



Research Paper

Preferences for urban green spaces and peri-urban forests: An analysis of stated residential choices

Gengyang Tu^{a,b,*}, Jens Abildtrup^a, Serge Garcia^a^a Laboratoire d'Economie Forestière, AgroParisTech, INRA, 54000, Nancy, France^b Université de Lorraine, 34 cours Léopold CS 25233, 54052 Nancy Cedex, France

HIGHLIGHTS

- Applying a choice experiment, we assess the preferences for living close to urban parks and forests.
- This study applies a pivot-based experimental design that frames respondents' choices in terms of their current residence.
- The preference heterogeneity in the population can be partially explained by differences in household characteristics.
- The results indicate substitution between having access to a private garden and to urban green spaces.

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ABSTRACT

This paper assesses the value of urban green spaces, specifically peri-urban forests and their potential substitutes, for the local population on the basis of their residential choice. We applied a choice experiment that focuses on the trade-offs between private housing characteristics and the environmental aspects of neighborhoods. Individual willingness-to-pay is estimated from a latent class model and a mixed logit model along with a Willingness-To-Pay (WTP) space approach. Our results show that green spaces provide both direct use value (recreation) and indirect use value (scenic view). The respondent's value of distance to peri-urban forests depends on recreational use. The ownership of a private garden reduces the WTP for living closer to an urban park.

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1. Introduction

Peri-urban forests located in between an urban core and a rural landscape generate both recreational and amenity benefits. On the one hand, the proximity of forests provides esthetic benefits such as scenic amenities (Cavailhès et al., 2010; Sander & Polasky, 2009). On the other hand, having forests in the vicinity of the residence also provides recreational value (Ezebilo, Boman, Mattsson, Lindhagen, and Mbongo, 2015). We know from studies that evaluate outdoor recreation that the WTP for access to a given recreational site decreases with increasing transportation costs (Phaneuf & Smith, 2005). In the meantime, an important determinant of the value of peri-urban forests is the presence of alternative urban green spaces

in the vicinity. In particular, urban parks can also provide esthetic benefits and serve as recreational sites, making them the most likely substitute sites for peri-urban forests (Chiesura, 2004). The degree to which urban parks may be substituted by forests in the proximity of the residence has only received minor attention in the literature (Mansfield, Pattanayak, Mcdow, Mcdonald, and Halpin, 2005). Nevertheless, the assessment of the preferences for these two types of green spaces and the understanding of the potential substitution effects are important information for public urban planners. Furthermore, private gardens and public green spaces may also, to some degree, be substitutes in terms of the demand for recreation sites (Barbosa et al., 2007). For example, if one decides to sunbathe and has a garden, she can choose between going to a park or to her own private garden. However, in other aspects, these two types of sites play different roles (Kellett, 1982). So far, few studies have dealt with the role of owning a private garden in a person's WTP for having access to public parks (Panduro & Veie, 2013).

* Corresponding author at: Laboratoire d'Economie Forestière, AgroParisTech, INRA, 14 rue Girardet, 54000 Nancy, France.

E-mail address: gengyang.tu@nancy.inra.fr (G. Tu).

A large body of research documents the positive impact of urban green spaces on local residents' welfare. This includes hedonic studies showing that house and land prices rise with proximity to forests (e.g., Mansfield et al., 2005; Thorsnes, 2002; Tyrvaïnen & Miettinen, 2000), or increase with the proportion of forest land in the region (Hand, Thacher, McCollum, and Berrens, 2008), and that access to urban parks has a significant value for the local population as well (Hoshino & Kuriyama, 2010; Poudyal, Hodges, & Merrett, 2009; Sander & Polasky, 2009). Significant values of access to parks have also been estimated using stated preference (SP) methods (Brander & Koetse, 2011; Del Saz Salazar & García Menéndez, 2007). The provision of urban green spaces may also contribute to the building of an attractive image of a city or a neighborhood, thus influencing the residential choice of newcomers. For example, in Nancy (France), where the empirical part of this study was carried out, the local government has attempted to build an attractive image by making the city "green and pleasant" (report from Nancy's Urban Development Committee, 2011). Therefore, knowledge about the role of urban green spaces in the choice of residence location constitutes important information for urban planners. While the value of urban green spaces for inhabitants has been estimated in numerous studies that apply the hedonic pricing method and the contingent evaluation method, information on how different types of green spaces, i.e., urban parks and peri-urban forests, interact is lacking, as are appropriate empirical methods for analyzing this issue. We propose choice experiments (CE) as a suitable empirical method in spite of their hitherto limited number of applications in the valuation of urban green spaces (Bullock, 2008; Giergiczyński & Kronenberg, 2014).

In this context, our study aims to estimate the non-market value of peri-urban forests for the local population through homeowners' residential location choices. Our SP data is obtained from a face-to-face survey carried out in the urban agglomeration of the city of Nancy, France, in the summer of 2013. The preferences of respondents are revealed through a CE where we propose alternative residences to them. We model residential choice by applying a random utility model (RUM). Specifically, we chose to use mixed logit (ML) and latent class (LC) models to account for preference heterogeneity. A main advantage of using a CE method is that by applying an experimental design, we avoid issues of correlated omitted variables, endogeneity of explanatory variables and multicollinearity, which is often a problem with revealed preference data used in applications of the hedonic pricing model (e.g., Earnhart, 2002; Freeman, 1993). Moreover, compared to contingent valuation, a multi-attribute discrete choice model makes it possible to estimate the trade-offs between private housing and green space attributes.

This paper is organized as follows. In the following section, we present our empirical strategy by describing the theoretical background, the CE design, and the survey carried out in the city of Nancy, France. In Section 3, we present the econometric specification we used and the way we estimate individual WTPs. In Section 4, we present the estimation results, Section 5 is devoted to a discussion and Section 6 concludes the paper.

2. Empirical strategy

2.1. Residential choice and CE

The CE method is based on the Lancasterian consumer theory (Lancaster, 1966), combined with the random utility theory (RUM, McFadden, 1974). The central assumption of the CE method is that the utility derived from any option depends on the attributes/characteristics of the goods. It involves the generation and analysis of choice data through the construction of a

hypothetical market using a survey. This method is therefore generally considered as an appropriate method for the valuation of multi-attribute non-market goods or to analyze preferences for new product attributes of market goods (Henley, Wright, and Adamowicz, 1998; Louviere, 1992).

In the present study, we construct a hypothetical market for residential choice. According to Prashker, Shifan, and Hershkovitch-Sarusi (2008), the attributes that influence the residential choice decisions can be broken down into four categories: dwelling unit characteristics (size, type of house, parking, etc.); neighborhood characteristics (safety, traffic, noise and air pollution); accessibility characteristics (working places, schools, shopping and leisure opportunities); and individual characteristics (education, age, income, etc.). Attributes considered in previous studies that apply the CE method to residential choice found that characteristics such as accessibility (Kim, Pagliara, and Preston, 2005; Liao, Farber, and Ewing, 2015) and the environmental quality of the neighborhood (Phaneuf, Taylor, and Braden, 2013) have an impact on the residential location choice. Walker and Li (2007) show that the importance of these attributes depends on the household's life style. So far, there is not any application of CE to the housing choice in the literature on the valuation of urban greenery. Nevertheless, pioneered by Adamowicz, Louviere, and Williams (1994), the CE method is an appropriate and widely-used approach in the valuation of the environment and amenities (e.g., Hanley, Wright, and Koop, 2002). Applying the CE method, the purpose of this study is to estimate the benefits that people gain from living close to peri-urban forests and urban parks by studying their residential location choice. While peri-urban forests and urban parks are normally considered as exploitable non-market goods, e.g., in the hedonic pricing model, they are attributes of housing, which is a market good. The idea behind our CE is to make the respondents state their preferences for different housing, which varies with respect to access to green spaces.

One advantage of using a CE is to be able to avoid multicollinearity among attributes since attribute levels are considered to be orthogonal in experimental designs (Earnhart, 2002). The large number of potential attributes that have an impact on housing prices and multicollinearity among these attributes may complicate the econometric analysis, i.e., low significance levels due to high standard errors and large changes in parameter estimates given a small change in the data or model specification (Irwin, 2002). Multicollinearity may be caused by the fact that households with the same preferences (and same socio-demographic characteristics) would choose the same location. For example, higher income households will, on average, reside in neighborhoods with larger houses with more bathrooms, larger gardens located within a certain distance from the city center, and with access to better schools. Another advantage of the CE method is the possibility of *ex ante* modeling of new green spaces. The last problem that we could solve with CE, and that may be the most important, is the problem of omitted variable bias (Bockstael & McConnell, 2007). Unobservable neighborhood characteristics that matter to households are often expected to be correlated with the amenity of interest (Kuminoff, Parmeter, and Pope, 2010). Crime rates are often lower in neighborhoods with high-income households, and high-income households will, in general, be found in locations with easy access to green spaces. If crime rates are not included in the hedonic model due to missing data, the estimated values of being close to green spaces will be upward-biased. In CE studies, the attributes of interest, in our case, access to green spaces, are specified in an experimental design. Therefore, before the respondents make their choices between different housing alternatives, we ask them to only consider the attributes specified in the experiment while considering that all other attributes

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