



Good Parks - Bad Parks: The Influence of Perceptions of Location on WTP and Preference Motives for Urban Parks

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Abstract

Urban parks generate substantial public benefits yet explicit economic assessments of such values remain relatively rare. Surveys of willingness to pay (WTP) were undertaken to assess such values for proposed new parks. The analysis assessed how preference motives and values varied according to the location of parks. Results revealed greater altruistic motivation and higher overall values for the creation of inner city as opposed to suburban parks. Spatial decomposition revealed that, after controlling for other determinants such as incomes, values generally increase for households closer to proposed parks, but that a significant downturn in values is evident for households located very close to a proposed inner city park; a finding which echoes concerns regarding the potential for such sites to provide a focus for antisocial behaviour. While these findings provide strong overall support for provision of public parks they highlight the importance of perceptions of location and the potential for localised dis-benefits.

Key Words

Parks, WTP, Distance Decay, GAM.

1. Introduction

Urban parks and other green spaces provide a wealth of benefits to urban residents. These include cultural services such as the provision of unique recreation and leisure opportunities as well as an array of ecosystem services including noise and pollution abatement (Whitford et al, 2001), climate and hazard regulation (see Davies et al., 2010 for a thorough review). Outdoor activity programs have even been shown to offer similar cost-effectiveness to behavioural therapy for social recovery in those living with mental illness (Willis et al., 2016). This wide range of benefits combined with an ever increasing demand for natural landscapes within increasingly populous urban areas of the UK results in public parks and green spaces being some of the most valuable land in the British landscape (Bateman et al. 2011).

Given this, the number of primary valuation studies of UK urban parks is surprising low (CabeSpace, 2005; Dehring & Dunse, 2006; Hanley & Knight, 1992). The present study sets out in part to address this research gap, using one of the longest serving approaches to estimating non-market values; the contingent valuation (CV) method (Mitchell and Carson 1989; Loomis, 2012; Mahieu et al., 2014). Here the approach is used to directly ask survey respondents what they would be willing to pay (WTP) for the creation of new public parks in the city of Norwich, UK. In addition, this study investigates the importance of the environmental attributes individuals perceive at different proposed park locations and the attitudes of the residents themselves. One of the major objectives of this paper is to explore commonly held assumptions regarding the distance decay of WTP values for environmental assets. This is achieved through the use of novel statistical techniques within a parsimonious

1
2
3 model of the determinants of WTP that includes both traditionally considered economic and
4
5 spatial, as well as less commonly considered, attitudinal determinants of WTP.
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8 2. Distance Decay in WTP 9

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11 Previous stated and revealed preference studies have found that WTP for environmental
12
13 assets such as urban parks decreases with increasing distance from the good (Salazar &
14
15 Menendez, 2005; Garcia, 2014). Here it is presumed that as distance to the good increases,
16
17 the costs of access rise and so does the ratio of users to non-users. As users are considered
18
19 to hold higher values than non-users the overall result is that average WTP declines with
20
21 increasing distance (Bateman et al. 2006).
22
23

24
25 While distance decay for public goods is often presumed to be linear and non-decreasing
26
27 numerous hedonic pricing studies have found quadratic or inverted U shape relationships
28
29 with proximity to a range of goods such as schools, transport hubs and shops (Day et al
30
31 2007). Here it is presumed that people want to be close to reduce travel costs, but far
32
33 enough away to avoid potential local disamenities such as, noise and traffic. Indeed the
34
35 value of proximity has been shown to vary for different property types (Dehring & Dunse,
36
37 2006) neighbourhood characteristics (Anderson & West, 2006) and park types (Espey &
38
39 Owusu-Edusei, 2001). For example, Dunse et al., (2007) found that houses located on park
40
41 edges exhibit insignificant or significantly negative relationships with distance, while flats
42
43 located on park edges exhibit significant positive relationships with distance. The authors
44
45 speculate that issues of security and perceptions of anti-social behaviour drive these local
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47 disamenities for houses but for residents of flats the benefits of proximity outweigh any
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3 local disamenities. Perceptions of nuisances (such as vandalism¹ and youngsters hanging
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5 around) have been ranked as more important than the presence of facilities (such as cafes,
6
7 and the presence of trees) by older people in Britain (Aspinall et al., 2010).
8
9

10
11 The existence of non-monotonic distance decay relationships has implications for both park
12
13 management and planning, as well as the use of value transfer techniques (Johnston et al.,
14
15 2015; Simpson, 2016) for valuing urban parks and other public goods. Value transfer
16
17 techniques make use of existing valuations to generate values for sites where no
18
19 assessments exist. While value transfers may only ever be a substitute, the reduction in
20
21 costs compared to primary valuations have resulted in value transfers becoming common
22
23 practice for recreational and natural sites (Rosenberger & Loomis, 2001; NRC, 2005).
24
25

26
27 Assumptions of monotonic distance decay relationships feature heavily in value functions
28
29 used for the transfer of values to sites for which no primary valuations exist (e.g. Bateman
30
31 and Langford 1997; Pate and Loomis 1997; Bateman et al., 2006; Day et al., 2007; Bateman
32
33 et al., 2011). The prevalence of assumptions regarding linear distance decay in the value
34
35 transfer literature is epitomised by recommendations that the presence of monotonic
36
37 distance decay be used as validation of the theoretical expectations of economic theory
38
39 when considering the validity of both primary valuations and values derived from transfers
40
41 (Bateman et al., 2010). In this study the potential for complex distance decay relationships
42
43 are explored through the use of flexible semi-parametric approaches (Ferrini and Fezzi,
44
45 2012) to the modelling of WTP bids which through the use of smoothing functions avoid the
46
47 imposition of specific functional forms onto the modelling of consumer preferences.
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54
55 ¹ A UK based poll showed that whilst 91% of people agreed that public parks and open spaces
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57 improve their quality of life, one in five respondents felt that investing money in park maintenance
58
59 was not justified due to vandalism of park facilities (CABE, 2005).
60

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6 In addition to the use values that urban parks provide they may also provide significant non-
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8 use values (including the utility others gain from there usage or potential usage). Previous
9
10 studies have demonstrated that attitudes can be a significant predictor of WTP for non-use
11
12 values such as the protection of endangered species (Kotchen & Reiling, 2000). Hanley et al.
13
14 (2003) found that use values decreased more rapidly with distance than non-use values and
15
16 suggests that distance decay will vary both spatially within a resource type and across
17
18 different resource types. As stated preference methods measure both use and non-use
19
20 values, a proxy measure of environmental concern was included to account for the potential
21
22 influence of other regarding attitudes on WTP. While attitudes are object specific, values are
23
24 general and abstract and often exhibit weak relationships with behaviour. As such the
25
26 General Awareness of Consequences (GAC) scale was employed to measure a general
27
28 attitude towards environmental behaviour. It is a condensed version of the awareness of
29
30 consequences scale (Stern et al., 1993) and has been shown to be very similar to the NEP
31
32 scale (Stern et al., 1995) but with a greater focus on detecting underlying values such as
33
34 altruism and self-transcendence. Studies have shown that individuals with self-transcendent
35
36 and collective values are more willing to engage in different forms of altruistic, cooperative,
37
38 or pro-environmental behaviour than those with individualistic or self-enhancement values
39
40 (Nordlund and Garvill: Karp, 1996; Schwartz, 1992; Stern & Dietz 1994; Stern, Dietz & Black
41
42 1985-1986; Stern, et al., 1995). By accounting for the heterogeneous nature of participants
43
44 other regarding attitudes the influence that such attitudes have on WTP can be observed in
45
46 addition to any differences in the influence of attitudes on WTP between the two locations.
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3 In this study two locations which were both plausible whilst differing in their potential to be
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5 perceived as generating local disamenities and other regarding values were chosen for
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7 valuation. By proposing two parks with identical facilities that vary only in their location,
8
9 differences in both WTP values and motivations can be attributed to differences in
10
11 perceptions of the proposed locations. The first park, located in the city centre (CC)
12
13 represents a highly accessible location however the area is visibly run down being home to
14
15 an unfinished shopping complex (Anglia Square). While the CC location promises greater
16
17 social benefits in terms of its accessible and deprived location this is a double edged sword
18
19 as this run-down area is known to be frequented by substance abusers. It is possible that if
20
21 distance decay in values is detectable then it will be non-monotonic due to the presence of
22
23 local disamenities at the CC location. The second park (SB) was located near the outer ring
24
25 road in a suburban location. The locations of the proposed parks can be seen in Figure 1
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31 below. Although neither site is intended to be the best site for a new park, the two sites are
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33 for the most comparable, being next to large roads and shopping facilities; in addition, both
34
35 imply redevelopment of disused buildings.
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39 While the creation of both parks would involve urban re-development, the creation of the
40
41 city centre park would involve highly visible changes in a clearly run-down area including the
42
43 removal of a well-known abandoned building. It is hypothesised that both of these factors
44
45 will contribute to the relative “other regarding” value perceived to be created by the two
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47 locations by residents and thus make the CC location more appealing to those with altruistic
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49 attitudes.
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54 **Figure 1 ABOUT HERE**
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3. Study Aims

In this study the potential for CV methods to measure the benefits of urban parks in Norwich, UK is explored. Due to the innate spatial nature of these goods particular attention is paid to the role that spatial relationships have in the modelling of WTP for urban parks. These spatial relationships have broader implications for environmental valuation as they are used extensively in both stated and revealed preference valuations. Spatial variables such as distance are used both in the construction of value functions and in determining aggregation areas without having to rely on political jurisdictions in addition to increasingly being found in value transfer techniques.

- i) To provide economic value estimates for the creation of two new parks in Norwich.
- ii) To explore the influence of environmental attitudes on WTP for two new parks in Norwich.
- iii) To explore spatial relationships that influence WTP for new parks in Norwich.

4. Methods

In accordance with the recommendations of the NOAA panel (Arrow et al., 1993) surveys were administered face to face at participant's homes. This enabled us to remind respondents of their budgetary constraints as well as the existence of potential substitute sites. Participants were informed that "we are researching the value of parks to the people of Norwich" and wished to interview people about their experiences and views.

Interviewers were recruited internally from the university student population and were selected to facilitate testing of interviewer biases. All interviewers had a smart professional appearance and carried university ID cards so that participants could confirm their identity.

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3 Strict ethical guidelines were followed by the interviewers who made it clear to participants
4
5 that their participation was entirely voluntary, that their data could be removed from the
6
7 study at any point upon their request and importantly that the parks they were valuing were
8
9 entirely theoretical and the results would only be used for research purposes.
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12
13 The study area was defined by drawing a 1.5 mile circular buffer around each proposed park
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15 location. These two circles were joined together and a grid of 96, 500m² sampling squares
16
17 (shown in Figure 4.1) draped over this area. The resulting study area has the advantage of
18
19 covering the majority of the Norwich city local authority area whilst also extending to the
20
21 edge of the greater Norwich area (see Figure 1). In an attempt to obtain a representative
22
23 range of sample squares for interviewers to canvas, the straight line distance to each park
24
25 was calculated for every postcode centroid and averaged for each sample square. In
26
27 addition the average IMD (2007) English index of multiple deprivation scores for all
28
29 postcode centroids within each study square were obtained and averaged. Averaged
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31 distance and deprivation scores for each study square were plotted against each other.
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33 Squares were then sampled from the resulting plot to provide a representative set both in
34
35 terms of deprivation and distance to each of the parks.
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4.1. Park Choice and WTP Questions

Previous researchers (Dijkstra et al., 2003) have asserted that the use of pictorial representations in evaluation tasks improve task realism, as such participants were shown stock photos of a verdant English park and informed that the park once complete would look like the photograph (see Appendix 1). The same photo was used to represent both proposed parks further re-enforcing to participants that the two parks were equivalent apart from their location whilst avoiding known problems with the disproportionate influence of irrelevant pictorial attributes (Laing et al., 2008). In order to establish the direction of participant's preferences and ensure participants had understood our proposal participants were asked which of the two parks they would prefer to be created if only one could be created. Participants were asked in an open ended format to explain their choice and to categorise their expected usage of the park into one of four categories. Assuming participants were familiar with the goods in question and that sufficient information had been provided for them to understand our proposal, interviewers explained that the significant costs of creating the new parks would be met through an increase in their annual council tax bill. In the UK both owners and tenants are liable for the payment of annual council tax bills which are charged on a per property basis. The amount payable is determined by the national valuation band for the home (based on 1991 assumed capital values), how much the local council charges for that band and whether the occupier is eligible to any discounts or exemptions. Those exempt from payment include under 18s, individuals with severe mental impairments live in carers and full time students. Average annual council tax bills in England at the time of this study ranged from £964 to £2878 (for property values \leq £40,000 and $>$ £320,000 respectively) DCLG (2013).

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2
3 Council tax was chosen over an entry fee due to its compatibility with the public
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5 provisioning of urban parks in the UK, it is also a payment vehicle with which the majority of
6
7 adults have experience, Vondolia et al., (2014) suggests that experience with a payment
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9 vehicle reduces protest bids. Council tax has been used as a payment vehicle in recent
10
11 contingent valuations of public libraries, which are also funded through council tax (Fujiwara
12
13 et al., 2015). A compulsory payment vehicle such as a tax increase also has the added
14
15 advantage of reducing free riding behaviour. It thus makes fairness implicit in the valuation
16
17 increasing the weight of other regarding motives. In order to compare the effect of the park
18
19 locations, each participant was asked three valuation questions, their maximum WTP for the
20
21 creation of: i) the CC park alone; (ii) the SB park alone; (iii) the creation of both Parks². A
22
23 payment ladder flashcard was presented to participants to select values from (see Appendix
24
25 2). In order to rule out potential ordering effects (Halvorsen, 1996) the order in which the
26
27 park valuation questions were presented was reversed on alternate sampling days.
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33 34 4.2. Protest Bids 35

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37 The presence of protest bids can introduce significant bias into WTP results, a problem
38
39 confounded by the lack of any consensus on how they should be treated (Boyle and
40
41 Bergstrom, 1999, Meyerhoff and Liebe, 2006). Their inclusion can lead to a downward bias
42
43 in predicted values (driven by non-economic motives) while their removal can lead to a self-
44
45 selection bias in the sample. This is particularly important given our interest in non-economic
46
47 motives. Protest bids are defined as a response which does not reflect the respondents
48
49 genuine WTP but instead a zero or an unrealistically high or low value (Bateman et al.,
50
51 2002). While true zeroes are the reservation price for individuals who are indifferent to the
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56 ² Collecting values for the creation of both parks allows us to observe any diminishment in values when
57 compared against the value of a single park.
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3 proposed change (Strazzera et al., 2003). To distinguish between the two, an open ended
4
5 question asking participants to explain the reasons for a zero bid was used. An optional
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7 don't know response was offered to accommodate participants who did not have sufficient
8
9 information to complete the valuation.
10

11 12 13 4.3. Participant Characteristics 14

15 Key socio-demographic variables were collected from each participant including age,
16
17 gender, the number of adults and under 18s in the household, total household income and
18
19 the number of cars available to the household. Budgetary constraint was measured using
20
21 both the number of dependents (under 18) and the total annual household income.
22
23 Altruistic attitudes were proxied by measuring participant's environmental concern with the
24
25 general awareness of consequences scale. The GAC was administered in its original self-
26
27 complete format towards the end of the survey. To minimize potential bias in the GAC
28
29 participants were re-assured that interviewers would not see their responses and were
30
31 given an envelope in which to seal their completed scale.
32
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41 The distance from each participant's geographic postcode centroid to the geographic
42
43 centroid of the two parks was calculated using ArcGIS network analysis and the Ordnance
44
45 Survey Integrated Transport Network (TM). Norwich postcodes can contain anything from 1
46
47 to 100 addresses and as such the use of postcode centroids introduces a significant amount
48
49 of spatial error in distance calculations and significantly reduces the variability in the
50
51 distance variable as many participants shared the same postcode. The average size of the
52
53 postcode polygons used in this study was 14639 m² (with a range of 456 m² to 102255 m²,
54
55 std dev = 15708 m²). (November 2007 version of the NSPD used).
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5. Results

Three interviewers collected 386 completed surveys³. 64 participants refused to value the CC park and 61 the SB park. Follow up questions revealed that the majority of these responses were attributable to the payment vehicle. These participants felt that council tax was already too high and refused to pay any more on this basis. A further 13 participants gave don't know responses for the value of park A (14 for park B) and 4 participants gave bids over £150 for the CC park (5 for the SB park). Out of the original sample of 386 participants, 37 failed to provide their household income. Removal of these participants and the above outliers gives a final sample of 270 participants with 270 bids for the CC park and 268 for the SB park.

No significant differences were found between the means of the study variables between the two ordering treatments ruling out any potential ordering effects. Comparison of socio demographic characteristics of our sample with the study area reveals no significant differences in the distributions of age in our sample and those calculated from the 2001 census⁴ for every postcode in the study area ($z=-0.399$, 0.69). Comparison of income values⁵ reveals that the distribution of incomes is significantly higher in the study area. While there was a significantly higher number of dependents per household than the average for the

³ Two male (22 and 26 years) and one female (51 years) interviewers were recruited, no significant differences were found between the estimated age of refusals and respondents ($t = -0.111$, $p = 0.912$). 568 individuals declined to be interviewed giving a 40% response rate. Of those who declined 53% were female and 46% male. This study was conducted in September 2009.

⁴ Mean ages were calculated from mid points of census frequency data for all over 18s.

⁵ Study area median household incomes were extracted from the Experian Mosaic data set at the LSOA level.

1
2
3 study area. These test results and descriptive statistics for both our sample and the study
4
5 area can be found in Appendix 3.
6
7

8 9 5.1. Environmental Attitudes

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11 The GAC scale measures individual's environmental concern by asking participants how
12
13 much they agree with statements regarding environmental degradation and protection.
14

15 While the GAC scale is designed to measure 3 value orientations (biospheric, egoistic and
16
17 altruistic) based on if the action occurs to avoid consequences for nature, the self or others
18
19 respectively. Factor analysis of the GAC item scores revealed a lack of clear dimensionality in
20
21 terms of the three value orientations, confirming the results of (Ryan & Spash, 2008) who
22
23 found that the GAC scale cannot be relied on to describe three value orientations. As a
24
25 result all subsequent analysis utilises the mean of all GAC item scores.
26
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30 31 5.2. Park Choice Results

32
33 246 Participants stated that they would prefer the CC park to be created over the SB park
34
35 leaving 133 choosing CC and seven giving a don't know response (Table 1). Showing a clear
36
37 preference for the creation of the CC park. Qualitative responses explaining why
38
39 participants chose each park were grouped according to their motivation resulting in 14
40
41 motivation categories⁶. Roughly 47% of those who chose CC referenced the city centre
42
43 location, a need for regeneration, a need for green space in the area and altruistic reasons
44
45 (would benefit others around the location) in their qualitative responses to why they chose
46
47 each park. Indicating that a significant number of people expressed a preference for the CC
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49
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52
53 ⁶ Categorized reasons given for choosing the CC park: prefer the CC Location, presence of alternatives around
54
55 SB location, prefer city centre location, location in need of regeneration. Reasons for choosing the SB park:
56
57 dislike the CC location, SB location more rural, prefer SB location, lesser of two evils, CC location not big
58
59 enough, easier parking at the SB location. Reasons which were present for either park choice: would use more,
60
would benefit others around the location, need for greenspace around location and better access.

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3 park based on its location. In contrast, the reasons given for choosing the SB location where
4
5 dominated by distance, access and a dislike of the Anglia square area (CC park location).
6
7 70% of the sample chose the park closest to them, however of the 118 not choosing their
8
9 closest park, some 81 (nearly 70%) chose the CC park. Indeed only 55% of those living closer
10
11 to Park SB actually chose the latter as their preference. Taken together these results show a
12
13 strong overall preference for the CC location⁷.
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16
17

18 **Table 1:**

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21 **(Table here)**
22
23

24 A Probit model was fitted to participant's Boolean park choice response coded so that one
25
26 represents a choice of the SB location and zero the CC. Results of this model are shown in
27
28 Table 2. The natural log of distance to the CC location has a significant and positive effect on
29
30 park choice showing that the further away from the cc location participants are, the more
31
32 likely they were to choose SB *ceteris paribus*. The coefficient for the natural log of distance
33
34 to the SB location is negative indicating that the further away from Park B the less likely you
35
36 are to choose the SB location *ceteris paribus*. The mean total GAC score also shows a
37
38 significant negative relationship with the likelihood of choosing SB indicating that
39
40 participants who express greater environmental concern are less likely to choose the SB
41
42 location. This provides clear evidence that participant's preferences over the two locations
43
44 are significantly influenced by their environmental concern. The categorical park use
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52 ⁷ Comparison of the incomes of those who choose park B with those who choose park A shows no
53
54 significance difference (Mann-Whitney N = 280 z = 0.554 p = 0.5798). Comparison of the gender split
55
56 of the two park choice categories also shows no significant difference with 43.84% of those choosing
57
58 A being male compared to 45.54% of those who choose B.
59
60

1
2
3 variable was converted into a single dummy variable with one equal to a participant
4
5 intending to use a park at the SB location. Increasing intended usage has a significant
6
7 positive effect on participant's choice of SB. The inclusion of use variables and distance is
8
9 potentially problematic due to expected confounding; however the strongest correlation
10
11 was found between the distance to SB and use of SB variable was relatively low (-0.3824).
12
13

14
15
16 **Table 2:**

17
18
19 **(Table here)**

20 21 22 5.3. WTP Results

23
24 Comparing the WTP bids for the two locations using a t-test confirms a significant difference
25
26 ($t = 3.411, p < 0.001$) with the CC park location having higher mean WTP. Participants were
27
28 classified as users and non-users based on their response to the park usage questions. Users
29
30 have higher mean WTP than non-users while also living closer to the park being valued
31
32 (Table 3). Kurtosis tests confirm that the distance, income and GAC measures are non-
33
34 normal and thus non-parametric (Wilcoxon rank sum) tests of difference were performed
35
36 between user and non-user groups. Significant differences were found between the
37
38 distance of users and non-users of both the CC park ($Z = -4.890, p = 0.000$) and the SB park
39
40 ($Z = -5.930, p = 0.000$). While no significant differences were found in the distribution of
41
42 income values for both the CC park ($z = 2.145, p = 0.0320$) and the SB park ($z = 1.947, p =$
43
44 0.0515). Mean GAC scores for the CC park are higher for non-users than users while for the
45
46 SB park they are higher for users than non-users. Mann Whitney tests on the difference
47
48 between the GAC scores of users and non-users show a significant difference for the CC park
49
50 ($z = 2.815, p = 0.0049, N = 319$) and the SB park ($z = -2.306, p = 0.0211, N = 317$).
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1
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3 **Table 3:**
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6 **(Table here)**
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9 5.4. Marginal Effects 10

11 To test whether WTP values are diminished when valuing multiple parks the sum of WTP
12 values for the CC and SB park were compared with the WTP values given for the creation of
13 both parks. A t-test confirms a significant difference between the means of WTP for both
14 parks and the sum of WTP for both parks ($t = 8.0202$ $p = 0.0000$). This implies that there is a
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diminishment of WTP values when valuing the creation of more than one park.

5.5. Testing for Preference Reversals

Our study design permits us to examine the preference reversal phenomenon first reported
by Slovic & Lichtenstein (1983). This occurs where a respondent faces the choice between
two options and can express values for both. Slovic & Lichtenstein note that in their
experiment in a significant minority of cases the chosen option did not receive the highest
valuation. It can be seen from Table 4 that of those who choose the CC park some 97
participants were willing to pay more for CC while 3 were willing to pay more for SB, and of
those who chose SB just 4 were willing to pay more for CC while 42 people were willing to
pay more for SB. This preference anomaly is quite clearly not present in our own
experiment. This finding affords an interesting perspective on the original Slovic &
Lichtenstein study, which concerned choices between and valuations of casino gambles.
Bateman et al., (2008) provides evidence to suggest that the occurrence of such preference
anomalies may be positively linked to the degree of uncertainty experienced by
respondents. The lack of preference reversal in our study suggests that a high familiarity

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3 with the goods in question engendered low levels of uncertainty. This finding tends to
4
5 reinforce the credibility of our overall valuation and choice results.
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7

8 **Table 4:**
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11 **(Table here)**
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13 5.6. WTP Models 14

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16 Initially Tobit models were fitted for each park, testing linear, log and quadratic forms of
17
18 distance. Here the strongest (quadratic distance) models are reported in Table 5 (see
19
20 Appendix 4 for all Tobit models). A positive effect of median household income on WTP was
21
22 found but this was only significant for the SB park. The number of dependents (under 18s) in
23
24 the household had a significant negative effect on WTP for both parks. These results are
25
26 consistent with the effects of a budgetary constraint on WTP which appears to be more
27
28 pronounced for the SB park.
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35 The mean of all GAC scale items showed a significant and positive effect on WTP ceteris
36
37 paribus for the CC park but no significant effect on WTP for the SB park. This confirms that
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39 non-economic motives can have a significant effect on WTP but that the significance of
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41 attitudes to WTP bids is dependent on the location of the park. The absence of a significant
42
43 effect of GAC on WTP for the SB park suggests that participants WTP is based on use based
44
45 motives. This is further emphasised by the significance of distance for all functional forms of
46
47 distance for the SB park (see Appendix 4). WTP for the CC park appears more sensitive to
48
49 the functional form of distance with only the quadratic form achieving statistical
50
51 significance. To test for a moderating effect of attitudes on distance decay an interaction
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53 term between GAC and distance was included in each Tobit model. No evidence was found
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3 for an interaction effect for either park. By testing the Tobit specification against the
4
5 alternative model that is non-linear in its regressors and contains a heteroskedastic and
6
7 non-normally distributed error term⁸ both Tobit models were found to be miss-specified (CC
8
9 park $lm = 43.69$, critical lm at a 10% significance = 2.83, SB park $lm = 36.74$, critical $lm @ 10\%$
10
11 = 3.58). As a result the coefficients produced from these models whilst informative are
12
13 unreliable.

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18 Based on Ferrini & Fezzi (2012) Generalised Additive Models (GAMs) were used in an
19
20 attempt to incorporate non-linear relationships through the use of smoothing functions and
21
22 achieve a correctly specified model (Table 5). Given the theoretical importance of distance
23
24 in WTP for spatial goods (e.g. Bateman et al., 2006) and the apparent sensitivity of our prior
25
26 models to the functional form of distance, the GAM model were used to apply a non-
27
28 parametric smoothing function to the distance measures within a Poisson log link regression
29
30 model. This avoids the need to impose a priori assumptions concerning the shape of the
31
32 distance decay. It also has the advantage of allowing us to further explore potential
33
34 interaction effects between distance and attitudes without the confounding that would
35
36 result from including both a quadratic and GAC*distance interaction. The number of
37
38 dependents and median household income remain as standard parametric variables as in
39
40 the prior Tobit models.
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55 ⁸ Using Stata's bctobit command
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3 **Table 5:**
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7 **(Table here)**
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10 The GAM models show a similar pattern of results to the Tobit models, again the GAC score
11 only has a significant positive effect on WTP for the CC location, confirming our initial
12 suspicions that this location is perceived to offer more altruistic value. The effects of income
13 and the number of dependents in the GAM models are reassuringly consistent with the
14 Tobit models. The EDF (effective degrees of freedom) of the distance smoothing functions
15 (Table 4.5) indicates the estimated degree of “wiggleness”, an EDF of one would indicate
16 that the best approximation of the smoothing function would be linear. Again no evidence
17 for an interaction between GAC and the smoothed distance function was found.
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30 5.7. Evidence for the localised dis-amenity of city centre parks

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32 Figure 2 shows canonical plots of our smoothed distance parameters both distance variables
33 are clearly nonlinear (with the SB model closer to linearity than the CC park) and both
34 coefficients are significant. By not implying rigid assumptions concerning the functional form
35 of distance decay relationships distinct differences in the shape and statistical significance of
36 distance WTP relationships can be observed. For the CC park, WTP increases with distance
37 until approximately 3000 metres at which point it starts to decrease with distance. This is
38 contrasted by the slope of the smoothing function for distance to park B which shows
39 decreasing WTP with distance up to approximately 4000 metres at which point it plateaus
40 and then turns slightly positive likely due to the reduced number of observations at these
41 high distances. This n shaped curve confirms our suspicions that despite the overall
42 preference shown by participants for the CC park it exhibits local disamenities.
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Figure 2:

(Figure here)

There is a consistent difference in the distribution of predicted WTP values for the two parks (Figure 3) with median WTP for the CC park being consistently higher and exhibiting a broader distribution.

Figure 3:

(Figure here)

To demonstrate the difference between the GAM and Tobit models reported above, Figure 4 and 5 below show mean household WTP for the CC park predicted for all postcodes in the study area (details of data sources used for out of sample predictions can be viewed in Appendix 5). The Tobit map on the left shows the expected monotonic decay with values decreasing with increasing road distances from the CC park. While the GAM map shows a large local disamenities with lower mean WTP in the immediate vicinity of the CC park which steadily increases before decreasing.

Figure 4:

(Figure here)

Figure 5:

(Figure here)

5.8. Aggregation

In a decision making context the total annual benefit that a new park could bring is more useful to policymakers than mean WTP values. Whilst it is possible to simply estimate the total annual benefits by multiplying the average WTP for each park by the number of households in the aggregation area required, this would not allow for the fact that the population of households may exhibit different distances and incomes than our sample. If it is presumed that the sample is representative of the wider population then the relationships with WTP should hold for the population (i.e. coefficients for the sample will be the same as for the population). Similarly relationships between WTP and distance should hold, allowing a value function transfer to be made. Here the WTP model is used to predict the WTP for areas without WTP responses.

Aggregated values of the two parks for the study area and a larger 10 mile buffer of the city center are presented in Table 6 below. The first row shows a simple aggregation based on the mean WTP of each park. For the Tobit and GAM based aggregations two sets of aggregations are presented. The first treats the preferences of protestors as if they are the same as non-protestors (i.e. by excluding them). This method may well over estimate aggregate WTP as a result of ignoring the preferences of protestors. The second method presumes that protest zeros are genuine economic preferences and thus uses the protest rate of the sample to set 6.5% of households in each aggregation population to a WTP of zero. If these aggregations are compared for the study area it can be seen that the Tobit models produce very similar aggregate values for park A (Mean based = £1,130,674, Tobit based = £1,297,970) when protestors are ignored. The inclusion of a lower bound to account for protestors in the Tobit model also resulted in similar values to the equivalent mean

1
2
3 based aggregation (mean based = £933,302 Tobit based = 1,140,256). The study area
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5 aggregations based on the GAM model were relatively similar but lower than those based
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7 on the Tobit models and thus even closer to the mean based aggregations.
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11 **Table 6:**

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14 **(Table here)**

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17 The expansion of the aggregations to a ten-mile circular buffer of Norwich results in a
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19 significant difference between the Tobit and GAM based aggregations. The GAM models
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21 produce significantly lower aggregate values than the Tobit and the gap between the two
22
23 parks begins to decrease. This is to be expected as the GAM models are trained on a set of
24
25 distances with a much lower range than those used in the ten-mile aggregation. While these
26
27 models are theoretically more accurate in their ability to estimate the functional form of
28
29 non-linear variables they represent a trade-off in terms of a loss of predictive power for out
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31 of sample data.
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41 6. Discussion and Conclusion

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43 Results of the CV survey presented in this paper confirm previous findings that parks are
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45 highly valued public goods, with the creation of new parks in the city of Norwich having the
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47 potential to generate substantial value to residents. The low protest bid rate in the sample
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49 suggests that not only do residents have strong preferences towards the creation of new
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51 parks but that, at least in principle, they are willing to pay for increased provisioning through
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53 a familiar and realistic payment vehicle. Using an ex ante valuation allowed values and
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3 preference motives to be compared for two locations revealing significant differences in
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5 both mean WTP and its determinants.
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9 Results of a simple choice experiment of which park should be created revealed that 65% of
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11 the sample would prefer a park to be created at the CC location. While participants were
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13 more likely to choose the park closest to them variations in levels of participant's
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15 environmental concern also had a significant effect on their park choice, asserting the
16
17 importance of attitudes in preference formation. A preference for the CC location was also
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19 evident in WTP bids with significantly higher mean WTP for the CC location than the SB. This
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21 overall preference for the CC location may be attributable to the highly accessible nature of
22
23 the city centre location. While it is also possible that distance is perceived as a sunk cost for
24
25 the CC park as people visit the city centre for shopping trips regardless.
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30 Examination of the determinants of WTP for each park reveal consistent differences in the
31
32 effects of distance. Both the concave quadratic specification of the Tobit and smoothed
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34 distance curve of the GAM model indicate that participants prefer to live close to this park
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36 but not too close. In contrast WTP for the SB park decreases steadily to a distance of
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38 approximately 4000m at which point a slight upturn in values occurs. These differences in
39
40 both the shape and magnitude of distance decay can only be attributed to differences in
41
42 participant's perceptions of the two locations. The presence of non-monotonic distance
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44 decay in WTP values for public parks has implications for the inclusion of distance coefficients
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46 in value transfer functions. If disamenities are present but ignored then such functions risk
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48 overestimating aggregate values. Furthermore, using the presence of monotonic distance
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50 decay as a validation of the theoretical validity of both primary and derived WTP values
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3 (Bateman et al., 2010) should be avoided unless the possibility of local disamenities is ruled
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5 out.
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9 While the authors speculate that fear of crime and anti-social behaviour drive the observed
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11 disamenity we offer no empirical test of what it is about the CC parks location that causes
12
13 this difference in distance decay. This study has also observed varying effects of attitudes on
14
15 WTP values with increased levels of environmental concern causing a greater increase in
16
17 WTP for the city centre park location. This supports previous empirical findings that non-
18
19 economic motives can be relevant to individuals WTP for goods with non-use value
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21 components (Ojea and Loureiro 2007; Cooper, et al. 2004).
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29 In conclusion this study has highlighted the importance of a priori assumptions regarding
30
31 the functional form of distance decay functions. While Tobit models failed to establish
32
33 distance as a significant influence on WTP for the CC park the use of smoothing functions in
34
35 the semi-parametric GAM models reveals clear differences in distance decay between the
36
37 two parks. Despite the potential presence of local disamenities at the CC park it is still seen
38
39 to generate higher mean and aggregate values over the study area.
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8. Appendixes:

Appendix 1: Stock photo of Park shown to participants



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Review Only

Appendix 2: Payment Ladder Flashcard.

UEA University of East Anglia	
Norwich, University Drive, NR4 7TJ, Tel: 01603-456-161	
Increase in Annual Council Tax for Creation of Park A	
£0	£150
£3	£160
£5	£170
£10	£180
£15	£190
£20	£200
£25	£225
£30	£250
£35	£275
£40	£300
£45	£325
£50	£350
£55	£400
£60	£450
£65	£500
£70	£550
£75	£600
£80	£650
£85	£700
£90	£750
£95	£800
£100	£850
£105	£900
£110	£950
£115	£1000
£120	£1050
£125	£1100
£130	£1150
£135	£1200
£140	£>1200 £.....
£145	Other: £.....

Appendix 3: Sample Descriptives

Variable Name	N	Min	Q1	Median	Q3	Max	Sample Mean (SD)	Study Area Mean (SD)
Gender (1 = female)	270	0	N/A	1	N/A	1	.54 (CI 95% = 48% - 60%)	.50 (CI 95% = 50.3 - 50.7)
Income (Mid-point of household income category)	270	£3,000	£15,000	£27,000	45,000	£75,000	£28,867 (£19,997) CI = £26,471 - £31,263	£27,251 (£4918)
Age	270	16	29	44	59	93	45 (17.5) years CI = 43 -48	44.9 (CI = 45.8 - 49.4)
No. of Dependents (under 18s)	270	0	0	0	1	5	.69 (1.1) CI = .55 - .82	0.2 (CI = 0.5 - 0.7)
GAC total (Mean of all 9 GAC scale items)	270	2.4	3.6	4	4.3	5	3.97 (.56) CI = 3.9 - 4.04	N/A
GAC Altruistic (Mean of 3 Altruistic items)	270	1.7	3.7	4	4.3	5	3.95 (.65) CI = 3.88 - 4.03	N/A
GAC Biospheric (Mean of 3 Biospheric items)	270	1.7	3	3.67	4.3	5	3.70 (.80) CI = 3.60 - 3.79	N/A
GAC Egoistic (Mean of 3 Egoistic items)	270	2	4	4	5	5	4.25 (.61) CI = 4.18 - 4.33	NA
Distance to nearest park (meters)	270	62	662	1025	1191	2443	981 (514) CI = 920 - 1043	N/A
Distance to Park A	270	1035	2109	2699	3247	5120	2792 (1038) CI =	2273 (1108)

(meters)							2668 - 2917	
Distance to Park B (meters)	270	388	1866	3014	4390	5743	3068 (1438) CI = 2896 - 3240	3181 (1299)
Use Park A9	269	1	2	3	3	4	2.68 (.92) CI = 2.57 – 2.79	N/A
Use Park B3	267	1	2	2	3	4	2.37 (.91) CI = 2.26 – 2.48	N/A

Comparison of our sample with the study area revealed no significant differences between the underlying distributions age in our sample and those calculated from the 2001 census¹⁰ for every postcode in the study area ($z = -0.399$, $p = 0.69$). Income values for the study area postcodes were extracted from the Experian mosaic data set. Comparing these with those of our sample with a two sample Wilcoxon rank sum (Mann-Whitney) test shows that the distribution of incomes is different ($p = 0.0005$) having a higher rank in the study area.

The spatial representativeness of our sample relative to the two park locations can be seen by comparing the average distance of all postcodes in the study area to that of our sample. While distance to the SB park has a similar average value for all postcodes in the study area, for our sample distance to the CC park is significantly higher for the sample compared to the study area. An independent sample t-test on the distance to park A shows a significant difference between distance to A of our participants and distance to A in the study area ($p = 0.0000$).

⁹ Categorical variable representing participants expected usage of the proposed park: 1 = Definitely use 2 = Probably use 3 = Probably not use 4 = Definitely not use

¹⁰ Mean ages were calculated from mid points of census frequency data for all over 18s.

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Appendix 4: Tobit Models of WTP

	WTP CC Park * N = 270 (79 left censored)			WTP SB Park + N = 268 (88 left censored)		
	Linear	Log	Quadratic ¹¹	Linear	Log	Quadratic
Distance (Linear)	-.0039749 (.0026743)		-.0009867 (.0028632)	-.0051329*** (.0018093)		-.0051366*** (.0017812)
Ln Distance		-6.810845 (7.16576)			-14.51143 (4.419909)***	
Distance ²			-6.24e-06 (2.30e-06)***			2.96e-06** (1.39e-06)
GAC	13.02284*** (4.875385)	13.60391*** (4.859375)	11.42336 (4.82753)**	3.22158 (4.495875)	3.1583 (4.456687)	2.706739 (4.45137)
Income	.0002567* (.000132)	.0002533* (.0001324)	.0002114 (.000131)	.0003131** (.000128)	.0003114 (.0001261)**	.0002986** (.0001267)
No. of Dependents in Household	-5.497549** (2.46747)	-5.554504** (2.470393)	-5.66972** (2.429829)	-4.510092* (2.311832)	-4.591721 (2.289304)**	-4.533405* (2.284023)
Constant	-29.97609 (22.0898)	10.35501 (61.54)	-26.68489 (20.15296)	7.106661 (18.26694)	106.2465 (36.94295)***	-12.12288 (18.24875)
R ²	0.0084	0.0078	0.0119	0.0064	0.0077	0.0087

Significance Levels: * = p < 0.1, ** = p < 0.05, *** = p < 0.01

Appendix 5: Spatial Data Used for Aggregation

Spatially referenced out of sample data for the variables used in the Tobit and GAM models

above were collated from a range of sources. While it was possible to calculate distance to

¹¹ Without mean centering the park A linear distance coefficient = 0.339** and the squared coefficient = -0.000006*** for park B the linear distance coefficient = -0.232*** and the squared coefficient = 0.000002**.

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each of the parks using postcode centroids and the OS ITN, Median household incomes had to be obtained from the Experian Mosaic data sets at the much larger LSOA level. To parameterise the number of dependents in the household for out of sample households, population data from the 2001 census was used to calculate the average number of dependents per household at the census output area scale. Thus, there is significantly less spatial variation in these two measures than in the distance measures. Finally, as no GAC score data was available for out of sample households the mean GAC score was used. These variables were collected for all the postcodes in both the study area (2,743 postcodes) and a 5000 metre road based service area of each respective park centroid (4,192 postcodes for park A and 3,354 postcodes for park SB).

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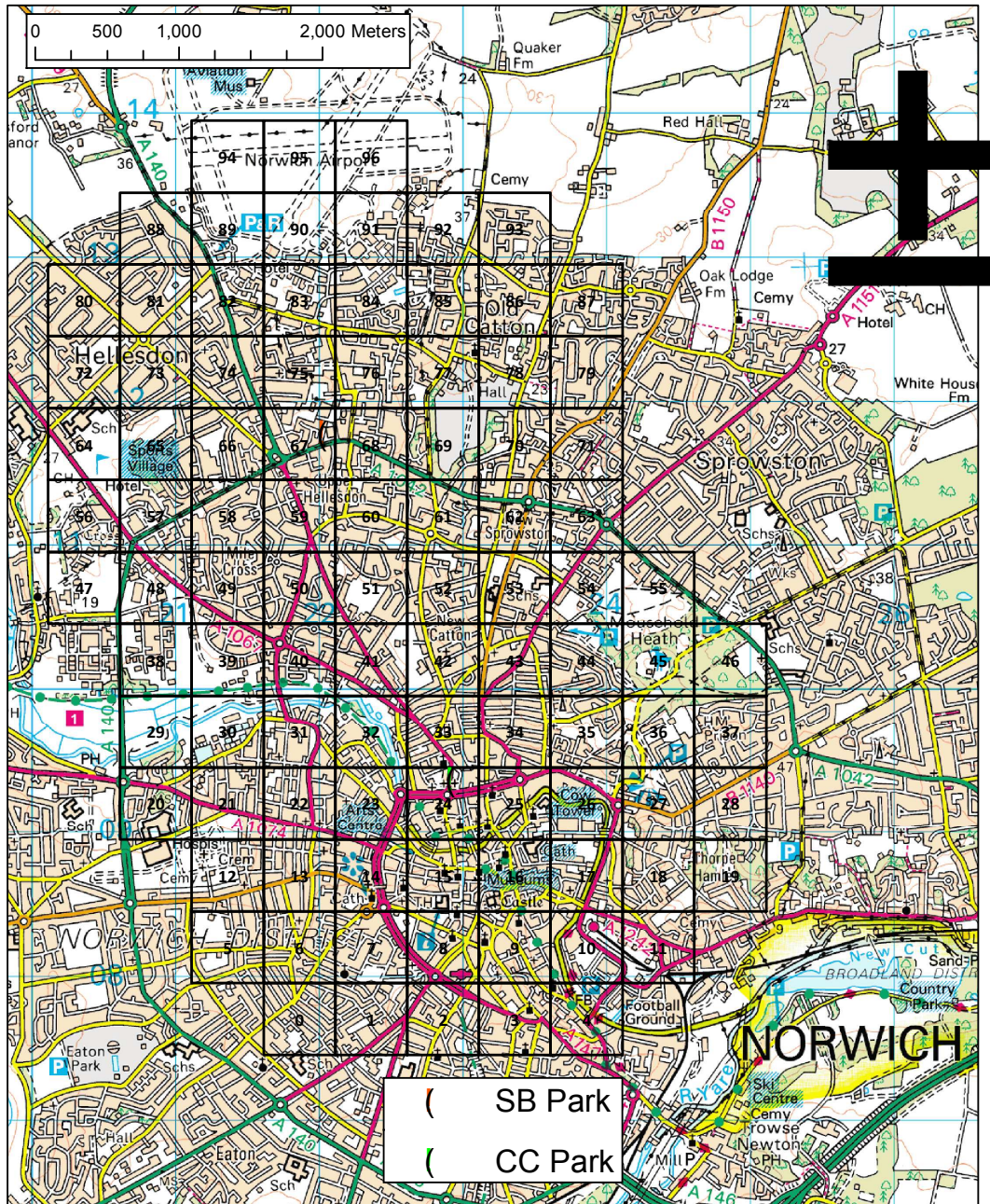


Figure 1: Study area showing 96 sampling squares and sites of proposed Parks.

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Table 1: Cross-tabulation of park choice preferences.

		Choose CC Park	Choose SB Park	Total
Closer to CC	Count	165	37	202
	% of total sample	45	10	53
Closer to SB	Count	81	96	177
	% of total sample	21	25	47
Total	Count	246	133	379
	% of total sample	65	35	100

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Table 2: Probit park choice model, (1=choose park SB), N=374.

Variable	Coefficient (s.e.)	Z	P > Z
Log Distance to CC Park	0.95 (0.22)	4.42	0.000***
Log Distance to SB Park	-0.41 (0.13)	-3.10	0.000***
Use SB Park	0.89 (0.16)	5.62	0.000***
Mean of all GAC items	-0.31 (0.13)	-2.35	0.019**
Intercept	-4.04 (2.22)	-1.82	0.069*
Pseudo R ²	0.24		
P	0.000***		

Significance levels: ***=0.01; **=0.05; *0.10

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Table 3: Mean WTP (£) Missing income, protest and bids >£150 removed and Breakdown of bids (N's in parenthesis). Mean WTP for both parks = £31.71 (N = 270).

	Protest Zeros	Genuine Zeros	Mean WTP		N	Mean Distance	Mean WTP (£) (s.d.)	Mean GAC
CC Park	64	90	£23.14 (270)	Users	191	2598 (972)**	30.06 (35.18)	4.04 (.57)
				Non- Users	129	3195 (1101)**	12.60 (25.02)	3.85 (.55)
SB Park	61	104	£19.11 (268)	Users	141	2487 (1316)**	27.10 (35.12)	3.88 (.56)
				Non- Users	177	3524 (1365)**	12.27 (20.26)	4.03 (.56)

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Table 4: Frequency of choices to test for reversal of preferences

	Choose CC	Choose SB
Frequency of WTP CC > WTP SB	97	4
Frequency of WTP CC < WTP SB	3	42

For Peer Review Only

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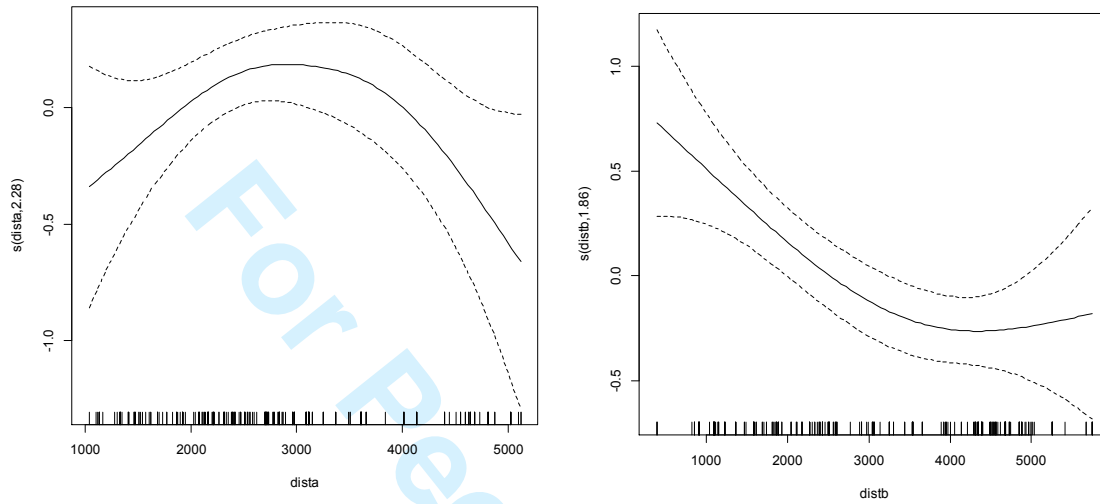
Table 5: WTP regression models (standard errors in parenthesis).

Predictors	Tobit		GAM	
	CC Park	SB Park	CC Park	SB Park
Distance	0.034** (0.014)	-0.023 (0.009)***	Smoothed Distance:	Smoothed Distance:
Distance (sqrd)	-0.000006*** (0.000002)	0.000003** (0.000001)	Edf = 2.28 Ref.df = 2.849 P = 0.047**	Edf = 1.859 Ref.df = = 2.341 P = 0.0007***
GAC	11.423** (4.828)	2.707 (4.451)	0.29 (0.14)**	0.08 (0.14)**
Income	.0002 (.0001)	.0003** (.0001)	-0.20 (0.09)*	-0.22 (0.08)**
No. of Dependents	-5.670** (2.430)	-4.533** (2.284)	0.000006 (0.000003)**	0.000008 (0.000004)**
Constant	-72.913*** (27.029)	31.378 (21.286)	1.86 (0.58)***	2.49 (0.59)***
R ²	.060	0.066	R ² = 0.05 (8.68% Var. Explained)	R ² = 0.06 (7.97% Var. Explained)
N	270 (79 left censored)	268 (88 left censored)	270	268

Significance Levels: * = $p < 0.1$, ** = $p < 0.05$, *** = $p < 0.01$

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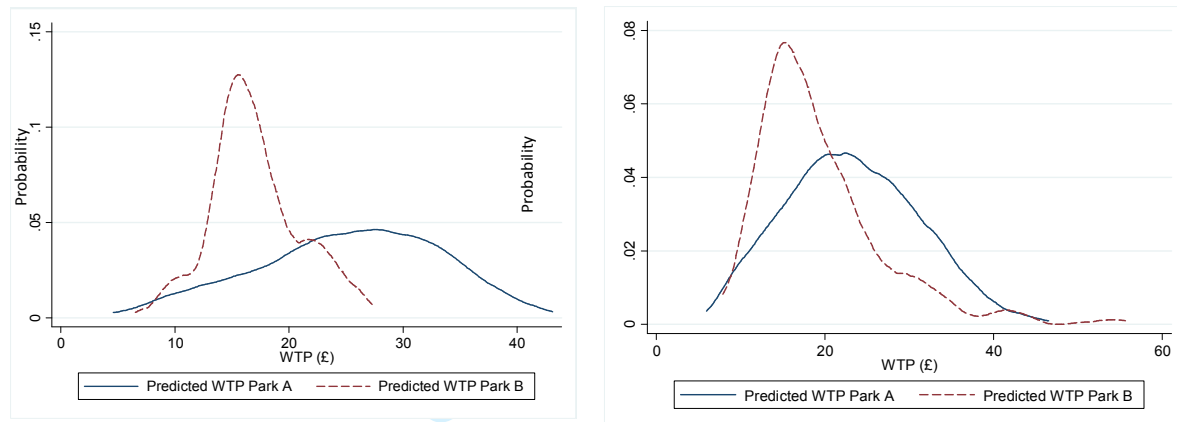
Figure 2: Estimated canonical parameters distance decay functions (equal to the linear predictor) for



distance to CC park (left) and distance to SB park (right).

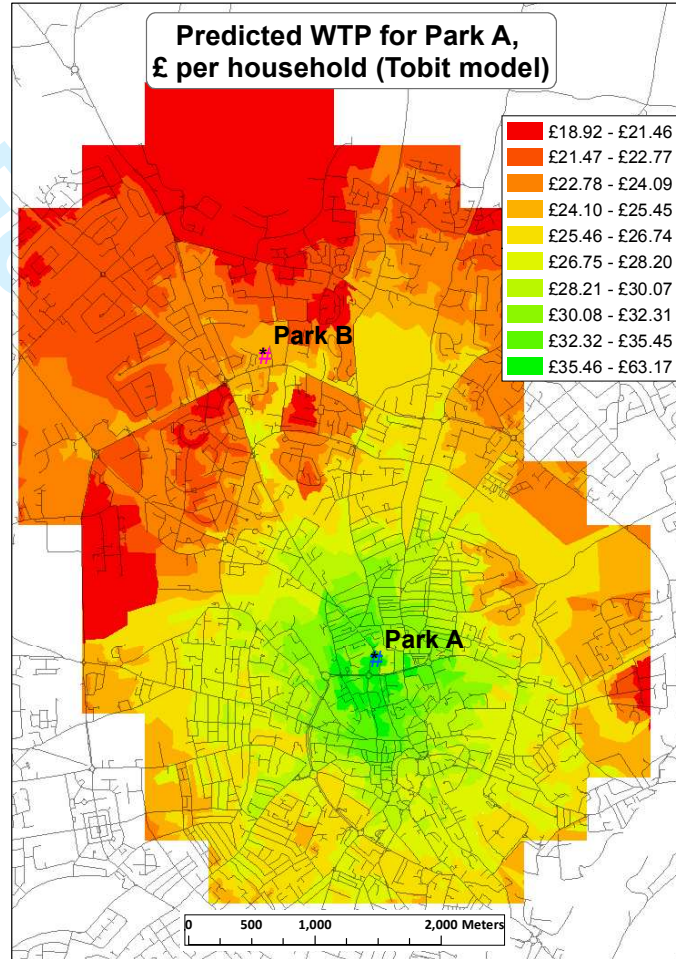
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Figure 3: Predicted WTP values (in sample) distributions for parks A and B (left Tobit model, right GAM).



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Figure 4: Predicted WTP by Tobit model (quadratic distance) £ per household (no protestors) for the

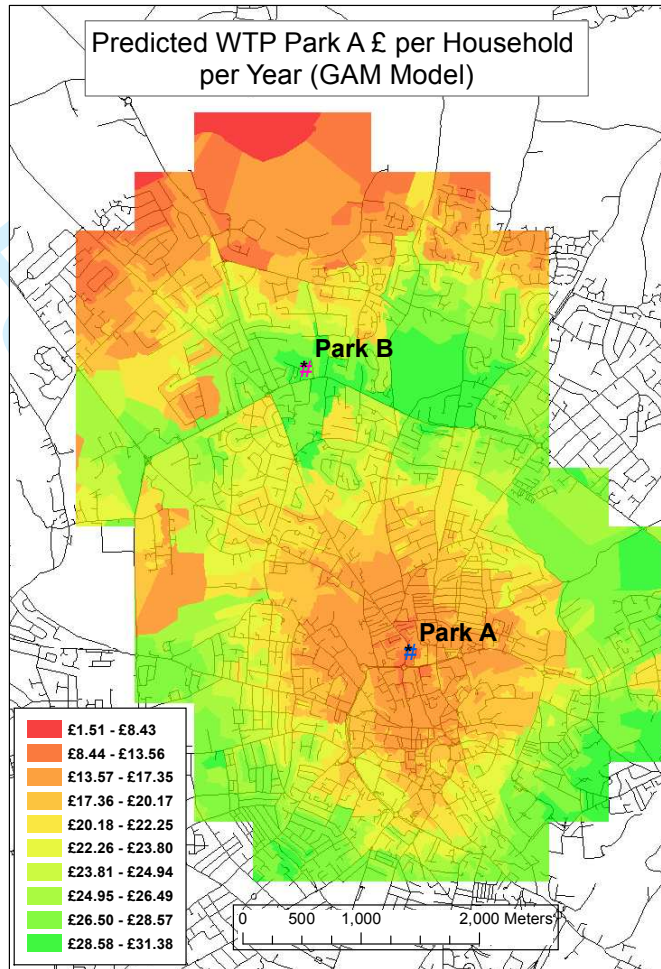


study area (2740 postcodes).

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Figure 5: Predicted WTP (GAM model) £ per household for the study area (2740 postcodes)



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Table 6: Tobit and GAM Model based aggregations for the study area and a ten mile buffer of Norwich. Simple aggregations are based on a mean WTP of £23.14 for the CC park and £19.11 for the SB.

	Study Area = 49,591 households in 2,743 postcodes		Ten Mile Aggregation = 106,576 households in 6,442 postcodes	
	CC Park	SB Park	CC Park	SB Park
Aggregation based on mean WTP (bids >150 protest zeros and missing incomes removed)	£1,147,536	£947,684	£2,466,169	£2,036,667
Tobit aggregation Model (protests removed)	£1,297,971	£1,005,133	£2,484,897	£1,846,733
Tobit aggregation Model (6.5% of households zero)	£1,140,256	£886,763	£2,323,379	£1,726,695
Aggregation based on GAM model with (protests removed)	£1,114,849	£905,259	£1,863,520	£1,909,985
Aggregation based on GAM model (6.5% households zero)	£1,042,384	£846,417	£1,742,392	£1,785,836