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The value of trees, water and open space as reflected by house prices in the Netherlands

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Abstract

An attractive environment is likely to influence house prices. Houses in attractive settings will have an added value over similar, less favourably located houses. This effect is intuitively felt, but does it always occur? Which environmental factors make a location an attractive place to live in? The present study explored the effect of different environmental factors on house prices. The research method was the hedonic pricing method, which uses statistical analysis to estimate that part of a price due to a particular attribute. Nearly 3000 house transactions, in eight towns or regions in the Netherlands, were studied to estimate the effect of environmental attributes on transaction prices. Some of the most salient results were as follows. We found the largest increases in house prices due to environmental factors (up to 28%) for houses with a garden facing water, which is connected to a sizeable lake. We were also able to demonstrate that a pleasant view can lead to a considerable increase in house price, particularly if the house overlooks water (8–10%) or open space (6–12%). In addition, the analysis revealed that house price varies by landscape type. Attractive landscape types were shown to attract a premium of 5–12% over less attractive environmental settings.

Keywords: Economic valuation; Trees; Water; Open space; House prices

1. Introduction

Integrated decision making emerged as a major concern from the workshop on urban–rural relationships (Tjalingii, 2000). Decisions on land-use should not only be motivated by economic (and social) arguments, they should also include ecological motivations. As a consequence, it is important to understand the interaction between socio-economic and ecological factors. In the context of urban–rural relationships, an obvious research topic is the socio-economic value of ecological factors for residents. No one would doubt that ecological factors have a socio-economic value, the question is how to measure this value. One of the links between economy and ecology is found in the premium that houses in an attractive, green setting attract over houses in a less favourable location. This premium is an expression of the socio-economic significance of ecological factors in a rural–urban setting. It is often felt that the socio-economic value of ecological factors is not sufficiently reflected in policy priorities. A quantification and specification of this value will support ecological arguments in policy debate and urban–rural planning. If the socio-economic value of ecological factors can be demonstrated through a premium on house price, this strengthens the position of existing green areas in the policy decision process. It may thus act as a

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counterbalance in urban expansion plans, when urban development threatens green areas and open spaces.

One of the most important reasons for the susceptibility of green areas and open spaces to urban pressures is that they are not articulated in monetary terms (More et al., 1988). Decision-makers compare economic factors like contribution to the tax base and employment or the value added to the local economy against the value of environmental factors. By expressing the latter in monetary terms they become comparable to the former. This will put more weight on environmental factors in the decision making process (although by no means all environmental values can be put into monetary terms).

Also in urban–rural planning, insights in the socio-economic value of green areas and open spaces will help to optimise socio-economic and ecological factors simultaneously. One of the issues where these insights may contribute is design of new urban areas, in particular where the distribution of green areas (including water bodies) and houses over new urban areas is concerned. The premium on house price may be used as the guiding principle for optimising the socio-economic value of ecological factors. Public finance is the main source of finance for green areas, but it is conceivable that future residents and/or urban developers will finance the creation of new green areas. In the context of increasing demand for green areas, which is not met by an increase in public finance, this is exactly what the Dutch government is looking for: financing possibilities from private sources. Interesting examples of private finance for green areas are the (experimental) New Rural Lifestyle Estates in the Netherlands (van den Berg and Wintjes, 2000). On these estates, which are to be founded on former agricultural land, development rights are provided in exchange for the production of new nature and landscape. In the case of private finance of green areas, a careful analysis of the value-increasing effect of attractive, green settings on house price is of course particularly important.

This study aims to clarify how, when and to what extent the value-increasing effect on house price arises in the Netherlands. These issues have been studied before, in particular in the US and the UK (e.g. Morales, 1980; More et al., 1988; Anderson and Cordell, 1988; Garrod, 1994; Powe et al., 1995). In the Netherlands. however, the empirical evidence is scarce. Since the urban–rural settings in the UK and the US differ considerably from those in the Netherlands, the empirical findings cannot be translated to the Dutch situation. In the Netherlands, urban pressure in the Randstad — which covers the major cities Amsterdam, The Hague. Rotterdam and Utrecht, as well as a number of smaller towns and villages — is particularly high. This coincides with a high demand for green areas and open space for recreational purposes. Consequently, the integrated development of urban and green plans is a relevant policy issue in this area. Therefore, the emphasis on research areas in this study is in the Randstad, which is represented in the study with live research areas. To investigate the regional impact, three research areas outside the Randstad were studied. They are spread over the country, located in the centre, the north and the south.

2. Method

Broadly speaking, there are two ways to establish the value-increasing effect of a specific housing attribute. The first way is to ask the people concerned — for example residents or estate agents — how they value a particular attribute. A second way is to derive the value from actual behaviour. The hedonic pricing method (HPM) is an example of the latter. Assuming that houses are valued for their several attributes, housing transactions are examined to estimate that part of a price due to a particular attribute. There are two categories of attributes: the structural characteristics of the house — like plot size, house type or number of rooms — and the locality, which may be valued positively or negatively. Although our analysis focuses on environmental attributes, which make tip a relatively small part of total house price, the HPM requires that all attributes that affect house price are included in the analysis.

In 1995, a pilot study based on the HPM was carried out in Apeldoorn, a medium-sized town in the east of The Netherlands (Fennema et al., 1996). This study analysed 106 house transactions in a relatively new district, which is built round a park. The study demonstrated that location within 400 m of the park attracted a premium of 60% over houses located outside this zone. In addition, a house with a park view appeared to attract a premium of 800. The results were encoura-

ging, because they were consistent and confirmed the expectation that green has a value-increasing effect on house price. But could this effect also be demonstrated in other areas, for different house types and other environmental factors? This article presents the results of both the follow-up study which tries to answer these questions, and the pilot study.

Nearly 3000 house transactions were studied to estimate the effects of environmental attributes on transaction prices. We were able to use a huge data set — featuring transaction prices and various structural house characteristics — that was provided by the Dutch Association of Estate Agents (NVM). Information on environmental and other location factors was drawn from maps, and complemented by specific, detailed information on the locality gathered by visiting each house in the sample. This was necessary to get a complete picture of the view from each house in the sample and of disturbing factors like traffic noise. The accessibility of green areas was examined by bicycle. Thus obstacles not apparent from maps could be experienced.

To minimise the impact of inflation, a period characterised by price stability was selected, i.e. the period 1989–1992. Since maintenance level is notably difficult to measure, only transactions in houses built after 1970 were included. Thus we could safely assume that the influence of maintenance levels was negligible. A large sample is a pre-condition for a reliable result from HPM analysis. Therefore, every house built after 1970 for which an NVM transaction was recorded in the period 1989–1992 was included in the sample. Since the housing market is highly segmented, house transactions were studied for each research area separately.

The analysis was performed in two stages. Firstly, the house price due to structural housing attributes was estimated in a linear regression analysis. Subsequently, we assumed that the difference between this value and the actual transaction price could be ascribed mainly to difference in locality. Locality refers to not only to environmental amenities, but also to schools, traffic noise, view of apartment buildings, motorways, shops, public transport or other public facilities. The ratio of the estimated price and the actual transaction price is referred to as the location indicator — which was calculated as the difference between the two values expressed as a percentage of the estimated value. The location-indicator is linked to location variables in a second linear regression analysis. Since the research is focused on environmental factors, only the results from the second stage are presented and discussed in the following.

3. Hypotheses and results

The central hypothesis is that houses in an attractive setting attract a premium over houses in a neutral setting. Green areas. water bodies, open space and attractive landscape types are aspects of an attractive setting. Since these are valued differently by residents, for example because they differ in use value, they will affect house prices differently. The selection of research areas assured an analysis of the influence of a wide range of green area types, water bodies, open space and landscape types. Not only do they differ in age, function and type, they also occur on different scale levels: from small, decorative strips of green and small canals to large parks and lakes.

Table 1 summarises the tested hypotheses and the results for environmental factors. The following example illustrates how the table reads. The first line presents the results for the hypothesis ''a view of a green strip has a value–increasing effect on house price''. These hypotheses was tested in six cases (in the two other cases, the situation did not allow for a test of this hypothesis); in three cases the variable was significant, in three cases it was not. The premium in the three significant situations amounted to 4% (one case) and 5% (two cases).

The table shows that the impact of green areas was ambiguous; in many cases, the hypothesis that a green structure attracts a premium had to be rejected. The effect of water bodies and open space could be demonstrated in almost every instance. Attractive landscape types were shown to attract a premium over less attractive landscape types (monotonous agrarian landscapes).

4. Combinations of results

In each research area, the impact of a different set of environmental factors was examined. Since factors may interact, it is important to test the effect of the

Table 1
Summary of results for environmental factors

	Feature	Significant	Not significant	Not tested	Premium
In the residential area					
Green strip	View of	3 cases, n=962	3 cases, n=1442	2 cases, n=409	4%, 5%, 5%
Park	View of	2 cases, n=456	6 cases, n=2357	–	7%, 8%
	Vicinity	1 case, n=112	1 case, n=2701		6%
Canal	Facing garden	–	1 case, n=297	7 cases, n=2516	–
	View of	2 cases, n=391	–	6 cases, n=2422	4%, 5%
Lake	Facing garden	2 cases, n=443		6 cases, n=2370	11%, 12%
	View of	2 cases, n=443		6 cases, n=2370	8%, 10%
	Vicinity	2 cases, n=443		6 cases, n=2370	5%, 7%
Bordering of residential area					
Park	Vicinity	1 case, n=297	3 cases, n=1031	4 cases, n=1485	12%
Lake	Vicinity	3 cases, n=1166	–	5 cases, n=1647	5%, 7%, 10%
Open space	View of	2 cases, n=929	–	6 cases, n=1884	6%, 12%
Regional features					
Woods	Presence	2 cases, n=890	–	6 cases, n=1923	8%, 12%
Lake	Presence	1 case, n=336	–	7 cases, n=2477	6%
Diversity of landscape types	Presence	1 case, n=593	–	7 cases, n=2220	9%

various factors simultaneously. For example, in a town surrounded by an attractive wooded landscape, the impact of a green area bordering the residential area is likely to differ from a town without attractive regional features. When several environmental characteristics are significant in a certain research area, the effects are additional. Consequently, if a house has a garden bordering water, this implies a view of a lake, which in turn implies that there is a lake in the vicinity. Thus, if the three effects are all significant, there are three premiums on house price. In the following, the three most striking cases are discussed. In each case, a set of different environmental factors is highlighted. These cases are illustrative both for approach and results.

4.1. Case Emmen

Emmen is a medium-sized town in the northeast of the Netherlands, with three districts built after 1970. Two districts are built on sandy soil. They have woods bordering the residential area. The third district is designed around a new lake, on former farmland. The new district facing the lake and a part of the lake itself have been developed simultaneously. The sample consists of 282 transactions in houses, more or less evenly distributed over the three districts. Contrary to expectations, a positive effect of location close to the woods, i.e. on the attractive side of the districts, could not be demonstrated. Irrespective of zone definition, the variable 'close to the woods' was not significant. The effect of the lake, however, emerged very clearly. Location in the district with the lake, which comes to the same thing as location within 1000 m of the lake, attracted a premium of 7% over location in the other two districts. A water view raised price by an extra 10%, whereas a garden bordering on water attracted a premium of 11%. This means that the price of a house with a garden bordering on water is on average 28% higher than the price of a house in one of the other two districts. Fig. 1 illustrates the results for Emmen.

4.2. Case Apeldoorn

In Apeldoorn, a medium-sized town in the east of the Netherlands, 102 house transactions were studied to assess the effect on house prices of a park located right in the middle of the district 'De Maten' (Fennema et al., 1996). The distance from the park to the edge of the district amounts to 800 m. An effect of location close to the park, i.e. within 400 m (walking distance), could be demonstrated — a premium of 6%. On top of this, a view of the park was shown to attract an extra price increase of 8%. View of a multi-storey apartment building was a negative factor, decreasing house price by 7%. Thus, price difference between houses could accumulate to 21%, which represents the

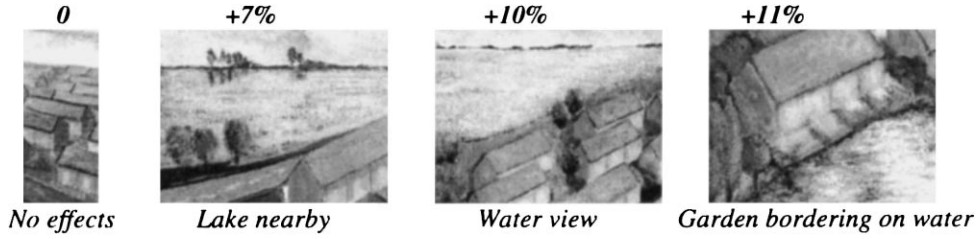

Fig. 1. The effect of a lake on house prices in Emmen.

difference in prices of comparable houses between least favourable (−7%) and most favourable (6+8%) locations, as illustrated in Fig. 2.

4.3. Case Leiden

Leiden is one of the larger towns in the west of the Netherlands. In Leiden, 336 house transactions were studied spread over several town districts in the north, the west and the south. The central assumption in Leiden was that the attractive landscape with water features north of Leiden would attract a premium over less attractive settings. The distance between the district in the north of Leiden and other houses in our sample is substantial — it varies between 3 and 5 km. The hypothesis could not be rejected and the estimated premium for an attractive landscape type was 7%. Two other factors were shown to have an impact on house price in Leiden: traffic noise and a nice view. Traffic noise was shown to exercise a negative influence (−5%). A nice view could be either a water view or a view of open space, or both. Thus, the most favourable setting in Leiden is in the northern district (+7% for attractive landscape with water features), an open view (+9%) and a water view (+8%) Compared to the least favourable location characterised by traffic noise, the most favourable location attracts a premium of 29% (see Fig. 3).

5. Concluding remarks

Interpreting the results, some limitations of the HPM should be kept in mind. The results only apply to districts built after 1970 and they are only valid within the context of the set of environmental factors they where derived in. Great caution is required when results are transferred to other areas or types of green. Naturally, the premium is relative; it applies to a group of houses in relation to a specified group of other houses. The essence of the method is a comparison of situations with and situations without a specific attribute. Consequently, the value of a specific attribute can only be tested if suitable situations with and without can be found. For example, if a whole district is nice and green, the value-increasing effect of green in the residential area cannot be tested in this district. Another — otherwise comparable — district, which is not nice and green, is needed. Since the house market is highly segmented, the two districts should be found within the same segment of the house market. This caused difficulty in the selection of suitable research

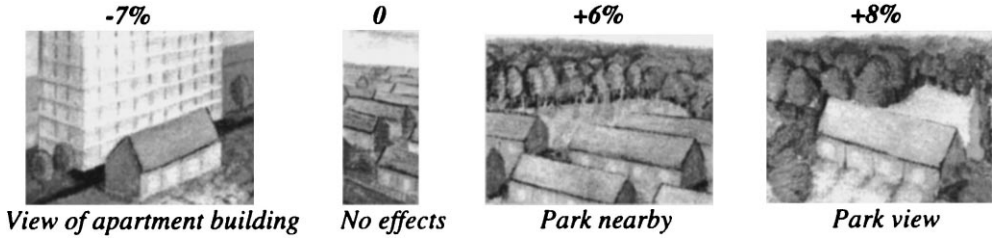

Fig. 2. The effect of a park in Apeldoorn.

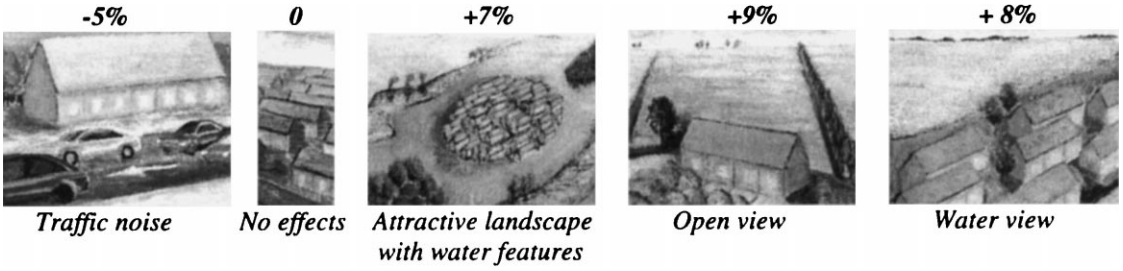

Fig. 3. The effect of attractive landscape features in Leiden.

areas and variables. The house market is not only regionally segmented, also different house types are traded in different segments of the house markets. Therefore, houses were distinguished by type. The largest group in our sample consisted of terraced houses (n=2813). The other group consisted of semi-detached and detached houses. Due to data availability, the emphasis has been put on the first category, and the number of tested hypotheses was limited for the second group. However, a comparison of the results for the two groups, where possible, indicated that there was no reason to assume that an attractive setting attracts a different premium for different house types.

Another complicating factor is the interrelation between variables. An obvious interrelation, which is difficult to disentangle, is between social status and attractive location. People who can afford to do so have a tendency to choose attractive, green settings for their homes. As a consequence, certain towns or districts in attractive, green settings have become known as places for the rich. Are house buyers in these areas willing to pay a premium for the attractive environmental setting or for the social status attached to living among the rich? Apart from these practical difficulties and interpretation problems, some interesting patterns emerged from our analysis. Since we were able to study a large number of house transactions in different areas, and similar factors emerged in different areas, the results can be considered as reasonably robust.

Clearly, the most influential environmental attribute in the study is the presence of water features. This corresponds with findings from landscape psychologists. As is stressed for example by Kaplan and Kaplan (1989): ''Water is a highly prized element in the landscape''. Current town developments in the Netherlands indicate that town developers are well aware of the value of water features, given the large number of plans that include water bodies. As stated in Section 1, the Dutch government is searching for alternative sources of finance for creation and/or maintenance of nature and landscape features. Given the immediate effect of water features, as opposed to green areas which need time to mature, and the high premium water features seem to attract, they seem to be the major candidate for private finance or joined public–private finance. A promising option would be to develop a new attractive, green urban area with water features. In this area, fewer building plots can be sold for a higher price than in a 'standard' area without attractive environmental features. Yet the project may turn out to be more profitable because of the premium for an attractive setting which the house plots will attract.

Also green in the residential area was shown to attract a premium in a number of cases. This advocates preservation of existing green areas in residential areas, and application of existing green areas in new urban developments. Articulation of the monetary value of environmental factors will place them on comparable terms with socio-economic factors. As a consequence, environmental factors are likely to be taken into account in the decision process.

It proved to be much more difficult to demonstrate the effect of a park or a recreational area bordering the residential area. This hypothesis was tested in four cases, whereas the remaining three cases did not allow for a test of this hypothesis. Only in one case (out of four) this variable was significant. This sheds some doubt on the current policy preference in the Netherlands for development of this type of green areas. Recreational lakes bordering the residential area were shown to attract a premium, also when they were of the

same size as the investigated green areas bordering the residential area (circa 100 ha). This suggests the application of sizeable water bodies in parks or recreational areas. At the same time, this leads the way to preserve openness in the landscape, another environmental factor that was reflected in a higher house price.

The results for larger green areas (circa 1000 ha) and attractive landscape types are summarised under the heading 'regional features' in Table 1. Attractive regional features were demonstrated to have a considerable impact on house price. Only in one case, the hypothesis that an attractive, wooded landscape attracts a premium on the house price had to be rejected. In this particular case it seemed likely that poor accessibility crossed the willingness to pay for an attractive landscape. In this situation, improving accessibility is a clue for policy action.

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