



Original article

Estimating the willingness to pay for green space services in Shanghai: Implications for social equity in urban China



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ARTICLE INFO

Keywords:

Social equity
Willingness to pay
Green space
Quantile regression
Club goods
Shanghai

ABSTRACT

The willingness to pay can be considered as the fiscal dimension of equity in a planning context. The common solution in most western countries for such fiscal inequity is to apply taxation to rebalance; however, there is no equivalent tax category in China, where residential segregation has already occurred and intensified. This paper re-examines the traditional economic aspects of urban green space in relation to size, type and proximity level, and questions whether green fiscal equity appeared in China by exploring how homebuyers in different price ranges value green space services. Specifically, this paper uses the empirical case of Shanghai, China, to test the hypothesis via the quantile hedonic approach. The results show that people at the lowest percentile level paid a higher value for accessing urban public goods than people at the higher income percentiles, and that wealthy people prefer to purchase green space services privately. These results indicate that the traditional social equity problem may not appear in the Chinese context, instead urban China's problem with social equity may be more related to the privatisation of green space provision, which is only accessible to homeowners and the resulting decline of public green space developments, which primarily affects low-income renters.

1. Introduction

It is well acknowledged that urban green space has many social, ecological and economic benefits: improving air quality; mitigating the urban heat island effect; increasing provision of recreational facilities; enhancing the sense of community; promoting people's physical and mental health, etc. (Czembrowski and Kronenberg, 2016; Czembrowski et al., 2016; Klaiber and Phaneuf, 2010; Jim and Chen, 2010; Wolch et al., 2014; Jiang et al., 2015). The extant literature shows that many studies estimating the value of urban green space are heavily reliant on the hedonic price approach based on the local property market (Jim and Chen, 2010; Xiao et al., 2016a). In such approaches, value is mainly dependent on characteristics such as type, size, and property rights (Panduro and Veie, 2013; Lutzenhiser and Netusil, 2001; Bolitzer and Netusil, 2000).

Property value can be considered to be a function of its structural, locational, neighborhood and environmental characteristics (Freeman III, 1981). In this sense, the people who use public green space services should be the people to pay for it. This can be regressed as the marginal willingness to pay for an additional unit of each characteristic (Rosen,

1974). Lucy (1981) illustrated how willingness to pay can offer a fiscal indicator of equity in the planning context. Therefore, understanding and measuring the socioeconomic value of urban green space can be important for urban planning policy and decision-making on matters of social equity, social public capital and other social-environmental aspects (Rutt and Gulsrud, 2016; Byrne and Wolch, 2009; Wolch et al., 2014; Lucy, 1981; Heckert and Rosan, 2016).

Despite growing findings in this field in the Global North, the benefits and functions of ecological infrastructure are still poorly understood in mainland China (Wolch et al., 2014)—particularly during socioeconomic reconstruction, where the variation of green space value at different socioeconomic levels is relatively unknown. So far, the majority of environmental justice studies have focused on the spatial provision of environmental amenities (Boone et al., 2009; Kabish and Haase, 2014), and they found the social equity issues arise when the wealthy begin to create segregated communities (Brambilla et al., 2015); Logan (2016) states that the issue of environmental injustice is often accompanied by residential segregation. In most western countries, tax is employed (e.g. property tax and council tax) to calibrate fiscal inequities—people are taxed higher in return for better access to

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public services. However, to our knowledge, there is no property tax or related local tax in China and it is, therefore, questionable whether such fiscal equity has emerged in China. Recently, [Chen and Hu \(2015\)](#) found a negative relationship between the increasing pace of urbanization and economic development and the provision of urban public green space at the national level—indicating that social inequity in urban green space access in China's megacities is worsening.

Building on the statements above, we adopted the hedonic framework ([Czembrowski and Kronenberg, 2016; Czembrowski et al., 2016; Xiao et al., 2016a](#)), to measure the degree of social equity through the use of people's willingness to pay for the use of specific green attributes at the city level. The aim of this research is twofold: (1) measure people's willingness to pay for green services, considering the size, proximity level, and type of green service provision; (2) assess whether people's willingness to pay for green space varies across different housing segments.

We utilized a quantile regression estimation to study the fiscal equity issue over different social classes, taking advantage of its suitability for analyzing relationships that exhibit inherent heterogeneity. Unlike previous empirical studies in mainland China, several socioeconomic attributes at the residential committee level were employed in this study as control variables ([Anderson and West, 2006; Song and Zenou, 2012](#)) to improve the accuracy of estimation and to mitigate the spatial autocorrelation issue. The aims are addressed using a case study of Shanghai, China, which is one of the most prominent high-rise and high-density cities in the world, with a population of 24 million. Shanghai's green space per capita increased to 13.1 m² in 2011, compared to the US national median green space ratio of 50.18 m² per capita ([Trust for Public Land, 2011, Shanghai Statistical Book, 2012](#)).

The remainder of the paper is organized as follows: Section 2 outlines the extant discussions on the economic benefits of green space and the concept of willingness to pay as an equity indicator. The hedonic quantile price evaluation approach and model specification are reported in Section 3. Section 4 discusses the study area, data source and selected variables for Shanghai. Estimations of the types, sizes and spatial influence areas of green space are presented in Section 5, with conclusions presented in Section 6.

2. Literature review

2.1. Economic benefits of urban green space

It is well established that urban green space is a type of public good and, as such, its value is unknown, since it fails to be defined via market transactions. Given the variety of frameworks, developed by economists, for such non-market goods, including contingent evaluation, travel cost, and cost of community services, there is a large and growing academic field estimating the value of urban green space via housing markets, applying the hedonic price approach ([McConnell and Walls, 2005](#)).

The extant preference studies in the Global North confirm that the value of urban green space is not homogenous: its value is mainly dependent on characteristics such as type, size, quantity and property rights ([Panduro and Veie, 2013; Lutzenhiser and Netusil, 2001; Bolitzer and Netusil, 2000](#)).

Specifically, increasing the size of urban parks positively increases the housing values nearby ([Tyrväinen, 1997](#)). This supports the idea that it is the size of parks, rather than the number of parks, that matters most when attempting to meet the green space needs of a city, with a corresponding effect on property values. For example, [Poudyal et al. \(2009\)](#) found that the size of the park was a substitute for living space and that proximity to a park, along with a 20% increase in the size of the park from the current level, increased the per household consumer surplus by \$160. However, [Morancho \(2003\)](#) found that the size of the park had no impact on price in Castellon, Spain, suggesting that having many small green spaces distributed throughout an urban area may be

more beneficial than having a few large parks.

In addition, some scholars state that green space cannot be treated as a homogenous good and that its value is dependent on the different types of green space, such as parks, urban forests and golf courses (e.g. [Panduro and Veie, 2013; Bolitzer and Netusil, 2000; Lutzenhiser and Netusil, 2001](#)), but the results were generally mixed, with positive, negative and insignificant effects found. In support of the idea that the variability of green spaces is an important consideration, [Lutzenhiser and Netusil \(2001\)](#) found that other types of open space also had an influence on property prices: golf courses (13.3%), specialty parks/facilities (8.5%) and urban parks (1.8%) in particular had positive impacts on property values.

[McConnell and Walls \(2005\)](#) demonstrated that the revealed preference approach is efficient in measuring people's actual use of green space via their residential choice. The value of green space was shown to vary depending on the context, particularly residents' demographic characteristics and location-specific characteristics, including proximity level, aesthetics (view), population density, crime rate, age, income and gender ([Anderson and West, 2006; Troy and Grove, 2008; Brander and Koetse, 2011](#)). A number of studies have focused on exploring the proximity effect of urban green space; these include the consideration of aesthetics (the view) ([Bourassa et al., 2004](#)) and spatial influence, as the housing market will reflect people's willingness to pay extra for proximity to green spaces, especially in regard to accessing the specific benefits of green spaces such as improved air quality and the increased provision of recreational activities ([Lutzenhiser and Netusil, 2001](#)). The proximity effect is suggested to bring a locational premium to housing prices (e.g. [Bolitzer and Netusil, 2000](#)). [Crompton \(2001\)](#) surmises that there is general agreement on the impact of parks on house value for most US cities, where the distance to the nearest park exceeds 500–2000 feet.

2.2. Equity as willingness to pay

Green space is not always equitably distributed within cities, as such, exploring the disparity between the uneven accessibility to urban green space and specific social group has become recognized as an environmental justice issue to both scholars and governments ([Byrne et al., 2009; Kabish and Haase, 2014; Kabish and Haase, 2014](#)). Equity is a planning approach that is associated with the idea of spatial justice ([Collin, 1991; Lucy, 1981](#)). In the context of planning, [Lucy \(1981\)](#) decomposed the notion of "equity" into five dimensions: equality, need, demand, preference and willingness to pay. Willingness to pay indicates fiscal equity, which could combine both quantity and quality of services with the willingness of consumers to purchase them.

Environment justice (equity) issues arise when the wealthy begin to create segregated communities ([Brambilla et al., 2015](#)). [Logan \(2016\)](#) states that the issue of environmental injustice will be accompanied by residential segregation. In fact, the Chinese economic transition has accelerated the social stratification and marketization of housing, increasing the gap between rich and poor and worsening the issue of housing inequality ([Huang and Jiang, 2009; Sicular et al., 2007](#)). Furthermore, the gated community has grown to become the dominant genre of China's real estate market ([Wu, 2005](#)). Socioeconomic inequality has also led to residential segregation, which is largely centered on housing tenure and affordability ([Li and Wu, 2008](#)). Recently, [Chen et al. \(2016\)](#) re-examined [Li and Wu \(2008\)](#)'s work through the latest census information of Shanghai. They found that the global index of housing tenure has slightly eased compared with the figures from 2000, but that in the metropolitan area, the index of housing tenure had worsened, possibly linked to the huge gentrification projects that had occurred. It is noted that such fiscal inequity is rarely widespread in most western countries, since the local municipality employs a tax (e.g. property tax and council tax) or user fee to rebalance spatial inequity ([Lucy, 1981; Simonsen and Robbins 1999](#)), meaning that people are taxed higher in return for better public services.

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