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IMPACT OF BIKE FACILITIES ON RESIDENTIAL PROPERTY PRICES

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Context & Motivation

- Street improvements and transportation infrastructure upgrade projects aim to increase mobility for pedestrians and bicyclists.
- Few empirical evidences support the impact/benefits of bicycle infrastructures
- In urban economics, property values is an indicator of consumer preference for bicycle infrastructure

Study Objectives

- What is the value of bicycle facilities?
- How do bicycle facilities access or bike network impact property values?

Advanced Bike Facilities

- In the context of Portland, advanced bike facilities include:
 - Cycle tracks
 - Buffered bike lanes
 - Bike boulevards

Cycle Track/Protected Bike Lane

SW Broadway near PSU

<http://www.flickr.com/photos/bikeportland/3876749620/>

Buffered Bike Lane

SW Stark Street

http://wiki.openstreetmap.org/wiki/File:Buffered_bicycle_lane.JPG

Bike Boulevards

SE Stark Street

<http://www.bikewalklincolnpark.com/2011/10/bicycle-boulevards-post.html>

Method – Hedonic Model

- 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

Method – Spatial Auto-correlation

- 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 (2010-2013)
 - 17163 single family homes (SFH)
 - 2959 multi family homes (MFH)

Independent Variables

Distance to nearest advance bike facility

Density of advance bike facility

Findings

Variables	SFH.OLS	MFH.OLS	SFH.SAR	MFH.SAR
Number of observations (n)	17,163	2,959	17,163	2,959
Property Characteristics				
Age of property (years)	281.04*** (29.65)	-377.60*** (45.91)	95.64*** (20.41)	-304.45*** (44.94)
Size of property (sqft)	151.26*** (1.02)	230.53*** (2.93)	117.64*** (0.99)	228.38*** (2.99)
AV/RMV ratio	-410.67*** (61.92)	-64.70 (114.75)	-326.87*** (48.45)	104.47 (119.95)
Regional Characteristics				
School quality (out of 100)	1,274.47*** (59.42)	639.54*** (177.81)	516.87*** (41.64)	461.06 (188.41)
Distance to CBD (mi)	-22,880.47*** (645.19)	-23,982.46*** (1,477.44)	-10,393.59*** (438.66)	-25,713.60*** (2,562.96)
Walk Score (out of 100)	-678.66*** (72.82)	531.40*** (102.22)	-10.93 (-)	461.06** (188.41)
Crime rate per 1000 residents	-141.28*** (17.53)	-31.67*** (10.01)	-71.45*** (11.86)	-26.85 (19.51)
Advanced bicycle facility characteristics				
Distance to nearest bike facility (ft)	-0.52** (0.27)	-0.05 (0.53)	-1.19*** (0.17)	-0.16 (0.99)
Bike facility length (ft)	3.06*** (0.23)	3.57*** (0.36)	1.06*** (0.17)	2.79*** (0.67)
Transaction Characteristics				
Sale year (2011)	-13,524.15*** (2,229.85)	-16,680.44*** (4,006.72)	-13,422.31*** (1,959.80)	-16,096.37*** (3,143.64)
Sale year (2012)	-4,232.12** (2,139.88)	-10,207.24** (4,076.16)	-4,347.16** (1,750.70)	-9,778.45*** (3,330.92)
Sale year (2013)	25,370.05*** (2,090.80)	10,082.32*** (3,935.21)	25,544.81*** (1,796.51)	14,283.81*** (3,185.97)
Non-rainy season	11,919.76*** (1,486.17)	10,489.90*** (2,692.89)	10,118.49*** (1,285.99)	7,877.64*** (2,032.32)
Constant	107,871.30*** (9,279.54)	-24,196.06 (20,469.20)	5,375.05*** (1,347.15)	-9,875.86 (34,235.05)
Adjusted R² (R²)	0.728 (0.728)	0.766 (0.767)		
Log-likelihood	-220773	-37181	-218703	-36612

Findings

Access

Each quarter mile closer to the nearest advanced bike facility

SFH: + \$686

MFH: + \$66

Extensiveness

Each quarter mile increase in the density of advanced bike facilities within a half-mile radius

SFH: + \$4,039

MFH: + \$4,712

Policy Implication

- Portland “Green Loop” is designed as high levels of infrastructure investments to provide separated bike lanes, bike paths with safety improvements.
- **According to our model, 12,135 households** in Portland will be impacted by Green Loop.
- The **OLS models** predict average increases of approximately **1.77% for SFHs** and **8.22% for MFHs**, while **SAR models** predict attenuated increases of **1.02% and 6.42%** for the two property types, respectively.

Conclusion

- A strong and persistent preference for high quality bike facilities .
- Both measures of advanced bike facilities impact property values: **ease of access** (distance) and **extensiveness of bike network** (density).
 - Consistent with previous research, **proximity to advanced bike facilities** has significant and positive effects on property values;
 - New finding: **bike facility network** is important too.
- Enhancing the model specifications with **spatial autocorrelation effects** prevents overestimation of coefficient estimates.

Future Research

- Results do not show casual relationship! Further time-series analysis to establish the pre- and post-treatment effects are encouraged.
- Further delineation of bike facility types, including both on-street and off-street, the impact of these bicycle infrastructure improvements provide value for urban residents.
- The **Portland experience** might not be appropriate for direct application to other cities. Further studies that expand this methodology **across multiple urban areas** would be helpful to validate the research methodology and results.

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Variables	Overall Average (n=20122)	Single-Family Home (n=17163)	Multi-Family Home (n=2959)
Transaction characteristics			
Sale price	\$303,834 (\$20,000 -2,700,000)	\$312,639 (\$20,000-2,700,000)	\$252,764 (\$23,834-1,560,000)
Sale year (mode)	2013	2013	2012
Seasonality (% of transactions from June to September)	36.9%	37.2%	35.3%
Property characteristics			
Age of property (years)	60.27 (0 - 148)	65.13 (0 - 148)	32.04 (1 - 130)
Size of property (sqft)	1636 (275 – 9,552)	1,726 (339 – 9,552)	1,110 (275 – 4,830)
AV/RMV ratio	65.19 (8 - 100)	62.83 (8 - 100)	78.61 (27 - 100)
Regional characteristics			
School quality (out of 100)	71.07 (27 - 93)	69.35 (27 - 93)	81.04 (27 - 93)
Distance to CBD (mi)	4.2 (1 – 9.5)	4.5 (1 – 9.5)	2.8 (1 – 9.5)
Walk Score (out of 100)	63.82 (6 - 97)	61.73 (6 - 97)	75.93 (6 - 97)
Crime rate per 1000 residents	81.87 (10 - 1270)	70.3 (10 - 1270)	148.6 (10 - 1270)
Advanced bicycle facility characteristics			
Distance to nearest bike facility (ft)	3,602 (29 – 21,206)	3,755 (40 – 21,206)	2,713 (29 – 20,523)
Bike facility length (ft)	3,896 (0 – 18,896)	3,661 (0 – 18,796)	5,260 (0 -18,896)