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Valuing Bicycle Infrastructure in Portland, Oregon

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Valuing Bicycle Infrastructure in Portland, Oregon

Wei Shi, PhD Student
Jenny Liu, Assistant Professor
Introduction

- Street improvements and transportation upgrade projects aims to increase mobility for pedestrians and bicyclists
- Few empirical evidences support the impacts/benefits of bicycle infrastructure

Research Questions

- What is the value of different types of bicycle facilities to households, as represented by property value impacts?
- How much does ease of access, measured by network distance, impact these values?
- How much does extensiveness of the bike network, considering multiple buffer zone radii, impact these values?
Literature Review

- Proximity to off-street recreational trails and other park-based greenways trails generate positive to neutral property value impacts.

- Emerging but limited studies examine property value impacts of on-street bicycle facilities.

- Krizek (2006) and Welch et al. (2016) exemplify the few research examples that differentiate the property impacts of various types of bicycle and other transportation facilities.

- Researchers (Hood et al., 2011, Broach et al. 2012) have shown that cyclists have different preferences for different levels of on-street bicycle facilities within the context of transportation route choice study.
Types of Bike Facilities in Portland

- **Advanced Bike Facilities**
  - (a) Bike Boulevards: SE Lincoln & 37th Ave.
  - (b) Cycle Tracks: Broadway St. & Mill Ave.
  - (c) Buffered Bike Lane: SE Holgate & 115th St.

- **On-Street Bike Lanes**
  - Bike Lanes: Multnomah Boulevard

- **Regional Multi-Use Paths**
  - Regional Multi-use Paths: Springwater Trail

- **Local Multi-Use Paths**
  - Local Multi-use Paths: Laurelhurst Park Trail
Types of Bike Facilities in Portland

Distribution of Four Types of Bicycle Facilities in Portland
Methodology

Hedonic Price Model

The general ordinary least squares (OLS) specification is as follows:

\[ P_i = \beta_0 + \beta_1 T_i + \beta_2 H_i + \beta_3 R_i + \beta_4 B_i + \epsilon_i \]

- \( P_i \) – Property sale price;
- \( T_i \) – Transaction characteristics, such as year and season of the sale;
- \( H_i \) – Internal property characteristics, such as age, size and property tax liability;
- \( R_i \) – External neighborhood characteristics, such as school quality, crime rate, and walk score;
- \( B_i \) – Bike facility characteristics

Spatial Auto-correlation Regression Model (SAR)

Property values are more likely to be impacted by neighboring properties prices

Adding spatial weighting matrix to avoid inefficient coefficient estimates in OLS model
Data

Multnomah County residential property tax roll sale data:
- 17,163 single family homes (SFH)
- 2,959 multi family homes (MFH)

Property Value:
- Age
- Size
- Tax liability (AV/RMV)

Property Attributes:
- Location
- School quality
- Crime rate
- Walk score

Transaction Variables:
- Sale year
- Seasonality

Bike Facility:
- Ease of access
- Extensiveness of network

Neighborhood Amenities:
- Age
- Size
- Tax liability (AV/RMV)
## Findings

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Proximity Impact</th>
<th>Extensiveness Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Bike Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 mile OLS.I</td>
<td>$453 $321</td>
<td></td>
</tr>
<tr>
<td>1/2 mile OLS.II</td>
<td>$144 $2,106</td>
<td>$102 $1,032</td>
</tr>
<tr>
<td>3/4 mile OLS.III</td>
<td>$72 $1,494</td>
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</tr>
<tr>
<td>1 mile OLS.IV</td>
<td>$8 $1,321</td>
<td>$49 $601</td>
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<tr>
<td><strong>On-Street Bike Lanes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 mile OLS.I</td>
<td>$992 $2,262</td>
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<tr>
<td>1/2 mile OLS.II</td>
<td>$839 $1,341</td>
<td>$300 $495</td>
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<tr>
<td>3/4 mile OLS.III</td>
<td>$882 $681</td>
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<tr>
<td>1 mile OLS.IV</td>
<td>$1,013 $244</td>
<td>$361 $148</td>
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<tr>
<td><strong>Regional Multi-Use Paths</strong></td>
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</tr>
<tr>
<td>1/4 mile SAR.II</td>
<td>$75 $3,516</td>
<td></td>
</tr>
<tr>
<td>1/2 mile SAR.IV</td>
<td>$75 $3,516</td>
<td></td>
</tr>
<tr>
<td>3/4 mile SAR.II</td>
<td>$75 $1,232</td>
<td></td>
</tr>
<tr>
<td>1 mile SAR.IV</td>
<td>$75 $1,679</td>
<td>$560 $828</td>
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<td><strong>Local Multi-Use Paths</strong></td>
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<tr>
<td>1/4 mile OLS.I</td>
<td>$16 $1,622</td>
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<tr>
<td>1/2 mile OLS.II</td>
<td>$936 $993</td>
<td>$318 $1,939</td>
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<tr>
<td>3/4 mile OLS.III</td>
<td>$173 $747</td>
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</tr>
<tr>
<td>1 mile OLS.IV</td>
<td>$217 $2,226</td>
<td>$255 $1,216</td>
</tr>
</tbody>
</table>

**Proximity:** Each 10% closer to nearest bike facilities will cause increase or decrease in property value.

**Extensiveness:** Each 1/4 mile increase in bike facilities in specified buffer radius will cause increase or decrease in property value.

Darker color arrows represent statistically significant impacts; light color arrows represent insignificant impacts.
## Findings

### Multi-Family Homes

<table>
<thead>
<tr>
<th></th>
<th>1/4 mile</th>
<th>1/2 mile</th>
<th>3/4 mile</th>
<th>1 mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Bike Facilities</td>
<td>$42</td>
<td>$11,423</td>
<td>$725</td>
<td>$189</td>
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<tr>
<td>On-Street Bike Lanes</td>
<td>$47</td>
<td>$834</td>
<td>$77</td>
<td>$215</td>
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<tr>
<td>Regional Multi-Use Paths</td>
<td>$1,408</td>
<td>$17,985</td>
<td>$219</td>
<td>$39</td>
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<tr>
<td>Local Multi-Use Paths</td>
<td>$936</td>
<td>$14,150</td>
<td>$726</td>
<td>$143</td>
</tr>
</tbody>
</table>

**Proximity:** Each 10% closer to nearest bike facilities will cause increase or decrease in property value.

**Extensiveness:** Each 1/4 mile increase in bike facilities in specified buffer radius will cause increase or decrease in property value.

Darker color arrows represent statistically significant impacts; light color arrows represent insignificant impacts.
Conclusion

The property value impacts from both ease of access (distance) and extensiveness of bike network (density) are distinct across all types of bicycle facilities:

- Residents prefer to be located close to advanced bike facilities, and enjoy a denser advanced bike facility network;
- Bike Lanes tend to contribute negatively to property value in most cases, although multi-family homes are positively affected by extensiveness of bike lane network;
- Off-street trails have unclear impact on property values.

The impact of extensiveness of bicycle facilities generally diminish as buffer zone radius is increased.

The estimated impacts can be seen as a strong persistent preference for high quality on-street bike facilities.
Policy Implication

- Bicycle facilities do not all provide the same benefits for all households. Consumers tend to prefer higher quality bicycle facilities that afford them safer and more comfortable riding.

- It is important to consider both ease of access and extensiveness of network when making bicycle infrastructure investment decision.

- We caution against inferring causal relationship from these findings.
Thank You!

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