Household Preference for Impure Public Goods - an Application of Community Gardens

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Introduction

Urban agriculture (UA) has grown as a planning priority in many cities in the U.S. Comprising various forms such as community gardens, backyard, and roof-top gardening (EPA, NA), it becomes a major contributor to healthy urban communities and provides a vast array of ecosystem services including food supply and micro-climate regulation. As an essential form of UA, community gardens create a space for residents to grow plants. They share similarity with other types of urban greenspace such as parks by providing ecosystem services as public goods. However, individuals are often attracted by the private consumption benefits (i.e., harvested vegetables and fruits), which in turn contributes to the public goods provision such as biodiversity and greenspace conservation. Community gardens are thus impure public goods.

While many studies have examined the benefits of urban agriculture and other types of urban greenspace like parks, few has focused on community gardens. Even though community gardens are seen as a tool addressing social equity issues like food insecurity among low-income communities and unbalanced distributions of urban green spaces (Siegner et al., 2018), preferences for local and healthy food are typically associated with highly educated and wealthy communities (Bellemare and Dusoruth, 2020). It is therefore unclear whether there is a demand for such food among low-income households whom the gardens intend to benefit. More importantly, it is critical to evaluate whether public goods co-benefits encourage individual's willingness to contribution for community gardens. We fill the gap in the literature by estimating individuals' preferences for community gardens with both private and public benefits using a discrete choice experiment (DCE).

We quantify people's preferences for different features of a community garden using both pecuniary and non-pecuniary payments for two reasons. First, labor contribution plays an important role in sustaining community gardens. To keep the gardens vital, households are required to spend time nurturing the plants and keep the harvested fruits and vegetables in the community gardens. Thus, only including pecuniary payment vehicle in the choice experiment design does not represent a realistic scenario. Second, using money as a mode of contribution

may not capture the potential contribution of low-income households. Pecuniary payment vehicle is commonly used in DCE to explore the trade-offs between having different features of environmental goods and paying monetary costs. However, recent literature starts to apply labor contribution to estimate the value of environmental goods (e.g., Rai and Scarborough (2015); Gibson et al. (2016); Meginnis et al. (2020); Hagedoorn et al. (2020)). Majority of studies that utilize non-pecuniary payment vehicles are conducted in developing countries since respondents in a subsistence economy may have limited access to cash income and are not engaged in waged labor (Rai and Scarborough, 2013; Gibson et al., 2016). Using money as payment vehicle can underestimate people's preferences for environmental goods (Rai and Scarborough, 2015). Similar concern exists when conducting DCE in developed countries since we may undermine low-income households' preferences for community gardens due to their constrained household budgets.

We conduct a split sample DEC to estimate households' preferences for community garden in Los Angeles, California. Half of the respondents are asked about establishing and managing a community garden in relation to using volunteering time as a payment with the other half asked in relation to contributing both money and volunteering time as payment methods. We investigate three questions in this paper. First, what are individuals' preferences for different features for community garden? Second, whether public goods co-benefits encourage individual's willingness to contribute to community gardens? Third, we explore disparities in valuation of community garden in terms of time and money contribution.

Converting time values into monetary values is required to compare WTC estimates from time and money payments as well as to use the outcomes of a DCE study with time payments in cost-benefit analyses. Existing literature has used different conversion rates for the value of time for each labor hour to convert WTC time into dollar values. Most studies monetize time values using a generic market wage, individual specific wage rate, or a leisure rate that is a fraction to the wage value (e.g., Gibson et al. (2016); Meginnis et al. (2020); Hagedoorn et al. (2020)). One third of the wage rate is commonly used as an estimate of the value of leisure time based on Beesley (1965) and Cesario (1976). Additionally, some literature finds the shadow value of time as 20% to 60% of local wages. However, as shown in Lloyd-Smith et al. (2019), Ando et al.

(2020), and Czajkowski et al. (2019), little correlation may exist between a person's value of time and their wage rate. Inspired by Lloyd-Smith et al. (2019) and Czajkowski et al., (2019), we estimate Individual Specific Value of Time (VOT).

Our study contributes to several strands of literature. First, we offer insights on whether and how public co-benefits affect people's valuation of impure environmental public goods (MacKerron, 2009). Second, we contribute to the urban agriculture and greenspace literature by investigating the heterogeneity in households' preferences such as how diversity or social cohesion affects their evaluation (Printezis and Grebitus, 2020). In this regard, our study also adds to the benefit transfer literature (e.g., Johnston et al., 2018) since the results can be applied to adjusting preferences in other locations/settings with different contexts, depending on the households' characteristics. Lastly, our study complements a recent yet rapidly developing literature on measuring valuations of environmental assets using non-pecuniary payment modes like time (Ando et al., 2020).

Framework and Methods

We conduct a discrete choice experiment (DCE) to estimate households' WTP and WTV for community garden in Los Angeles, California. The DCE framework allows us to estimate the marginal value of each attribute. Volunteering plays an important role in sustaining community gardens. Households spend time nurturing the plants and keep the harvested fruits and vegetables on their plots. Their private consumption helps maintain the gardens and thus contributes to the public goods. Consequently, the WTV and WTP estimates entail people's valuation of both private and public benefits offered by community garden.

To quantify the individual level valuation for community gardens while accounting for unobserved heterogeneity, we estimate a mixed multinomial logit (MMNL) model. To explore heterogeneity in households' preferences, we include interaction terms of factors such as neighborhood diversity with choice-specific attributes in the MMNL. The results show how different factors such as social cohesion affect people's WTP and WTV. Second, to illustrate how preferences vary across different neighborhoods, we recover the conditional individual-specific means of marginal WTP

and WTV for every respondent and then calculate the zip code level valuation for each attribute by averaging the marginal WTP and WTV over the respondents living within that zip code.

Survey Design and Data

Our survey attributes and levels are developed after holding conversations with the Los Angeles County Parks and Recreation, community garden non-profit organization managers, and participants attending focus groups. Respondents are first presented with a background information explaining that there is a land revitalization project supported by government funding, converting public vacant land in their neighborhood to a community garden. The status quo scenario is when a community garden is constructed but with limited maintenance (e.g., no harvested food, limited biodiversity improvement). Each community garden has a list of **fixed attributes** including distance to the local community, responsibility of voluntary managers, and types of tools and assistance provided.

Following the background and fixed attributes, respondents are presented with the following **variable features** with the corresponding attribute levels: monetary cost measured by increases in monthly membership fees (10, 15, 20 dollars), time cost measured by volunteer hours per week (1, 2, 3 hours), environmental benefits measured by % increase in bird species and bees (5%, 10%, and 15%), garden size measured by the number of households that shares the garden (30, 60 households), and how harvested produce are allocated (consumed by households, donate to food bank).

The respondents are then presented with a total of six discrete-choice questions, in which they choose between a pair of hypothetical scenarios of community gardens with varying attribute levels and a status quo option (i.e., a community garden with limited maintenance).

Results and Conclusions

Taken together, our analysis examines benefits offered by community gardens and factors affecting the provision of impure public goods with both public and private goods component.

Faced with limited financial and land resources, our results offer practical insights for urban land management and can guide local community managers and policymakers by showing whether residents value community gardens and what factors drive their valuation. The zip code level variation in preferences helps local policymakers understand different communities' interests in and commitment to community gardens so that they can better allocate resources.

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