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A Hedonic Analysis of the Value of Parks and Green Spaces in the Dublin Area

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Abstract: We use a hedonic house price model to estimate the value of green spaces and parks to homeowners in the Dublin area. Using a dataset of house sales between 2001 and 2006 and combining it with available data on the location of green spaces in Dublin it is possible to assess the different values assigned to green areas by homeowners. We find that the value of green space depends first of all on how far from the property it is located. We also find a difference in the values assigned to open access parks and green spaces. For every 10% increase in the share of green space and park area near a house, its average price increases by 7% to 9%. We also attempted to identify different individual parks and rank them according to their value, however due to spatial multicollinearity the results were mixed.

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1. Introduction

In rapidly growing urban areas with increasing land prices, construction of housing and commercial property tend to become very lucrative and green spaces can be crowded out. Construction of new housing in Dublin was one of the driving forces of the economy in the last decade and the construction of new builds maintained a very high rate throughout the Celtic Tiger years, with the national average reaching 18 new builds per 1000 inhabitants in 2007 compared to a European average of 5.3 per 1000 inhabitants.[1] While the construction of housing itself is not necessarily a problem, the management of large scale construction projects without the necessary or recommended level of master-planning that is required to maintain coherent urban spaces can be problematic. Unfortunately, due to the speed and scale of construction projects in the Irish capital, there are now areas of Dublin which have inadequate school, transport or retail infrastructure. The absence of such amenities has an effect on the house prices in these areas. Much of public policy, understandably, concentrates on amenities of public infrastructure such as education and transport. The benefits of the provision of green spaces and parks in residential areas have however only recently been emphasised by policymakers.

According to Dublin City council there are approximately 3500 acres of park land and open spaces within Dublin City.[2] The types of green spaces in Dublin are wide ranging and Dublin boasts the largest enclosed urban public park in Europe, Phoenix Park. Proximity to green spaces is valued by homeowners for the recreational and aesthetic value of the space. It has also been shown that access to green spaces can positively affect people's health. Hartig and Fransson (2009) looked at the effect of access to leisure homes in Sweden on the probability of early retirement for health reasons. They found that men with access to green spaces were less likely to have health problems later in life. They also refer in their paper to the "gray:green ratio" which is the ratio of green spaces to urban built areas. They state that people might be

[1] CSO (2008), *Construction and Housing in Ireland 2008 Edition*, Table 11.1, p.64, Total House Completions in Ireland, Ireland and Euroconstruct countries.

[2] http://www.dublincity.ie/RECREATIONANDCULTURE/DUBLINCITYPARKS/Pages/parks.aspx

> "able to live in and enjoy high urban residential densities if outdoor spaces were designed to better afford visual and physical access to natural areas, even if those areas were small in size".

Hence, access to green spaces provides recreational, aesthetic and physical benefits, however as access to most urban parks and green spaces is free it can be difficult to establish the monetary value attached to them. In this regard, we need to use non-market valuation techniques, such as the hedonic house price model which will be further explained later in this paper. The value of green spaces has become quite a topical research question and quite a few hedonic studies have been conducted in a variety of countries.

One of the earliest papers on the value of parks is by Weicher (1973). He refers to work by Milton Friedman (1962) who identified the problem of valuing city parks and how to charge those benefiting from the park but who do not access it: passers by enjoying the scenery. Friedman identified the externality to be valued, the aesthetic value of the park, and Weicher made an attempt at valuing it for five parks in Columbus, Ohio. He included three variables relating to parks: whether or not the house was close to and facing a park, whether it was close to and backing onto a park and if the house was close to the park and facing an area with heavy recreational use. He found that the highest premium was paid for houses facing a park and backing onto parks (23% more). However, houses close to recreational areas sold for less. He attributes this to a loss of privacy and security. Since this paper, various other studies of the value of green spaces have been conducted in the United States and abroad. These have focussed on different types of green spaces, ranging from large spaces such as forests and parks to smaller areas such as the landscaping in front of specific houses.

Cho et al. (2008) use data of sales of over 9000 houses in Knoxville, Tennessee in 2001 to value urban forests. They find that evergreens and more natural looking forests are valued in more rural areas whereas areas that are more urban place a higher value on having tree variety (mixed forest species). Tyrvaeinen and Miettinen (2000) look at the same type of urban forests but in Finland in 1996. They use four different variables relating to green spaces: distance to the nearest wooded recreational area, the direct distance to the nearest forested area, the relative amount of forested areas in the housing district, and the view from the dwelling window. They find that a one kilometre increase in the distance to the nearest forested area leads to an average 5.9 percent decrease in the market price of the dwelling. Views onto forests increase prices by 4.9%.

On a smaller scale, Voicu and Been (2008) focus on the effect of community *gardens* on property prices in New York city between 1974 and 2003. They use a difference in difference specification of a hedonic regression model on residential properties and find significant positive effects in the poorest neighbourhoods. They also find that high quality gardens have the highest impact indicating that the quality of the space is also important.

Finally, Des Rosiers et al. (2002) look at the green areas directly related to the house and the property's outdoor landscaping. They use data on 760 houses in Quebec sold between 1993 and 2000. This is a very detailed analysis which looks at the percentage tree cover on the property and in the neighbourhood as well as landscaping attributes (e.g. landscaped patio and curbs, rock plants etc.). They find that the positive effect of trees on property prices is higher when there is a larger proportion of retired people living in the area. They also found that hedges and landscaped walls added 4% to the price of a property through their visual impact. Anderson and Cordell (1988) provide even more detail and find that houses in Georgia with on average five trees in the front yard sold for 4% more than houses without, and that trees of medium to large sizes were valued more.

Studies on the value of other types of green spaces are numerous and use similar methodologies. Bolitzer and Netusil (2000) use dummies for homes located within different distance thresholds of green spaces while Bender et al. (1997) use a similar variable: distance to green areas. Hobden et al. (2004) concentrate on park sizes and whether or not they include trails. Leigh and Coffin (2005) look at the effect of an announcement of a change of regulation on the price of houses close to brownfields in Atlanta. Luttik (2000) uses separate variables for being within the vicinity of a park and having a view of an open space in a study in the Netherlands while Espey and Owusu-Edusai (2001) look at park size and available amenities in South Carolina. Crompton (2005) provides a comprehensive literature review of studies conducted in the US and McConnell and Walls (2005) survey the literature since the 1970s.

Two similar papers to this study are those by Mansfield et al. (2005) and Geoghegan (2002). Mansfield et al. (2005) use the density of green areas within three circular buffers around the houses in their sample. They also use the distance to the edge of a parcel of greenness defined as an area of vegetation. Finally they include dummies for whether or not a house is close to the perimeter of a green parcel. We use similar variables in this analysis. Mansfield et al. use a dataset consisting of 11,500 house sales in North Carolina between 1996 and 1998. They find that the closer a house is to green areas the higher the value of that property and that the overall level of "greenness" in an area also adds value to a property. They conclude that parcel greenness can substitute for proximity to a forest. Geoghegan (2002) conducts a similar study on residential land values in Maryland and uses similar distance and density variables. An original feature of this paper is that her data allow her to split her open space variable into developable open space and permanent open space. She finds that people value permanent open space much more than green space that might be developed in the future. This has important policy implications at a zoning level.

Hence studies have shown that green spaces are valued for their aesthetic value, amenity value, health benefits and visual impacts. Secure and well-kept spaces are favoured, however being located too close to a very popular park can be a negative externality (for noise, nuisance and security reasons). Parks with bigger, more mature trees are favoured, as are mixed species forests. Homeowners will pay a premium to live in a "green" neighbourhood and will pay even more to live somewhere that is not likely to be developed in the future. Most of these results pertain to small cities in the United States. Here we will attempt to see if they are also valid for a European capital city: Dublin.

The remainder of this paper is set out as follows. The following section presents the model used in this paper and in those described above: the hedonic house price model. Section 3 describes the data used in the study. Section 4 presents the results for two different aspects of green spaces. Finally, Section 5 provides a discussion and conclusions.

2. The model

Due to the non-market nature of parks and open spaces, it is difficult to measure their benefits to society. Different non-market valuation techniques have been used to try and estimate the value of open spaces. Contingent valuation is a stated preference technique where respondents are directly asked how much they would be willing-to-pay for a specific amenity. It has the advantage of taking a range of benefits (recreational, aesthetic, etc.) into account, but is subject to bias as the responses are entirely dependent on the respondent's decision and not based on any market transactions. The travel cost method has also been used to estimate the value of certain major park amenities. The use of this method is however only possible if access to the park is costed. In that case the value of the park is estimated depending on the number of visitors, cost of access and distance travelled by those visiting.

On the other hand, hedonic analyses use unrelated market-based transactions as indicators of a person's preferences. The hedonic technique is based mainly on work by Griliches (1961) and Rosen (1974) and originated in the development of value indices for manufactured products that combined measures of quantity and quality. A hedonic analysis decomposes the price of a good into the prices of the separate characteristics of that good and centres on consumers' choices regarding composite goods.

The most common hedonic analysis is the hedonic house price model. A house can be decomposed into its constituents, for instance, number of rooms, bathrooms, size of the garden and car park spaces. All of these attributes make different contributions to the price of the house. On top of these house characteristics, neighbourhood characteristics also contribute to house prices. If you have a large enough bundle of houses, it is possible to econometrically separate out the implicit price of the attributes.

The hedonic price function takes the following form:

$$PRICE = f(S, N, E) + \varepsilon$$

where the price (or logged price) of the house is a function of the house's structural characteristics (number of bedrooms, size in square meters etc.), neighbourhood characteristics (such as location in the city, access to transport routes etc.) and environmental characteristics (such as proximity to green spaces, to the coast, quality of ambient air). ε is the error term. The house price is thus a function of all of the attributes relating to the house and the resulting coefficients are the marginal implicit prices of the attributes. This analysis uses ordinary least squares and a semi-log specification which the most common specification in these types of studies. Consequently the results will represent the percentage change in the price of the house for a one unit change in the explanatory variable.

Our basic model looks as follows:

$$\ln(H) = \alpha X + \beta Z + \delta Y + \gamma Q + \eta T + \lambda E + \kappa GreenSpace + \phi Parks$$

Where ln(H) is the log sale price of the property, X is a vector of property related characteristics, Z are a series of location fixed effects which take account of unobserved neighbourhood features, Y and Q are a series of year and quarter of sale dummies to take account of any time or seasonality trends. T are a series of transport related variables and E are a series of environmental variables. Finally we include park and green space variables. We estimate two types of models. The first uses the density of green spaces and parks and the second looks at the effect of specific named parks on house prices. The following section details the house price data used in the analysis and the GIS based environmental variables included.

3. Data

The dataset used in this analysis is composed of a house price and characteristics dataset, which was then related to information on the location of green spaces and parks. The house price dataset was provided by Sherry FitzGerald, Ireland's largest property advisory group. The dataset consists of a representative sample of house sales facilitated by Sherry FitzGerald in the Dublin area between January 2001 and December 2006. This amounted to just over 9,700 dwellings. The complete addresses were used, along with the An Post Geodirectory, to geo-code the data. Not all addresses in the original database were amenable to geo-coding. Our valid sample size after geo-coding was 6,956, covering most of the Dublin area (see Figure 2) and a wide range of house prices. This is not only a large sample but also very detailed and location specific. A comparison of the dataset with other sources of housing market data indicates that our sample has an average price for houses that is higher than other sources. However, this reflects the fact that the majority of transactions within our dataset take place in South Dublin, the part of the city that is generally much more expensive than other areas.

The available structural variables are the floor space, measured in square metres, the number of bedrooms, the presence or not of a utility room, of parking and of a garden, whether the heating system is gas heating or not and the condition of the house as assessed by the real estate agent (excellent, fair, poor, very poor, unknown). The type of dwelling is also included (apartment, detached house, semi-detached house terraced house and cottage) as well as in what period the house was built (pre-1900, 1900-1950, 1950-1975, 1975-2000, post-2000).

We then incorporated GIS data from a number of sources. The environmental variables include the distance to the nearest beach and to the coastline. This data was provided by the Environmental Protection Agency (EPA). Transport variables include three types of rail transport: proximity to train stations, commuter rail stations and light rail stations as well as distance to tracks.

We allowed for unobserved heterogeneity in area characteristics through the use of locality dummy variables, and we included quarterly dummy variables (from Q1 2001 to Q4 2006) to control for house price inflation. Potential seasonality in house pricing was also accounted for using a dummy for each calendar month. The 105 locality dummies represent neighbourhoods, and each is made up of one or more electoral districts sharing a common area name. We considered using individual electoral district variables as locality controls, but we have too few observations to allow the use of such small area dummies (there are over 200 electoral districts in our sample area).

Green space data was extracted from the CORINE 2000 project courtesy of the EPA and combined with European Environmental Agency data on green urban areas within urban zones.[3] This allowed us to identify all types of green spaces in Dublin (small tree areas, neighbourhood greens, neighbourhood parks and larger city parks). All of these areas are visible in Figure 1. We were then able to locate what we call 'open access named parks'. We identified 22 of these in Dublin. This was a somewhat subjective selection based on the authors' knowledge of the largest parks, the most popular tourist parks and those with extra amenities (sports facilities, art installations, memorials). This was the basis of the separation between two of our main "greenness" variables: green spaces and park space (any of these 22 parks).

The next step was to create buffers around each of the houses and calculate the density of the two types of green space within those buffer zones. We also created variables for the Euclidean distance to the nearest park boundary and dummies for each of the parks which equal 1 of that park is the closest named park to that property. A specific Phoenix Park dummy was included in all the models, it is equal to 1 if Phoenix park is the closest park to a property and zero otherwise.

The following section presents the results of the analysis. The first section presents the overall neighbourhood and house characteristics. The second section focuses on the

[3] EEA (2005), Results of the extraction of Green Urban Areas (GUA) from satellite data within Urban Morphological Zones (UMZ), http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=912.

density of green spaces and parks and the final section underlines the results and issues relating to individual public access parks.

4. Results

We look at the effect of green spaces from two perspectives: First, the density of green spaces and parks in the vicinity of houses; and second the effect of distance to specific named parks. We start with a short description of the results relating to other variables included in the analysis (a more detailed presentation of these results is available in Mayor et al., 2008).

4.1. Transport, neighbourhood and house characteristics

A hedonic analysis must include a number of different variables in order to be able to single out the effect of a park. We consequently included in the regressions as many of the variables that might affect house price. This section presents the results of the different estimations. First we included a number of area and time dummies to take account of seasonal and neighbourhood effects on price. This included quarter dummies and monthly dummies for the time of sale as well as 104 locality dummies to take account of intrinsic neighbourhood characteristics. As there are so many of these variables the complete regressions are included in the appendix and the main transport and environmental variables are reported in Table 1.

Second, we include some transport related variables to take account of closeness to public transport access. Distances to train stations, trams stations and rapid rail transit stations as well as train tracks are included. We find that living within 2km of a light rail station adds between 9% and 11% to house value (depending on which tram line it is). The older rapid rail transit stations add approximately 3% to house values in the vicinity. Environmental and recreational amenities such as distance to beaches and coasts were also included. We find that living very close to a beach confers a negative externality while living in the vicinity adds to house value. The further away from the coast a house is, the smaller the positive externality.

Finally, the house characteristics themselves were also included in the analysis. As expected, the bigger the house the higher its value. People place a higher value on detached houses with a garden, a parking space, that are in excellent condition and that are either very new or very old (pre-1900). We now turn our attention to the value of green spaces and parks in Dublin.

4.2 Density of green spaces

As mentioned above we defined two types of green spaces. The first, which we refer to as "parks" includes all large green spaces in Dublin that would be referred to as an open access park. These include Dublin's largest park, Phoenix Park and a variety of other local parks. The data also allowed us to identify green areas in Dublin. These were areas with trees and grass that were not necessarily parks but could be used as an outdoor play space. These "greens" are fairly common in housing estates in Ireland. They do not necessarily have any extra amenities (playground, picnic tables) but are visible pieces of nature in the city. Consequently, we analysed the effect of green spaces and separately of parks on house prices in Dublin.

As the green spaces can be quite small and dotted around an area, the distance to the nearest green space may not be a useful indicator. Consequently we placed geographical buffers around each house in our sample and measured the percentage of each buffer that consisted of green spaces or parks. Table 2 presents different buffer sizes and their corresponding measure in square meters. For instance, with a 100 meter buffer, a 1% increase of green space within that buffer refers to approximately an extra 313 square meters of green space.

Table 3 presents the regression results relating to the different green spaces. Model 1 presents the results using a 200 meter and a 2000 meter buffer for the green space and park density variables. A Phoenix park dummy is also included. A 10% increase in green spaces within 200 meters of a house results in a 9.0% increase in house prices. A 10% increase in green spaces in areas between 200 meters and 2 kilometres of a house results in a 7.6% increase in house prices. People seem to be valuing proximity and possibly the visual impact of green spaces more than their larger neighbourhood being green. Nevertheless living in a green neighbourhood is still highly valued by property owners.

Similar variables for parks were included in the regression in Model 1 with 200m and 2000m buffers. However, there was no significant difference between the two buffers and in Model 2 only the 2 kilometre buffer was used. A 10% increase in park area within 2000 meters of a house results in a 6.6% increase in the house price. People do not place a significantly different value on parks depending on whether they are very close to their house or within walking distance.

We also checked to see if combining the two types of green spaces would affect the results. The results are presented in Model 3. We find that a 10% increase in green spaces or park area within 200 meters of a house increases the house price by 9.0% and by 7.0% if within 2000 meters, both of which are in the same range as the estimates above.

Phoenix Park is by far the biggest park in Dublin and results for houses in any of the areas surrounding the park could be affected. A Phoenix park dummy was included and is one if Phoenix Park is the closest named park to the house and zero otherwise. The dummy variable is positive and weakly significant and its inclusion in the model does not affect the results for the parks and green spaces variables.

These results are consistent with the Mansfield et al. (2005) study. People will pay a premium to live in an area with more green spaces and place even more value on having these spaces within a very close vicinity to their house. Being able to access parks is also important but property owners do not necessarily require the parks to be on their doorstep. The following section presents the results for the regressions estimating the impact of specific named parks.

4.3 Distance to named public access parks in Dublin

Given the likely importance of a park's quality for its value, it would be interesting to identify the value of individual parks. Dublin has a number of parks of different sizes, quality and offering different amenities located around the city. These are of different sizes and can sometimes be located quite close to each other. We first included the logged distance to each of the 22 parks we had identified. The results are presented in Table A1 in the Appendix. The first model includes all 22 parks and the next few models include just some of the parks. As Dublin is a compact city with a large number of parks, we suspected we may have a multicollinearity problem. When alternate parks were eliminated the coefficients, signs and significance of the other parks changed a lot. As all the parks were spatially quite close to each other it was not possible to identify the specific effects of each park and hence it was not possible to include them all in the analysis.

Consequently we decided to concentrate our efforts on a selection of parks. We then picked five parks: Phoenix Park as it is the biggest park in Dublin, St. Anne's Park, a popular walking park in North Dublin, Marlay Park in the South, Ringsend in the East and Tymon in the West. We acknowledge that there is no objective reason for picking these parks and not others but we decided to pick the biggest ones in each section of the city.

We used a dummy equal to 1 if the park was within 2500 meters of the house in any direction and zero otherwise. Table 4 presents the results including the dummies with the 2500 meter buffer. Again they remain fairly stable regardless of how many of the dummies are included. Only two variables are statistically significant. Being within walking distance of Phoenix Park confers a positive externality on the house price and being within walking distance of Tymon park a negative externality. The very high coefficient on the Phoenix Park dummy is likely to be due to the fact that properties that close to the park are no where near other environmental amenities such as the beach or coast and consequently their main attraction is their location close to the park. The negative coefficient on the Tymon dummy may be due to congestion issues in and around the park at weekends as it is used for a variety of sports events. However, it is more likely to be due to its proximity to Dublin's busiest motorway, the M50.

5. Discussion and conclusion

We use a hedonic house price model to estimate the impact of green spaces on house prices in Ireland. We find that green areas have a positive externality and result in higher house prices in the neighbourhood. People distinguish between green space in the close vicinity of their house and within walking distance in their neighbourhood. The premium associated with having a greener neighbourhood is between 7% and 9% depending on the proximity buffer used. We also find that people value being close to park amenities but do not value close proximity more highly. This would imply that the green spaces provide an aesthetic and visual externality whereas the parks are preferred for their recreational value.

We also included a number of transport and structural variables to ensure the model was taking account of as many possible factors affecting the house price. We find that living close public transport links is considered a positive amenity. However being located close to train tracks is a negative externality due to noise and visual intrusion.

Environmental variables such as closeness to coast and beaches also command a premium.

Although it was not possible to measure the exact value of city parks, the results of the density regressions do indicate to city planners and developers the value of maintaining green spaces. Home buyers value the advantage of being close to a park but what the results in this paper emphasise is that home buyers place even more importance on having a certain level of "greenness" outside their front door. As advocated by Hartig and Fransson (2009) high density urban living areas, such as some recently developed in Dublin would be considered more pleasant to live in if a certain level of green space was maintained in the area.

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Tables and Figures

Table 1. Results - Transport, environmental and structural variables

VARIABLES	(1) Model Coefficient	s.d.
Within 1500m of a train station	0.01	(0.01)
Within 2000m of a commuter rail station	0.03**	(0.01)
Within 1000m of a train track	-0.01	(0.01)
Within 250m from a beach	-0.27***	(0.06)
Between 250m to 500m from a beach	0.13***	(0.05)
Between 500m to 1km from a beach	0.07***	(0.02)
Between 1km to 1.5km from a beach	0.03**	(0.02)
Within 250m from the coast	0.22***	(0.02)
Between 250m to 500m from the coast	0.16***	(0.02)
Between 500m to 1km from the coast	0.12***	(0.01)
Between 1km to 1.5km from the coast	0.06***	(0.01)
Within 2000m of the south city light rail line, zone 2	0.11***	(0.01)
Within 2000m of the south city light rail line, zone 3	0.09***	(0.02)
Within 2000m of the north city light rail line,	0.02	(0.03)
Ln(Floor Area)	0.64***	(0.01)
Number of bedrooms	0.03***	(0.00)
Existence of a utility room	0.04***	(0.01)
Gas heating	-0.02***	(0.01)
Garden	0.03***	(0.01)
Parking	0.01**	(0.01)
Good condition	-0.03***	(0.01)
Fair condition	-0.08***	(0.01)
Poor condition	-0.09***	(0.01)
Very poor condition	-0.15***	(0.03)
Unknown condition	-0.02	(0.03)
Apartment	-0.02	(0.02)
Detached house	0.16***	(0.01)
Terraced house	-0.07***	(0.01)
Cottage	-0.08***	(0.03)
Built pre1900	0.16***	(0.01)
Built pre1950	0.09***	(0.01)
Built pre1975	-0.03***	(0.01)
Built pre2000	-0.04***	(0.01)

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

Table 2. Buffer zones and their related area size

Buffer Zone	Total area in m^2	1% increase in area in m^2
100m	31374.21	313.74
200m	125579.84	1255.79
500m	785189.28	7851.89
1000m	3141174.66	31411.74
2000m	12565534.03	125655.34

Table 3. Results – park and green space density regressions

VARIABLES	(1) Model	(2) Model	(3) Model
Phoenix Park dummy (within 2000m)	0.02*	0.02*	0.02*
	(0.01)	(0.01)	(0.01)
% of park space within 200m of house	0.90***	0.90***	
	(0.10)	(0.10)	
% of green space between 200m and 2000m of house	0.76***	0.76***	
	(0.10)	(0.10)	
% of park space within 200m of house	0.66***		
	(0.08)		
% of park space between 200m and 2000m of house	0.67***		
	(0.08)		
% of park space within 2000m of house		0.67***	
		(0.08)	
% of park and green space within 200m of house			0.89***
			(0.07)
% of park and green space within 2000m of house			0.75***
			(0.07)
Constant	9.06***	9.06***	9.06***
	(0.06)	(0.06)	(0.06)
Observations	6956	6956	6956
R-squared	0.89	0.89	0.89

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

Table 4. Results – Dummy park is within 2500m of property

VARIABLES	(1) Model	(2) Model	(3) Model	(4) Model	(5) Model	(6) Model
Ringsend park within 2500m	0.01	0.01				
	(0.02)	(0.02)				
Phoenix park within 2500m	0.14***		0.15***			
	(0.02)		(0.02)			
Marlay park within 2500m	-0.01			-0.01		
	(0.02)			(0.02)		
Tymon park within 2500m	-0.05***				-0.06***	
	(0.02)				(0.02)	
St. Anne's park within 2500m	0.02					0.02
	(0.02)					(0.02)
Constant	9.13***	9.13***	9.13***	9.13***	9.13***	9.13***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Observations	6956	6956	6956	6956	6956	6956
R-squared	0.88	0.88	0.88	0.88	0.88	0.88

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

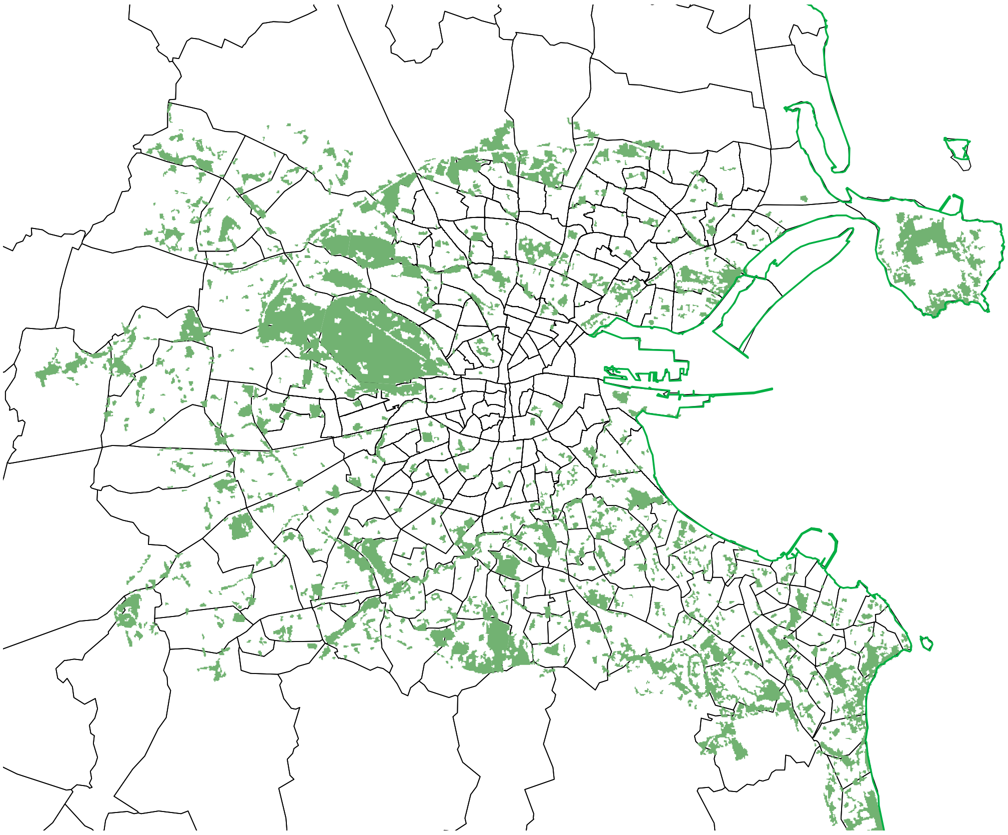

Figure 1. Map of Dublin with green spaces used in analysis (green area).

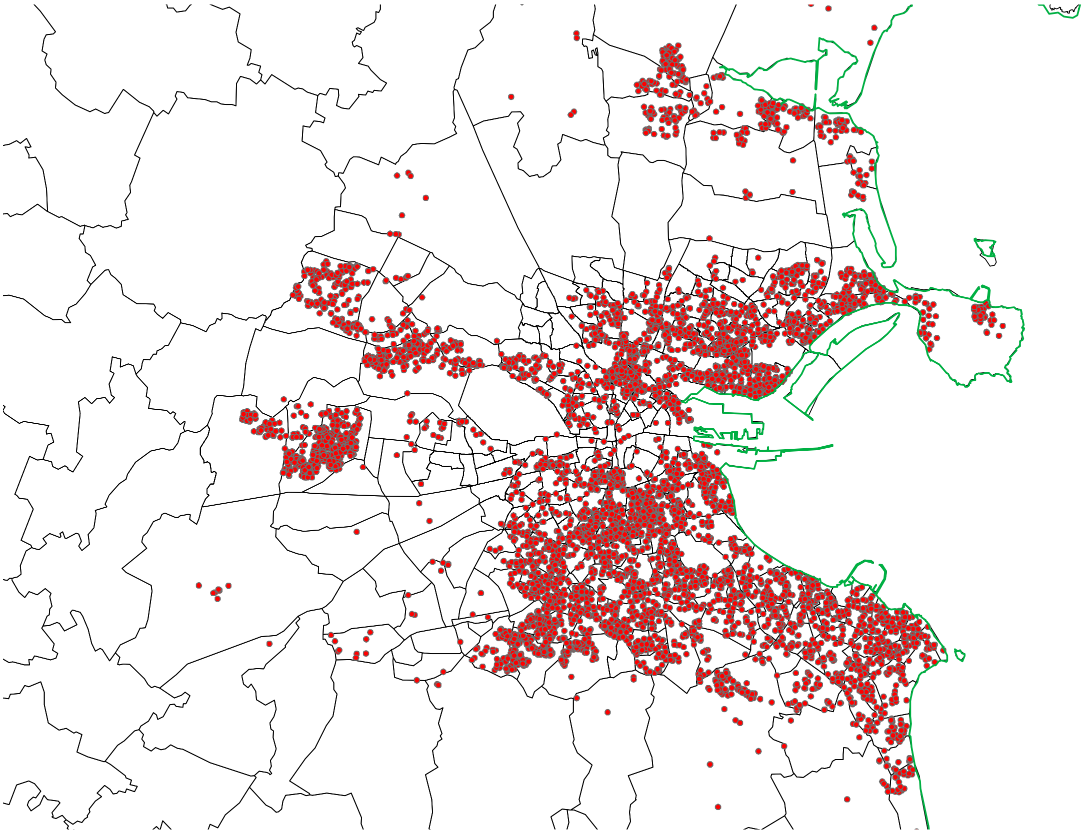

Figure 2. Map of Dublin with location of sample houses used in the analysis (red dots). Map by authors. Data from Sherry FitzGerald.

Appendix

Table A1. Results – Logged distance to individual parks

VARIABLES	(1) Model	(2) Model	(3) Model	(4) Model	(5) Model
Poppintree	0.45**		0.74***	0.29	0.36*
	(0.21)		(0.20)	(0.21)	(0.19)
Ellenfield	-2.79**		-4.72***	-1.78	-2.28*
	(1.41)		(1.36)	(1.43)	(1.34)
St. Anne	-0.03*		-0.01	-0.05***	-0.04**
	(0.02)		(0.02)	(0.02)	(0.02)
Prospect	-0.18***		-0.23***	-0.17***	-0.10***
	(0.04)		(0.03)	(0.04)	(0.03)
Phoenix	-0.63***		-0.62***	-0.65***	-0.32***
	(0.09)		(0.09)	(0.09)	(0.03)
Griffith	-0.05***	-0.09***		-0.06***	-0.06***
	(0.02)	(0.02)		(0.02)	(0.02)
Ringsend	0.21***	0.22***		0.25***	0.22***
	(0.04)	(0.04)		(0.04)	(0.04)
S.Moore	-0.12***	-0.13***		-0.23***	-0.12***
	(0.04)	(0.04)		(0.04)	(0.04)
E.Ceannt	0.10***	0.09***		0.10***	0.12***
	(0.03)	(0.03)		(0.03)	(0.03)
Kenilsworth	-0.10***	-0.09***		-0.18***	-0.10***
	(0.03)	(0.03)		(0.02)	(0.03)
Palmerstown	-0.12***	-0.12***	-0.13***		-0.12***
	(0.02)	(0.02)	(0.02)		(0.02)
Tymon	0.24***	0.24***	0.22***		0.33***
	(0.04)	(0.04)	(0.03)		(0.03)
Bushy	0.11**	0.12**	0.10**		-0.10***
	(0.05)	(0.05)	(0.05)		(0.02)
Deer	-0.19***	-0.19***	-0.19***		-0.16***
	(0.02)	(0.02)	(0.02)		(0.02)
Dodder-Knocklyon	-0.10***	-0.09***	-0.09***		-0.12***
	(0.02)	(0.02)	(0.02)		(0.02)
Riversdale	0.05**	0.05**	0.05**	-0.12***	
	(0.02)	(0.02)	(0.02)	(0.02)	
Longmeadows	0.46***	-0.04	0.48***	0.60***	
	(0.08)	(0.04)	(0.08)	(0.08)	
Cardiffsbridge	-0.24***	-0.41***	-0.28***	-0.23***	
	(0.06)	(0.05)	(0.06)	(0.07)	
Tolka	0.28***	0.21***	0.31***	0.26***	
	(0.06)	(0.05)	(0.06)	(0.06)	
Terenure	-0.27***	-0.28***	-0.27***	-0.20***	
	(0.05)	(0.05)	(0.05)	(0.02)	
St. Ed	0.11***	0.11***	0.11***	0.13***	0.13***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Lorcan O'Toole	0.04*	0.07***	0.05**	0.05**	
	(0.02)	(0.02)	(0.02)	(0.02)	

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