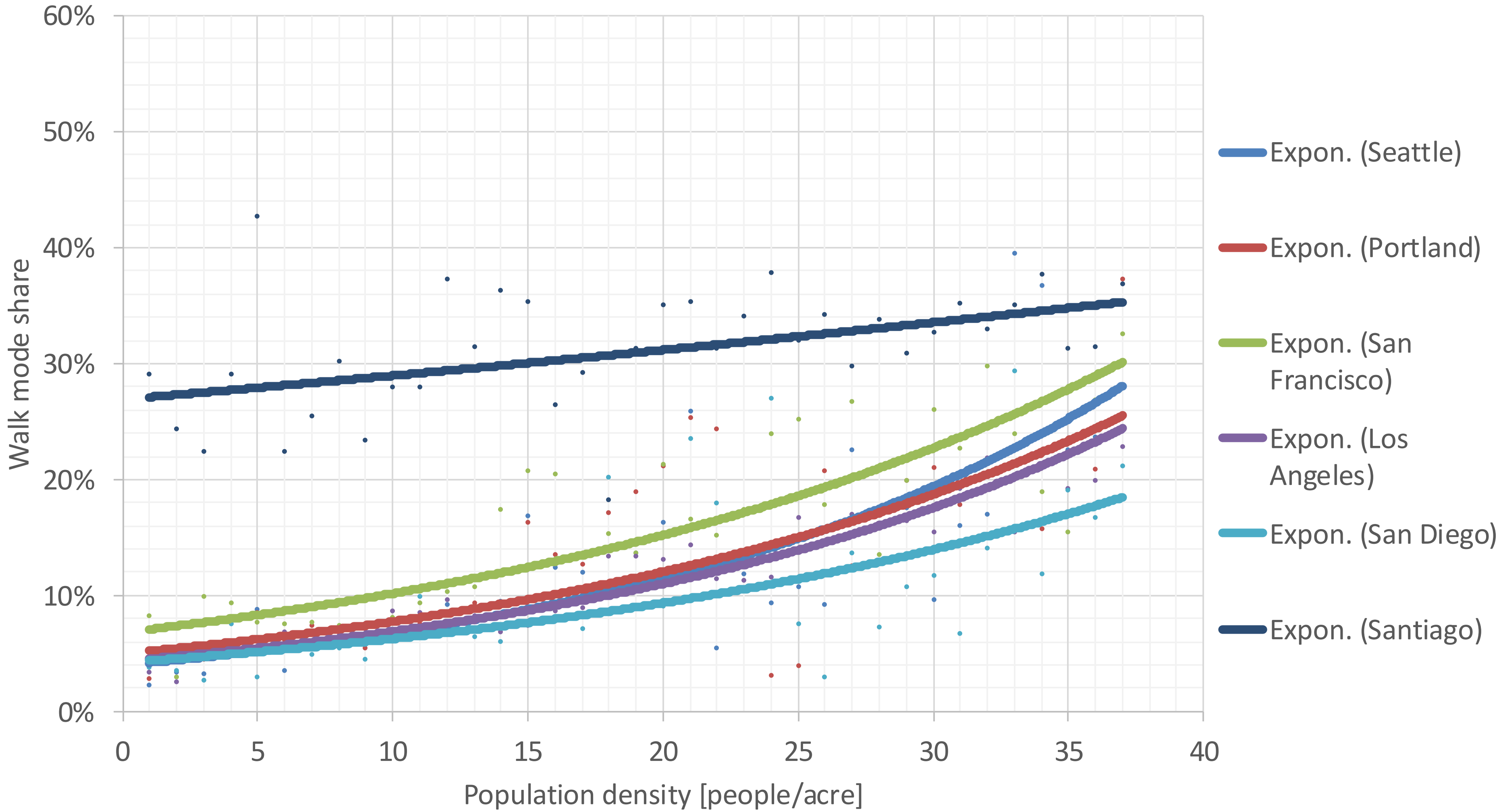


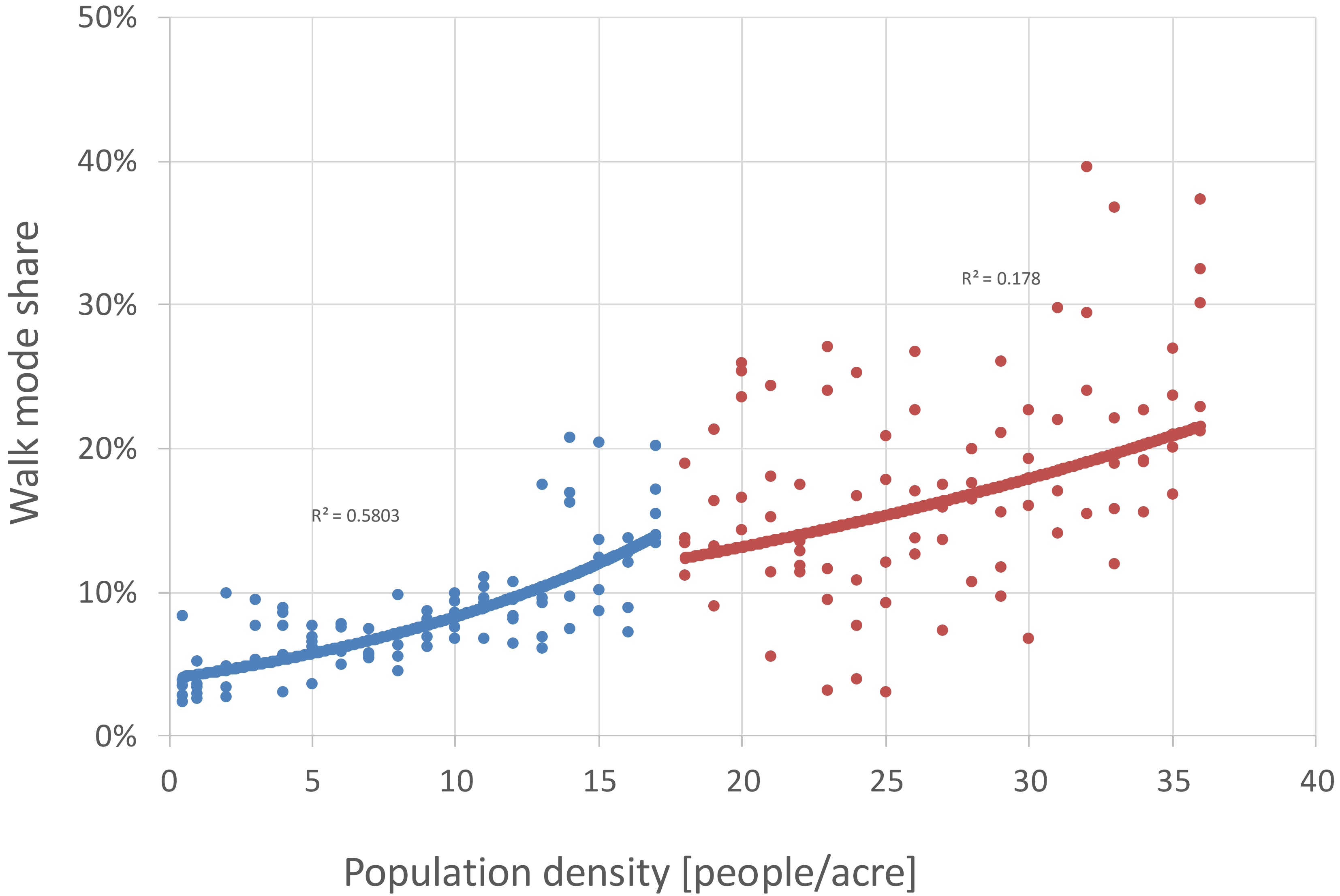
Walk mode share across density levels



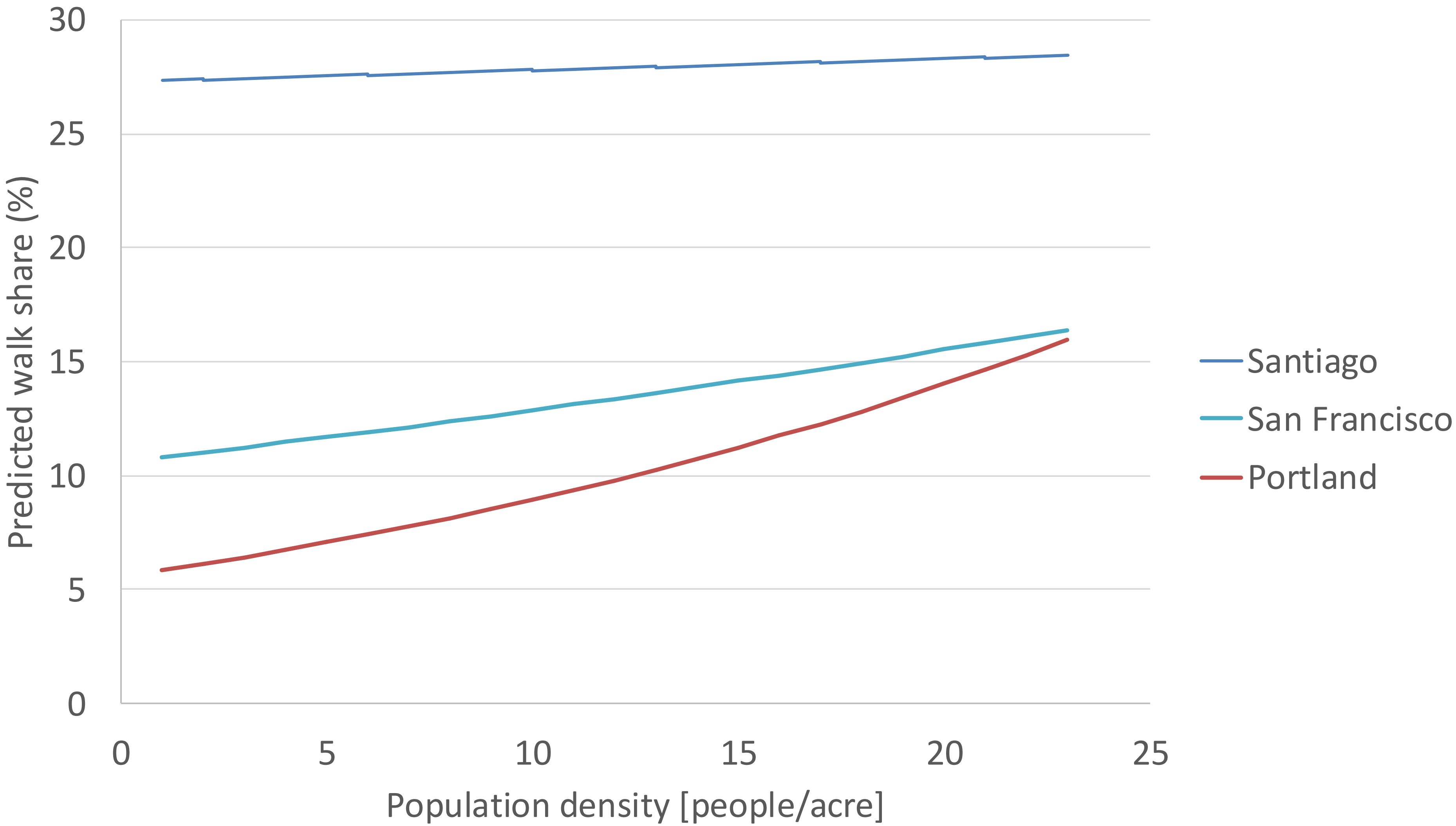
Trend lines across density levels



Two different regimes in US cities



Predicted walk mode share by density



Conclusions

- US cities see a positive, linear effect in walking with densities up to 15-25 people per/acre.
- Above that threshold, the effect is less clear.
  - Exponential growth?
  - We identify two regimes: urban/suburban environment
- In Santiago, we see less variation in walking with density patterns.
- Our evidence suggests that the relationship to walking is also about the distributions of densities across the urban structure.

Conclusions

- The parameters for cities with an irregular density distribution (Portland) tends to be more sensitive to increases in density than those where density is more regular (Los Angeles, Santiago).
- Walking in cities with higher overall density (Santiago) tends to be less sensitive to a increase in density than in those that have less overall density (Los Angeles, Portland).

Future Work

- Include other variables that can better reproduce the effect of the built environment like dwellings by unit of area.
- A separation between stages of the behavior addressing the thresholds that we have found should be included in the models.
- Estimation of variables that include the variability of density within the region should be also included in the models.
- Identifying more the effect that some variables may have over the decision of walking (e.g. Transit).

Questions?

Project info & reports:

http://trec.pdx.edu/research/project/510

http://trec.pdx.edu/research/project/677

http://trec.pdx.edu/research/project/1028

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Parameter estimations for each metro

City	Population density	Entertainment and retail employment density	Transit frequency	Intersection density	Employment density
Portland	0.051	0.040	0.0008	0.0026	0.00739
Seattle	0.040	0.022	0.0013	0.0034	0.00203
San Diego	0.039	0.009	0.0038	0.0029	0.00558
San Francisco	0.022	0.002	0.0012	0.0027	0.00001
Los Angeles	0.027	0.008	0.0004	0.0003	0.00113