

Valuing scattered greenery in urban areas: A hedonic analysis in Japan

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1. Introduction

In contrast to the richness of studies on cohesive greenery, prior research tells us little about the value of scattered greenery such as street trees and yard bushes. This paper uses a hedonic model to estimate the marginal implicit price of scattered greens. Green density is calculated using the Normalized Difference Vegetation Index (NDVI) from high-resolution (1.5-meter pixel resolution) satellite imagery. The greenery data is combined with large-scale real estate data provided by the Real Estate Transaction Promotion Center (RETPC). The real estate data include detailed characteristics to provide insight into the value of scattered greenery. The analysis covers the area around Setagaya and Sugunami wards in Tokyo, the most urbanized residential areas around the center of Japan. We also used two years of greenery data, 2008 and 2013, to analyze changes in effects over time.

2. Method

The green coverage data generated based on NDVI only tells us that the area is greenery and does not allow us to identify what kind of greenery it is. Therefore, we identify the type of greenery by combining it with the Urban Area Land Use Subdivision Mesh Data published by the Ministry of Land, Infrastructure, Transport and Tourism. This GIS data is based on satellite images and field surveys to identify land at the 100-meter mesh level for each type of use. We match the 2009 and 2014 Urban Area Land Use Subdivision Mesh Data to the 2008 and 2013 green coverage data, respectively.

Specifically, if the land use category is Buildings, Roads, and Railroads, then the greenery in the area overlapping that mesh is identified as “scattered greenery”. This definition is reasonable because the greenery present in areas used for buildings and roads are the trees between roads and sidewalks or bushes around buildings. Similarly, we define the categories such as “farmland & vacant land greenery,” “waterfront greenery,” and “parks & public facilities greenery” by using the mesh data.

3. Estimation Results

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As a result of estimation using hedonic property pricing models, we found that a 10% increase in scattered greenery within 100 meters of a property increases the price of apartments for sale by 2% to 2.5%. On the other hand, scattered greenery has a weak or little impact on rental properties (Table 1). These main results are not sensitive to changes in the estimation specification or variable

	Properties for sale		Properties for rent	
	2008	2013	2008	2013
	(1)	(2)	(3)	(4)
% Surrounding greenness				
Scattered greenery (0–100m)	0.251*** (0.057)	0.204** (0.076)	0.055* (0.027)	0.016 (0.024)
Scattered greenery (100–200m)	-0.137 (0.093)	-0.092 (0.118)	0.019 (0.043)	0.005 (0.043)
Scattered greenery (200–300m)	-0.096 (0.116)	-0.159 (0.140)	0.038 (0.056)	0.044 (0.046)
Scattered greenery (300–400m)	-0.270* (0.136)	-0.189 (0.156)	-0.054 (0.060)	0.038 (0.056)
Scattered greenery (400–500m)	-0.085 (0.152)	-0.324 (0.178)	-0.023 (0.080)	-0.111 (0.066)
Property characteristics	YES	YES	YES	YES
Neighborhood characteristics	YES	YES	YES	YES
Accessibility characteristics	YES	YES	YES	YES
Measures of urban greenness	YES	YES	YES	YES
Street FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Observations	7,872	9,680	43,188	94,663
Adjusted R-squared	0.9424	0.9452	0.9174	0.9106

Table 1. Effects of scattered greenery on property prices and rents

definitions and are robust to changes in the sample. In addition, we also found that the value of scattered greenery greatly depends on the characteristics of the property and its location. Street trees are highly valued along highways because of their role in preventing noise and emissions. Higher priced and roomier properties were associated with higher values for greenery, but this is also due to the high supply of both good quality properties and a lot of greenery in areas suitable for habitation. Furthermore, the analysis of changes in effects over time suggests that there may be a gradual strengthening of the heterogeneity of green valuations by price and quality of the property. The heterogeneity of preferences for greenery may lead to environmental gentrification, as more expensive properties increase in areas with more green amenities.

4. Discussion and Conclusion

The results of this study contribute to the literature on the value of urban green space, and further our understanding of how these values vary by resident and location characteristics. Because this study focuses on a very developed urban area, extrapolation of the results should be done with caution. Scattered greenery may not be valuable in areas with sufficient greenery; conversely, it may be more highly valued in areas where green space is scarce. Therefore, our results may only be applicable in cities such as Tokyo. Similar studies for other cities are a future task, in which the use of remote sensing to measure scattered greenery would be useful.

Analyzing the heterogeneity of individual-level preferences for scattered greenery is a limitation of this study as well as a demand for future work. Because this study uses a hedonic pricing model with property data, only the average WTP for scattered greenery is revealed.