Summary of the case study on valuation of the forest ecosystem services

Title of the valuation study: **Property Prices and Urban Forest Amenities**
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Reference: *Tyrvainen, L.; Miettinen, A. (2000): Property Prices and Urban Forest Amenities. Academic Press, Journal of Environmental Economics and Management 39 (2000): p. 205-223.*

Objectives of the study

Green spaces improve the quality of urban life. These benefits are difficult to estimate and often do not have market prices. Therefore, quantitative information on residents' valuations attached to urban forests is often missing. Most municipalities do not have any specified urban forest policy. Consequently, new means are needed in planning to assess the effects of losses and gains in the quality of urban environments.

The aim of the study was to value non-priced urban forest amenities by comparing dwelling prices and specific amounts of urban amenities in a hedonic price method (HPM). Thus, the purpose was (1) to search for variables suitable for describing close home forest benefits, and (2) to estimate the monetary value of urban forest benefits reflected in dwelling prices.

The outcomes of the study can be used for concretizing and measuring the benefits of residents, stimulate public awareness of urban green spaces, influence decisions through cost-benefit analysis and help to justify the improvement of degraded environments. Furthermore, comparing the urban forest benefits with the provision and management costs of the areas could serve as a tool in the formulation of appropriate urban land-use policy.

Scope of the study

The ecosystem services valuated in the study were cultural services (recreation, well-being) provided by urban green spaces. A local geographical scope was covered.

The empirical study was conducted in the Finish district of Salo, which is located 110 km from Helsinki. The district of Salo consists of two municipalities: The city of Salo (23 000 inhabitants) and the suburb of Halikko (9000 inhabitants). The city of Salo owns about 1100 hectares of mainly pine-dominated forests. The amount of green areas was about 10% of the total municipal area.

Valuation method(s) applied

To compare dwelling prices and characteristics, a HPM was used. This kind of method estimates the value of environmental benefits from the prices of related market transactions.

Unencumbered selling prices and basic structural data concerning the characteristics of dwellings have been collected from **stamp duty record files** charged on housing share transactions. Thus, the data consisted of 590 apartment sales in terraced housing over a stable housing market period from 1984-1986.

Four different variables measuring urban forest amenities were chosen according to the **theory of urban forest benefits** and the results of the previous studies: (i) the distance to the nearest wooded recreational area, (ii) the direct distance to the nearest forested area, (iii) the relative amount of forested areas in the housing district and (iv) the view from the dwelling window (classified in five categories).

The **property value technique** in **hedonic regression models** consisted of two stages. At first, implicit prices for different housing characteristics were estimated. Thus, the impact of marginal changes in the supply of environmental goods could be assessed. In a second stage of analysis, huge changes could be assessed by combining information about implicit prices and data concerning environmental quality as

inverse demand functions.

The functional form of the **hedonic price equation** was determined empirically within the housing market. The most appropriate form of the equation was found using a **quadratic Box-Cox** functional form tested by **asymptotic likelihood ratio tests**. The five quantitative explanatory variables were floor area of the dwelling, distance to the city centre, distance to the local shopping centre, distance to the nearest forested area, and age of the building. Additionally, three qualitative explanatory variables were taken into account (municipality, facade material, and possible forest view from the dwelling window).

To detect spatial autocorrelation, the data was ordered in housing districts. The errors in the regression model were then tested with a **Geary test** and for the error variance heteroscedasticity tests were carried out (**Glejser test, Breusch-Bagan-Godfrey-test**).

Finally, the use of the hedonic price models was illustrated exemplary by calculating the monetary value of a hypothetical forest park (circular, 1 ha) using the estimated **semilogarithmic model**.

Key results

- One kilometre increase in the distance to the nearest forested area led to an average 5.9% decrease in the market price of the dwelling (Fig.1). Distances to a forested park up to 600 m had a significant positive effect on the price of dwellings. The strongest effects occurred up to 300 m distance. Nevertheless, the recreational area's size did not have a significant impact on the apartment prices.

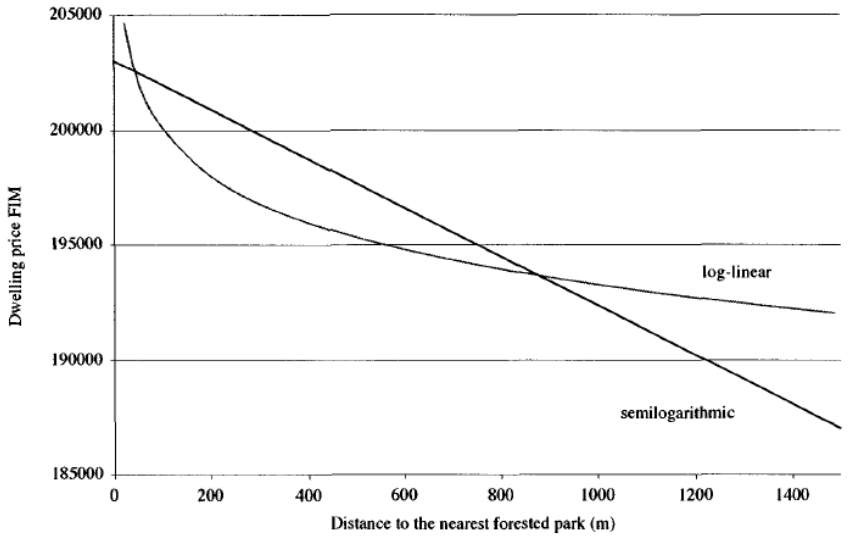

FIG. 1. Effect of distance to the nearest forested area on dwelling price. Both semilogarithmic and log-linear relationship between the dwelling price and the independent variable. The model was corrected by adding a correction factor equal to $e^{1+(\delta^2/2)}$ to the equation [25].

- Dwellings with a view onto forests were on average 4.9% more expensive. Residents paid for environmental amenities (forested park, forest view) through property prices. The monetary values calculated for green spaces represented the lower limit of the monetary value for residents.

- The value of a hypothetical forested park with the size of 1 hectare was estimated by a value of 652000 FIM (110 000 €) for the forest view and the price effect up to 600m distance added up to 22.17 million FIM (3.74 Mill. €). This means a conservative estimation for the total rise of dwelling prices through the establishment of a park of 22.76 Mill. FIM (3.84 Mill. €). Flats instead of small houses nearby even led to an estimated value of 66-89 Mill. FIM (11.13-15.02 Mill. €).