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Comparing Willingness-To-Pay and Subjective Well-Being in the Context of Non-Market Goods

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Abstract
In order to value non-market goods, economists estimate individuals' willingness to pay (WTP) for these goods using revealed or stated preference methods. We compare these conventional approaches with subjective well-being (SWB), which is based on individuals' ratings of their happiness or life satisfaction rather than on their preferences. In the context of a quasi- experiment in urban regeneration, we find that monetary estimates from SWB data are significantly higher than from revealed and stated preference data. Stigma in revealed preferences, mental accounting in stated preferences and unspecified duration in SWB ratings might explain some of the difference between the valuation methods.

Keywords: willingness to pay, preferences, life satisfaction, subjective well-being, non-market goods

JEL Classifications: D61, D62, H23, Q51, C21

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1. Introduction

Welfare economics is primarily concerned with how resources should be allocated to obtain the maximum well-being possible for individuals in society (Just et al, 2004). When valuing the well-being effects of non-market goods, such as improvements in the urban environment, economists typically rely on information about individuals' maximum willingness to pay (WTP) for the good in question. WTP can be estimated from preferences revealed in wage or land markets (Rosen, 1979; Roback, 1982; Blomquist et al, 1988) or from preferences stated in hypothetical contingent markets (Randall et al, 1974; Bishop and Heberlin, 1979; Mitchell and Carson, 1989). Preference-based methods have become standard practice for public policy in the United States (Office of Management and Budget, 1990) and in the United Kingdom (HM Treasury, 2003).

Revealed preference studies often use data on housing and neighbourhood attributes and the non-market good of interest to calculate a marginal rate of substitution between the price of the land and the non-market good. This approach assumes that the housing market is in equilibrium and that there is no housing market segmentation. However, Greenwood et al (1991) have shown that markets might not clear that quickly and that local wages and rents can be in disequilibrium for some time. Other problems result from the fact that land rent reflects not only demand, but also supply which might well be constrained (Glaeser et al, 2005).

Stated preference studies construct a hypothetical contingent market where the individual is asked to state their WTP for the non-market good. The main problem with this method is that it assumes individuals have a coherent and non-arbitrary set of preferences when there are good reasons to suppose that they do not (Slovic, 1995; Ariely et al, 2003). Responses to WTP studies have been shown to be subject to a number of quite pervasive biases, including irrelevant cues, whereby respondents are unduly influenced by the elicitation procedure (Sugden, 2005) and scope effects where responses are insensitive to the size of the good being valued (Kahneman and Tversky, 2000).

Given these and other problems with preference-based approaches to valuing non-market goods, there has been increasing interest in economics in measuring people's subjective well-being (SWB), most often by asking individuals to state how satisfied or happy they are with their life overall (Dolan and Kahneman, 2008). If we also gather data on income, and control for other relevant background characteristics, we can estimate the amount of income that is required to hold life satisfaction constant following a change in the non-market good. Such assessments are increasingly being used by economists to value non-market goods (van Praag and Baarsma, 2005; Oswald and Powdthavee, 2008), and as an input in to public policy making (Gruber and Mullainathan, 2002).

Life satisfaction ratings have shown to be highly correlated with actual behaviour, e.g. suicide (Di Tella et al, 2003; Bray and Gunnell, 2006), and key physiological variables (Steptoe et al, 2005; Blanchflower and Oswald, 2008). There is increasing evidence on the economic and social factors (income, employment status, health status, relationships and macro-economic variables) associated with life satisfaction ratings (van Praag and Ferrer-i-Carbonell, 2004; Di Tella and MacCulloch, 2005; Dolan et al, 2008). There is some evidence to suggest that air pollution (Welsch, 2002) and noise pollution (van Praag and Baarsma, 2005) can affect SWB but there has been little causal work examining how the physical appearance of the neighbourhood affects SWB. The life satisfaction approach does not require an assumption of equilibrium in markets and there is no need to construct a hypothetical market.

Whilst a consolidation between preferences and SWB has been advocated (Bernheim and Rangel, 2007), very little research has been conducted in this area (although see Loewenstein and Frederick (1997) and van Praag and Frijters (1999)). We aim to begin filling this gap by presenting the results from a quasi-experiment that allows preferences and life satisfaction to be directly compared to one another. There are some examples of revealed and stated preferences being compared to one another (Brookshire et al 1982, Adamowicz et al, 1997), but fewer examples of preferences being compared to SWB. Van den Berg and Ferrer-i-Carbonell (2007) value informal care by stated preferences and life satisfaction but they do not consider revealed preferences, they use different respondents in the preference-based and SWB studies,

and they cannot infer causality from informal care to well-being. Our research is the first example that we are aware of that compares the different methods in the context of a quasi-experiment. The main innovation presented here is the comparison of the different methods for valuing non-market goods.

The non-market good we use to illustrate the differences between WTP and SWB is an urban regeneration scheme in the UK. Regeneration does encompass some private goods (e.g. new house fascias) but when the whole area becomes regenerated, and when the area has a pleasurable aesthetic appeal, urban regeneration becomes a non-market public good. Regeneration is usually targeted at individuals in poor and materially deprived neighborhoods. In the United States, there have been individual-based strategies (i.e. a demand side policy), such as the Moving to Opportunity schemes, where individuals are given vouchers to move from deprived to less deprived neighbourhoods, whereas in the United Kingdom, there have been attempts to physically regenerate the neighborhood where individuals remain *in situ* (i.e. supply side policy).

Our neighbourhoods are perhaps more tightly defined than in other studies, such as Katz et al (2001) and Luttmer (2005), Kling et al (2007), where the analysis of secondary data means the neighbourhood is defined according to reasonably large areas. In contrast, we gather primary data from two spatially separated neighbourhoods which are within the same political or census boundary. These two neighborhoods have populations of less than one thousand individuals and are spatially distinct from one another, in that they are separated by a major train line and a school, but one area has recently had urban regeneration and the other has not. This allows us to assume a quasi-experiment of an exogenous change of policy at the local level. The use of quasi-experiments in environmental economics and non-market valuation is increasing, e.g. Greenstone (2002), Chay and Greenstone (2005), Deschenes and Greenstone (2007) and our paper in a similar spirit to these seminal papers.

In the next section, we examine the concepts of WTP and SWB as they relate to the valuation of non-market goods in general and the urban environment in particular. For revealed preferences, stated preferences and SWB to produce the same results, the

marginal rates of substitution between income and the non-market good must be equivalent across all three methods. This is the hypothesis we test in our empirical study. Section three sets out the background and methodology for the quasi-experiment. The revealed preferences came from house price data, and the stated preference and experienced utility data was gathered by means of a postal survey of residents in the two neighbourhoods. The payment card method was used to elicit WTP, and SWB was assessed in the form of a global life satisfaction question on a 0-10 scale.

Section four presents the results from our quasi-experiment. We find that urban regeneration is not significant in determining house prices but that the majority of individuals in the adjacent area are willing to pay for the urban regeneration, and the mean WTP is around £230-£245. Urban regeneration has a significant effect on the life satisfaction of those individuals who are of working age. The value of the regeneration from the life satisfaction ratings of those of working age is significantly higher (around £19,000) than the value derived from WTP responses. The results are based on analyses of 364 responses and so we do not claim these to be precise estimates. Rather, they facilitate methodological exploration of the kinds of differences found.

In section five, we discuss some of the reasons for these discrepancies that warrant further research. For revealed WTP values, it could be that urban regeneration creates a stigma effect, whereby house-buyers are put off by particular streets or areas and which devalues the prices of houses in those areas. For stated WTP values, it is possible that the responses may have been affected by loss aversion in the presence of mental accounting; that is, individuals may recognise the benefits from the regeneration but the benefit might be higher than their unanticipated consumption budget (i.e. their mental account), and beyond this budget, individuals are far more motivated to avoid losing their income than they are to gaining the benefit from the regeneration. There are also ambiguities about the time frame over which individuals' assess their life satisfaction. Such ratings could incorporate both past experiences and future expectations, so the monetary values might be seen as the sum of the value of life satisfaction over a finite time horizon. If this is the case, the SWB-based values are more in line with the stated preference ones.

2. Valuation methods

2.1 Revealed preferences

Considerable research has been conducted on hedonic house price models, especially in the valuation of air quality (Smith, 1995). There has been relatively little research into the using the hedonic pricing method to value the effect that urban regeneration has on house prices. Taking our example of where one area has had urban regeneration and the other area has not, we would expect the difference in house prices to reflect the willingness to pay for the regeneration holding all other attributes constant. Typically, we would have a vector of housing attributes $z = (z_1,\ldots,z_N)$ and an amalgamated good, x, which includes private goods except housing. We assume individuals to have the following utility function, $u(x, z)$, and that individuals maximise their utility subject to the budget constraint $x + P(z) = Y$, where $P(z)$ is the price of a house with attributes z, and Y is household income. In this case, the individual maximises utility by choosing:

$$\frac{\partial P}{\partial z_R} = \frac{\partial u/\partial z_R}{\partial u/\partial x} = WTP_{RP} \tag{1}$$

where the marginal price of a regenerated house, z_R, equals the marginal rate of substitution between z_R and x; that is, the marginal WTP for regeneration. Once the identification of the hedonic function is stated, we can estimate the WTP_{RP} by ordinary least squares (OLS).

2.2 Stated preferences

Due to imperfect markets and the lack of data to allow for robust estimates based on revealed preferences, economists have used stated preferences to value the non-market goods. The stated preference literature has grown rapidly over the last few decades, and since the 1990s the contingent valuation (CV) method has become the main method to value non-market goods, especially within environmental economics.

A CV survey elicits an individual's maximum WTP for a given good. It is assumed that an individual wishes to maximise utility subject to income, y, where the indirect utility function, in this case for the regeneration (R), is: $u(R, y)$. An individual's stated preference willingness to pay (WTP_{SP}) is the income loss equivalent to the regeneration:

$$u(R_0, y_0) = u(R_1, y_0 - WTP_{SP}) \tag{2}$$

where $R_1 \geq R_0$ and that an increase in R is seem as desirable (i.e. $\partial u / \partial R > 0$). We are using WTP rather than willingness-to-accept (WTA) since we are investigating an increase in utility from an initial lower utility level. Moreover, residents do not have property rights over government sponsored regeneration (see Knetsch and Sinden (1984) for greater discussion on compensation measures).

2.3 SWB-based valuation

Following Blanchflower and Oswald (2004), our notion of SWB is based on how satisfied an individual is with their life. We acknowledge that there are other measures of SWB, such as moment-to-moment utility (Kahneman et al, 2004) or psychological well-being (Konow and Earley, 2008) but life satisfaction has been widely used by economists (Dolan et al, 2008). To place a monetary value on a non-market good, we use the standard compensating differential approach as outlined by Clark and Oswald (2002), Frey et al (2004), and van Praag and Baarsma (2005). We specify a utility function, which for the sake of exposition includes only income and the non-market good:

$$v = h[u(y, R)] + \varepsilon \tag{3}$$

where v denotes some SWB i.e. life satisfaction. The $u(y, R)$ function is the respondents' true utility which is only observable by the individual. Therefore, $h[.]$ is a non-continuous non-differentiable function which maps actual utility to subjective well-being. The error term, ε, captures the fact that individuals cannot accurately map underlying true utility (u) on to SWB (v).

In order to estimate a function such as (3), one can use ordinary least squares (OLS), ordered logit or ordered probit regression. There is, however, some evidence that it makes little difference to the estimated coefficients if we were to assume cardinality and estimate the model using OLS (Ferrer-i-Carbonell and Frijters, 2004). The SWB function will therefore be:

$$SWB_i = \beta_0 + \beta_1 \ln(y_i) + \beta_2 R_i + \beta' X + \varepsilon_i \quad (4)$$

where $\ln(y_i)$ is the natural logarithm of household income, R_i is the regeneration as in (2), X are the personal and social characteristics, and ε_i is the standard error term. By using the estimated coefficients for the regeneration ($\hat{\beta}_2$) and household income ($\hat{\beta}_1$), we can calculate the income compensation (IC) for the regeneration or alternatively the implicit utility-constant trade-offs between regeneration and income. The IC is defined as the increase in income necessary to hold utility constant if the house and area are not regenerated. In an indirect utility function, this would be given by:

$$v(R_0, y_0 + IC) = v(R_1, y_0) \quad (5)$$

where $v(.)$ is the indirect utility function, y_0 is the initial household income, R_0 is the condition of the area prior to regeneration and R_1 is the condition after the regeneration. Given the specification of the micro-econometric SWB function expressed in equation (4) and the position of the IC in the indirect utility function, the IC (at mean income level) can be defined as:[1]

$$IC = e^{\left(\frac{\hat{\beta}_2 (R_1 - R_0)}{\hat{\beta}_1} + \ln(y_0) \right)} - \overline{y}_0 \quad (6)$$

where $\overline{y}_i$ is average household income of the sample population.

[1] This is derived by using equation (3) from the regression (5) to form:

$$\Rightarrow \quad \hat{\beta}_1 R_0 + \hat{\beta}_2 \ln(y_0 + IC) = \hat{\beta}_1 R_1 + \hat{\beta}_2 \ln(y_0) \quad \Rightarrow \quad \ln(y_0 - IC) = \frac{\hat{\beta}_1 (R_1 - R_0)}{\hat{\beta}_2} + \ln(y_0)$$

2.4 Comparing the methods

If preferences and experiences are theoretically equivalent, then equating (1), (2) and (5) gives:

$$\frac{\partial u/\partial z_R}{\partial u/\partial x} \equiv u(R_0, y_0) = u(R_1, y_0 - WTP_{SP}) \equiv v(R_0, y_0 + IC) = v(R_1, y_0) \quad (7)$$

<u>*Theorem*</u>:

If: (i) R_0 and R_1 are identical, i.e. the change in the regeneration is the same for revealed and stated preferences, and for SWB; and (ii) the initial income level, y_0, is identical in both the $u(.)$ and $v(.)$ functions; then:

$$WTP_{RP} = WTP_{SP} = IC \quad (8)$$

In order for this equality to hold, the marginal rates of substitution in preferences and experiences must be identical. This is the hypothesis that we test.

3. Methodology

3.1 Background to the quasi-experiment

The urban regeneration programme we use to begin comparing WTP and SWB was targeted at the Hafod area of Swansea, Wales, UK. The specific details of the regeneration programme are not especially relevant to this paper – it is the comparison of WTP and SWB in the context of a quasi-experiment are the important methodological features – but it consisted of four main elements: renewal of fascias, gutters and roofs of houses; renewing property front boundary walls and paths/paved areas; road resurfacing; and provision of new improved feature street lighting. The Hafod area has roughly 950 residential/commercial properties and, by the end of 2007, over 500 properties had been renewed since 2001. This renewal to date has cost around £10million and is expected to cost £20million by completion in 2011. An adjacent neighbourhood, Landore, was chosen as the control area as it has very

similar characteristics to Hafod apart from the fact that it has not had the regeneration – see Table 1 for a comparison of the two population groups. These two neighbourhoods were almost identical in terms of deprivation indices before the regeneration and so the urban regeneration can be treated as having been approximately randomised between Hafod and Landore. The Swansea Local Authority obviously had to choose one area to regenerate and did not have the resources to regenerate both areas together (this regeneration was the first of its kind in the Swansea Local Authority area). As a result, the Hafod area was chosen to have the regeneration funding over Landore.

3.2 Revealed preference data

The most robust comparison of revealed preference across the two areas will come from house price data obtained from market transactions. House price data are available online from the Land Registry (i.e. www.houseprices.co.uk), which also contains data on type of the house (flat, terraced, semi-detached or detached) as well as whether it is leasehold or freehold. Several dummy variables were also used to account for whether each individual house is on a one-way street and whether it is overlooking a park.

Furthermore, we use subjective assessments of crime from our survey and average the value across each individual street. We do not have data available on floor area (both internally and externally) and the number of rooms or bedrooms each house has. While these factors have been found to account for a large degree of variation in other samples (Leggett and Bockstael, 2000), the majority of houses in this area were built at the same time under similar specifications, so there is a great deal of homogeneity between the houses. As a result, we do not need to control for internal floor area in our linear and semi-log functional forms.

3.3 Stated preference and SWB data

Apart from questions about SWB, the survey took on the same format of a traditional CV survey. The survey comprised four sections. Section 1 contained a global life satisfaction question followed by a number of domain satisfaction

questions. Section 2 included attitudinal questions, including those relating to the local area. Section 3 included the WTP section, and only households who had not had the regeneration had this part of the survey. Section 4 elicited demographic information.

The initial life satisfaction question used the International Wellbeing Group (2006) question: "*Thinking about your own life and personal circumstances, how satisfied are you with your life as a whole?*". Possible answers range from zero (completely dissatisfied) to ten (completely satisfied). Bertrand and Mullainathan (2001) have argued that subjective data is vulnerable to ordering effects. This is indeed a problem for many surveys since the life satisfaction question is normally situated in the middle of the survey (as in the British Household Panel Survey), usually coming after domain satisfaction questions, which may bias the ratings given. Therefore, in this study, the life satisfaction question was the very first question on the survey and questions about domain satisfactions follow life satisfaction.

In developing the WTP question, it would have been a very complex task to ask respondents to value all aspects of the regeneration programme, so the main features were stated within a top-down approach, i.e. participants had to place a value on the whole bundle of goods together and then subsequently value each good individually. Respondents were initially asked for their overall WTP for: (i) resurfaced exterior walls of their house; (ii) new front garden walls and paths of their house; (iii) new improved feature street lighting; and (iv) resurfaced roads and pavements. The first two are quasi-private goods whereas the latter two are public goods. A follow-up question asked how this overall amount was broken down into values for (i) and (ii) together and (iii) and (iv) together. The top-down method is the accepted approach within the literature (Pearce et al, 2006),

There is much less consensus regarding elicitation method. Arrow et al (1993) argued that the dichotomous choice (DC) method reveals the most unbiased values but others have been highly critical of the DC method (Champ and Bishop, 2006), and some have found that it generates mean WTP values that are implausibly high (Welsh and Poe, 1998; Ryan et al, 2004). Furthermore, the method requires larger samples than available through our quasi-experiment (Bateman et al, 2002). Therefore, we

used the payment card (PC) method, which has been used to generate meaningful monetary estimates previously (Ready et al, 2001; Champ and Bishop, 2006), although there might be potential for range biases (Rowe et al, 1996; Ryan et al, 2004). Respondents were asked to circle one value from a possible sixteen values, ranging from zero to one hundred pounds sterling (about $200). The question was worded as follows: "*Taking all these improvements together, what is the highest amount, if anything, that you would be willing to pay on behalf of your household per month for the next 3 years for these improvements*?"

The final section included a number of background variables that have been shown to be associated with SWB and WTP responses, such as: gender; age; marital status; employment status; social capital; health; and gross household income. The questionnaire was posted by mail in March 2007 to 950 households in Hafod and 675 households in Landore. SWB responses may be best elicited in private where there will be limited bias from the presence of an interviewer.

4. Results

We received 364 (22.4%) completed questionnaires. Given the relative complexity of the survey and the fact that response rates are lower in more deprived samples, this seems acceptable and it is broadly comparable to some other published studies which have multiple valuation methods in the survey (e.g. Bala et al, 1998). In any event, the response rate is less problematic given the representativeness of the sample. Table 1 shows that the sample is comparable to the National Census which took place in 2001. Within the sample, 61% reside in the renewal area (although 19% of the 61% live on roads which are not regenerated) and 39% reside in the control area. Of those who have had their home renewed, the average time since renewal was 2.2 years. Importantly, all of the individuals living in the regeneration area have been living in their house since the regeneration took place, which mitigates any residential sorting problems.

4.1 Revealed preferences

Between April 2000 and May 2007, 511 properties were sold within the whole area. Figure 1 shows the average house price every six months for the two areas (the official announcement of the regeneration area took place in 2001). It is clear that there are no significant differences in house prices between the two areas in 2000. Regression (1) in Table 2 gives the baseline regression where the time period is after the regeneration (i.e. 2002 to 2007). The time trend variable takes on the value of 1 in April 2000 and up until 86 in May 2007. The marginal effect of time on house prices is £1,033 per month – this is reflected in the increasing trend of both areas in Figure 1. Being in a semi-detached home (the majority of houses are terraced) or living on a one-way street will have an effect of increasing house prices by £9,551 and £5,736 respectively. Having a house overlooking a park increases house prices by £14,598. However, being in the regenerated area does not significantly increase house prices although it does have a positive effect. The regeneration variable here encompasses houses that are in the regenerated *area* or not and is not based on whether the *house* has actually been regenerated or not. Note that the adjusted R^2 is quite high for a hedonic regression despite the fact that floor space, the number of bedrooms, and the quality of interior are not controlled for, supporting the notion that there is a great deal of homogeneity in the housing stock in this area.

Regression (2) in Table 2 has the same specification as regression (1) apart from the fact that the functional form has slightly changed in that we have assumed a non-linear relationship between house prices and the right hand side variables. Again, as in regression (1), the coefficients which drive the variation in house prices are: being a semi-detached property; being on a one-way street; overlooking a park; and the time trend. Comparing (1) and (2), it seems that (1) has the better fit despite the fact that we have not used the log likelihood test since our variables are binary.

Table 3 takes the same specification as Table 2 although different time periods are analysed to determine how the house prices have evolved over time since the regeneration. Row 1 illustrates the baseline regression in Table 2. Row 2 gives the data pre 2002 (i.e. 2000 and 2001) and it is clear that being in the regenerated area has no significant effect on house prices within our sample. Rows 3, 4, 5, 6 and 7 illustrate the hedonic function for the following years: 2002, 2003, 2004, 2005 and 2006-2007 respectively. It is clear that living in the regenerated area does not

significantly increase house prices for any particular year. Row 8 changes the independent variable so it becomes one when the exact road the house is situated on has been regenerated and zero otherwise, as opposed to being a dummy variable for the area. This regression shows that for the whole sample, even when we are more specific about the regeneration time periods, being in a regenerated house and street is not significant in increasing house prices. A difference-in-difference model was also estimated using the announcement of the regeneration area in 2001 as the policy change and we also found a non-significant result as above.

4.2 Stated preferences

The distribution of the overall WTP estimates is given in Figure 2. The positive skew on the data is comparable to many other WTP payment card studies. We use the parametric approach to estimating the WTP values from the payment card. This has the benefit of accounting for interpolations between monetary amounts stated on the payment card. The two parametric approaches analysed here are OLS (WTP_{OLS}) and interval data (WTP_{INT}) regressions.[2] Rows 1 and 2 in Table 4 show the parametric WTP values based on OLS (WTP_{OLS}), and interval data (WTP_{INT}) respectively based on estimates in Table 5. Regressions (1) and (2) in Table 5 present the WTP_{OLS} and WTP_{INT} for regeneration, respectively. Outliers are omitted using the Belsley et al (1980) procedure. Both regressions use individual characteristics as independent variables, which allow us to establish whether the determinants of stated preferences are similar to those of life satisfaction. From regressions (1) and (2), we obtain WTP values of £228 and £245, respectively. Given that household income is significantly related to higher WTP values, this provides some validity to our estimates. Other variables, such as age and marital status, are also important in explaining WTP values.

[2] We can obtain a parametric WTP of the regeneration by regressing relevant independent variables on the WTP, and by using the coefficients to obtain the WTP value. The mean WTP value for the payment card from OLS therefore is:

$$WTP_{OLS} = \beta_0 + \sum_{j=1}^{n} \beta_j \overline{x}_j$$

where β_0 is the intercept, β_j is the coefficient on the j^{th} variable with the mean of that value given by $\overline{x}_j$. However, if the intervals are too coarse, OLS will be biased and it is preferable to use interval regressions (Whitehead et al, 1995). For these interval data regressions, the mean WTP value is (see Cameron and Huppert, 1989):

$$Ln(WTP_{INT}) = \exp(\beta_0 + \sum_{j=1}^{n} \beta_j \overline{x}_j) \exp(\sigma^2/2)$$

4.3 SWB responses

Figure 3 illustrates the distribution of life satisfaction ratings (which had a 100% completion rate) and breaks down the data for those living in the regenerated area as compared to those not living in the regenerated area. The mean life satisfaction ratings for the regenerated area and non-regenerated area are 6.60 and 6.32, respectively, and this difference is not significant.

It is important to note that within our sample we have three different population groups: A – those who live in a house and on a street which has been regenerated; B – those who live in the regenerated area but not in a house and on a street which has been regenerated; and C – those who live in the adjacent area which is not to be regenerated. Our two main analyses are: (1) comparing A and B with C; and (2) comparing A with B and C. For (1) we are interested in the well-being effect of living in the regenerated area as opposed to not living in a regenerated area. For (2) we are interested in the effect of living in a regenerated house and street as opposed to not living in a regenerated house or street irrespective of whether one is in the regeneration area or not.

However, the problem for (2) is that population B is expecting the regeneration in the future which might actually make them feel better and increase their well-being (for instance, Loewenstein, 1987, has found that individuals derive some utility in expecting a positive future outcome – see also Graham and Pettinato (2002) regarding positive expectations of upward mobility). Furthermore, there might be endogenous neighbourhood effects (Manski, 1993) from the regeneration on to the life satisfaction of individuals who have not yet had the regeneration, which might further complicate the analysis. That is, individuals who have had their house and road regenerated might feel better and therefore might be more likely to have social contact with neighbours that have not had their house or road regenerated, which might make those neighbours feel better. This is consistent with Topa (2000) who finds that local spillovers are higher in neighbourhoods with less educated workers. So we can then provide an additional analysis: (3) comparing A with C and omitting B. Our variable of interest becomes therefore the marginal effect of being in a regenerated house and on a

regenerated road as compared to not being in a regenerated house and street. These are reflected in the regressions in Table 6.

Table 6 provides these three analyses where life satisfaction is regressed on key variables using OLS and omitting outliers using the approach suggested by Belsley et al (1980). Regression (1) in Table 6 relates to (1) above, which has the standard SWB function as seen in other studies. It is clear that being in the regenerated area significantly increases life satisfaction by roughly 0.5 points at the 5% level – in our data this is equivalent to roughly a third of the effect of being unemployed and looking for work. In keeping with existing evidence (see Dolan et al, 2008), the variables that are significantly associated with SWB are age, marital status, and unemployment. What is interesting here is that household income does not increase life satisfaction for this population group.

Regression (2) places all non-regenerated households in the control group, and it is clear that regeneration to house and street does not significantly improve life satisfaction. However, this result is complicated by the fact that people who have expectations about future regeneration, and possibly gaining some life satisfaction as a result, are in the control group. Regression (3) omits this group, so we have a straight comparison between those who have had regeneration and those who will never have it in the foreseeable future. Now, the coefficient on regeneration is positive and the coefficient is larger than in regression (1).

As well as examining the sample as a whole, we have also restricted the sample to persons of working age (18 years of age to state pension age, which is 65 for males and 60 for females) on the grounds that the economic concerns of retired individuals are likely to be different to those of working age. Evidence from the life cycle hypothesis illustrates that wealth in old age is largely allocated to bequests (Menchik and David, 1983; Modigliani, 1986), indicating that the income received by older individuals will not be overly used for current consumption. This illustrates the problem of examining the income of older individuals in such datasets. Indeed, older individuals seem to care primarily about or place greater importance on their superannuation assets and pension income, and not about income *per se* (Heady and Wooden, 2004; Brown et al, 2005) in comparison to working age individuals.

In Table 7, the population in regressions (1), (2), and (3) are only those under state pension age. From regression (1), regeneration significantly improves life satisfaction by around 0.6 points. The logarithm of household income is also positive and significant, which means that we can calculate the IC from equation (7). For this sample population, the IC for urban regeneration is roughly £24,900. Regression (2) compares sample A with B and C, and given that B have future expectations, the IC from this function is lower at £17,400. Regression (3) compares A with C and values urban regeneration at £19,000. This value assumes that household income has the natural logarithmic form. If we assume a linear relationship between household income and life satisfaction, the IC here becomes £14,000.

It is also important to note that the urban regeneration might influence individuals' life satisfaction indirectly through other key variables. Such variables might be social capital and neighbourhood negative externalities. For instance, regression 1 in Table 8 includes how often each individual speaks to family, friends and neighbours. It is clear that speaking to friends is important to life satisfaction although this association does not undermine the positive and significant regeneration result. However, by controlling for these factors reduces the income coefficient which generates higher ICs. Regression 2 includes the local negative externalities which might be reduced with urban regeneration i.e. levels of crime and noise from neighbours. Both variables are negatively associated with life satisfaction although significant at the ten per cent level. Overall, the effect of urban regeneration on SWB is largely independent of indirect effects, and the aesthetic appearance of the house and road directly improves an individuals' SWB.

One additional important variable could be relative income, which has shown to be important not only at the national level (Easterlin, 2001; Clark et al, 2007) but also at the regional level (Ferrer-i-Carbonell, 2005: Luttmer, 2005). If some of the income effect is relative in our population group, controlling for the income of others would be expected to lead to an increase in the size of the income coefficient. The relative income variable in Table 8 is the natural logarithm of average annual income in both neighbourhoods (i.e. Hafod and Landore) with respect to age (i.e. <25 years old, 25-34, 35-44, 45-65, and 65>) and gender, giving ten reference groups. Regression 3 in

Table 8 shows that by including relative income, the absolute income level effect slightly increases and the coefficient on relative income is negative (as in Ferrer-i-Carbonell, 2005; and Luttmer, 2005) although not significant. Nevertheless, the coefficient on regeneration remains roughly the same magnitude although it ceases to be significant – with a small sample this can be expected since the standard errors are now clustered.

A potential problem with the life satisfaction equations above is that household income could be endogenous i.e. if life satisfaction depends on household income, and household income is itself a function of life satisfaction, then the parameter estimates are biased and inconsistent. Within our data, we have two possible instrumental variables that can be used; namely, whether or not your partner is in employment and whether or not you are in rented accommodation. Neither is a perfect measure and instrumental variables are notoriously difficult to find in happiness research (Knight et al, 2007; Oswald and Powdthavee, 2008), but both can be used to give some indication of the problems with endogeneity.

In Table 9, regression (1) uses regression (3) in Table 7 – i.e. the baseline regression – and regression (2) uses regression (5) in Table 8 – the full specification. For both regressions, an over-identification test suggests that the instruments are valid. The instruments are not weak in regression 1 although they might be in regression 2. Nevertheless, it is important to note that the coefficients on regeneration are roughly the same size (or slightly higher) but the instrumented estimates produce higher coefficients on household income – increasing the size of the estimated effect by between two-fold and three-fold. This increase in the magnitude of the income coefficient, which is also found in Luttmer (2005) and Oswald and Powdthavee (2008), suggests that the bias under OLS is negative, i.e. more satisfied individuals tend to work less to earn income. This has implications for our previously estimated income compensations. For the baseline case, our IC is £6,400 per year, while it is £7,600 for the full specification although the instruments may be weak for the full specification.

5. Discussion

Revealed and stated preference methods are now routinely used to value the costs and benefits of many non-market goods. However, differences between the values elicited by these methods and the lack of robustness in many of the estimates have led economists to look for new methods of valuation. One promising alternative involves eliciting information on SWB, the non-market good and income and estimating the amount of income necessary to hold SWB constant following a change in the non-market good. This paper presents values for an urban regeneration scheme using both preference-based and SWB-based methods.

From revealed preferences, it seems that the urban regeneration is not positively valued through house sales. These may be the least robust of all of our estimates. First, given that the regeneration is still occurring in some places within the regeneration area, and the fact that people may be reluctant to move from their regenerated house due to lack of mobility, it is unlikely that the housing market in this area would have fully cleared. There have been houses sold after regeneration has taken place so this mutes any self-selection effects. However, it is known that all houses and roads in the regenerated area will eventually be regenerated so the benefit of this should already be capitalised into house prices. It is important to note that the local council has stated that only those houses in the Hafod area are to be regenerated and not those in other surrounding areas like Landore – so there should be not be any expectation effects in house prices elsewhere.

Second, the regenerated and non-regenerated areas are within roughly the same housing market, so that people who would buy a property in one area would also consider buying in the other area since the areas and housing types are very similar. Therefore, residents selling their homes in the non-regenerated area are likely to be aware that the housing stock is of better quality in the regenerated area, which imposes a negative externality on those living in the non-regenerated area in the form of private costs of improving the quality of their own homes.

Third, and possibly most plausibly, regenerated areas are known by locals as poor areas, and by naming these areas as ‘renewal areas’ provides a signal to society that there is a need for government intervention. So, it is very much probable that this signal creates a stigma effect. The effect of stigma on house prices has already been

shown in other hedonic price studies of adverse environmental consequences (e.g. Kohlhase, 1991; Messer et al, 2006). However, no study to date has established how urban regeneration creates a stigma, although anecdotal evidence suggests that this is indeed the case (Robertson et al, 2008). So, this study might provide the first evidence of this stigma effect for urban regeneration although more research is needed to further support this work.

From stated preferences elicited through a CV survey, it seems that urban regeneration generates a positive benefit and is a non-market public good which individuals do want, with willingness to pay values at around £230 to £240 per year for three years. It is entirely possible that, in generating their WTP per month, respondents did not pay attention to the duration over which they would make this payment. Indeed, other studies have shown that the responses are insensitive to the payment period – i.e. temporal embedding (Stevens et al, 1997) – and so it likely that higher values would have been elicited from using a longer time frame over which payments would be made. If we assume that temporal embedding occurs and that people would be willing to pay each year for the average length of the time they live in one house (12 years according to the Department for Communities and Local Government, 2006), then the total WTP for the regeneration would be roughly £2,800.

The stated WTP values may be below their true values a result of loss aversion in the presence of mental accounting. Essentially, loss aversion can be applied to all negative departures away from the status quo (Bateman et al, 1997), hence individuals may recognise the benefits from the urban regeneration but they may not be willing to sacrifice a large proportion of their disposable income (i.e. the negative departure) for the regeneration. It has already been found that loss aversion can explain sub-optimal transactions in a marketplace (Knetsch, 1989) and a reluctance to upgrade durable items (Okada, 2001). As a result, the benefit of the urban regeneration might be much higher than their unanticipated consumption budget (i.e. their mental account), and beyond this budget, individuals are far more motivated to avoid losing their income than they are to gaining the benefit from the regeneration (Thaler, 2001). Indeed, Bateman et al (2005) state that if an individual faces an unanticipated buying opportunity (i.e. the WTP choice) which they can finance only by foregoing some specific consumption plan, the act of buying the non-market good involves a definite

loss, as distinct from the possible gain from the non-market good (e.g. urban regenration).

The value of the regeneration estimated from SWB responses is around £6,400 (instrumenting for household income) to £19,000 per year (not instrumenting for household income). Assumptions about duration are also important for estimates based on the SWB ratings. It is possible that the life satisfaction ratings might incorporate individuals' past experiences and future expectations of the urban regeneration, which means the monetary value of £6,400 estimated from them should be treated not as a per year value but as a value weighted over a finite time horizon. If we assume an equal weighting over the average duration of occupancy, the annual IC would be £533. If we assume that the occupancy time is higher (which is not unreasonable since properties in these areas have a relatively low turnover rate), the IC value would decrease further. However, the occupancy duration would have to be twenty-seven years in order to equate the IC and stated preference WTP values.

The time frame over which gains in SWB are expected to last has not been addressed in any of the papers we are aware of, e.g. Blanchflower and Oswald (2004) and van Praag and Baarsma (2005) both assume that the ICs are annual and do not extend beyond the last or current year. However, it is unknown whether life satisfaction ratings incorporate the benefits or costs of a good or a circumstance from past experiences and/or future expectations. This assumption is crucial when applied to welfare appraisal, since the annual ICs would inherently double-count the benefits or costs of a non-market good and therefore would bias the cost-benefit analysis. Therefore, there would seem to be good grounds for viewing the ICs as a total value over a finite horizon. Clearly, the actual assumption made on how life satisfaction incorporates future expectations is crucial to the methodology of the value of the non-market good by experiences, and merits further investigation.

A further consideration is the possibility that we have not controlled for a factor within our regression that is important to the SWB of the intervention group but not for the control group. A difference-in-difference estimate would correct this but given that these two neighborhoods are in a similar geographic location and that they are both materially deprived neighborhoods, it is unlikely that we have omitted an

important third factor, suggesting that our results are not spurious. A more likely explanation is that we have not correctly specified the well-being function with respect to income. If we have not fully captured the effect of income on SWB, and the true effect is much larger, the value from life satisfaction would be lower and would tend toward the value derived from the stated preference method over the duration of time spent living in the house. Furthermore, it must be noted that we started our SWB approach on the premise that life satisfaction is a reliable proxy for experiences. However, this is one of a number of ways of measuring SWB, so we would need to know more about how such an intervention affects other measures of SWB.

Overall, and notwithstanding the relatively small scale exploratory nature of this study, it seems that equation (8) does not hold in our quasi-experiment of urban regeneration. Nonetheless, the results, especially if replicated on larger samples and in other areas, have major implications for welfare economics and cost-benefit analysis. Within our urban regeneration context, if we assume that all the benefits from regeneration are captured by the WTP values from house prices, we could argue that this intervention, at least in the short to medium term, has no affect on well-being and is therefore an inefficient allocation of resources. If we assume that all the benefits from regeneration are captured by the stated WTP responses, the total benefit of urban regeneration for the households in the Hafod area would be £240,000. Given that the scheme to date has cost £10 million, this scheme has been a net cost and has not been an efficient allocation of resources.

Assuming that all the benefits are reflected in life satisfaction ICs (i.e. between £6,400 and £19,000), the total benefit of urban regeneration for the households of the Hafod area would be between £6.1 million and £18.1million. However, if we included longer term tangible benefits, such as employment and increased investment in the area, urban regeneration might prove to be worthwhile in the Kaldor-Hicks sense. We need more large-scale studies to suggest whether urban regeneration is efficient.

6. Conclusion

It has previously been argued that the goal of welfare economics is to evaluate the social desirability of alternative allocation of resources so as *"to achieve the*

maximum well-being of the individuals in society" (Just et al, 2004: 3). Social desirability may well depend upon how utility is defined, and there is a need for researchers to begin to evaluate how preferences and SWB are related for non-market goods to enrich the debate about how best to allocation scarce resources. By using an urban regeneration intervention in a quasi-experiment context, we find that (revealed and stated) preferences and SWB do not equal one another. Stigma in revealed preferences, loss aversion the presence of mental accounting in stated preferences, and unspecified or unknown time duration in life satisfaction might explain some of the difference. We need much more research into the extent and the sources of the differences between these valuation methods.

The use of SWB has the potential to generate meaningful monetary values of non-market goods for public policy. However, the research on generating monetary values for non-market goods from SWB is still in its infancy and is literally thirty years behind that of generating monetary values from revealed and stated preferences. So, we need more research on using SWB for economic valuation and, in so doing, we will be in a better position in the future to judge just how meaningful and robust this method actually is.

Table 1: Percentage of resident population in our sample and that obtained from the 2001 National Statistics Census

	Hafod		Landore		Swansea
	Sample	Census	Sample	Census	Census
Regenerated area	61	62	39	38	N/A
Aged over 65	26	20	16	16	23
Employed full-time	33	31	39	41	35
Employed part-time	19	13	16	13	12
Self-employed	2	5	6	4	4
Unemployed – looking for work	6	5	4	4	4
Unemployed – not looking for work	13	11	10	12	10
Student	3	6	4	4	3
Retired	30	29	22	22	15
Single (including cohab)	30	30	33	32	30
Married	43	46	44	47	50
Separated	4	3	3	2	2
Divorced	11	12	12	11	8
Widowed	13	10	9	8	10
Owner occupied house	78	70	82	76	69

Table 2: Baseline hedonic regressions

	(1)	House price	(2)	Ln(House price)
	Coeff.	S.E.	Coeff.	S.E.
Regenerated area	1039.68	1544.44	0.020	0.036
Time trend	1033.00***	35.81	0.018***	0.001
Semi-detached	9551.53***	2375.55	0.120***	0.045
Freehold	3647.27	5414.18	0.039	0.104
One way road	5735.79**	2303.87	0.067*	0.041
Over looking a park	14597.72***	2369.30	0.213***	0.045
Crime	-1206.93	1388.72	-0.027	0.025
N	511		511	
Adjusted R^2	0.67		0.63	

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively.

Table 3: Robustness of hedonic regressions*

Dependent: House prices	Regenerated area			
Specification:	Coeff.	S.E.	Adj. R^2	N
(1) Baseline	1039.68	1544.44	0.67	511
(2) Pre regeneration	398.66	1935.68	0.02	139
(3) 2002	-514.42	2161.69	0.04	116
(4) 2003	3530.25	3079.51	0.28	92
(5) 2004	5663.64	3729.43	0.27	97
(6) 2005	1745.23	3204.16	0.32	82
(7) 2006 & 2007	-2923.42	3224.51	0.12	124
(8) Post regeneration - Only comparing regenerated sales not areas	517.04	1903.33	0.67	511

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively. Each regression has the same controls as Table 2.

Table 4: Mean willingness to pay values (per year) (n=126)

Specification:	Mean	95% CI
WTP_{OLS}	£228	£192-£264
WTP_{INT}	£245	£209-£281

Table 5: Determinants of WTP values

Dependent:	(1) OLS WTP		(2) Interval Ln(WTP)	
	Coeff.	S.E.	Coeff.	S.E.
Life satisfaction	0.909	0.632	0.052	0.050
Regenerated area	-4.397	3.093	-0.313	0.244
Ln(Household income)	5.460*	2.921	0.560**	0.226
Gender	5.415*	3.146	0.534**	0.244
Age	0.493	0.517	0.103**	0.041
Age^2	-0.007	0.005	-0.001***	0.000
Married	0.223	4.520	-0.391	0.348
Cohabiting	-5.477	5.318	-0.362	0.405
Divorced	-6.428	4.980	-0.765*	0.392
Separated	-11.059	6.937	-1.096**	0.553
Widowed	0.704	6.270	-0.295	0.497
Employed part-time	-4.630	4.786	-0.067	0.368
Self-employed	8.400	9.401	0.968	0.710
Unemployed – looking for work	-2.758	6.592	0.037	0.511
Unemployed – not looking for work	-0.505	5.665	-0.215	0.443
Student	-1.538	9.905	0.100	0.766
Retired	-3.817	5.723	-0.145	0.451
Constant	-44.595	32.375	-5.078	2.526
σ			1.134	
WTP	£228		£245	
N	126		126	
LogL			-288.672	
Adjusted R^2	0.21			

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively.

Table 6: SWB regressions – whole sample

Dependent: Life satisfaction	(1)		(2)		(3)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.477**	0.235	0.225	0.234	0.573**	0.243
Ln(Household income)	0.142	0.253	0.073	0.251	0.217	0.273
Gender	0.252	0.240	0.241	0.241	0.071	0.259
Age	-0.153***	0.041	-0.138***	0.040	-0.200***	0.041
Age^2	0.002***	0.000	0.001***	0.000	0.002***	0.001
Married	1.190***	0.336	1.192***	0.338	0.895***	0.346
Cohabiting	0.791	0.480	0.768	0.484	-0.012	0.533
Divorced	0.524	0.432	0.360	0.440	0.470	0.458
Separated	-1.604*	0.839	-1.503*	0.845	-2.783***	0.981
Widowed	0.025	0.513	0.378	0.502	-1.484***	0.563
Employed part-time	-0.085	0.182	-0.093	0.183	-0.098	0.177
Self-employed	0.527	0.690	0.698	0.663	1.767**	0.715
Unemployed – looking for work	-1.399**	0.610	-1.267**	0.588	-1.461**	0.643
Unemployed – not looking for work	-1.187***	0.425	1.316***	0.428	-0.680	0.450
Student	0.783	0.724	0.759	0.730	1.139	0.700
Retired	0.416	0.440	0.360	0.431	0.600	0.447
Constant	7.550***	2.690	8.072***	2.663	8.057***	2.876
N	305		308		244	
Adjusted R^2	0.18		0.18		0.25	

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively. Reference groups are Single and Employed full-time. Regression (1) compares populations A (living on a regeneration road) and B (living in the regeneration area but not on a regeneration road) versus C (living in control area). Regression (2) compares population A versus B and C, and regression (3) compares population A versus C.

Table 7: SWB regressions – working age

Dependent: Life satisfaction	(1)		(2)		(3)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.558**	0.259	0.556**	0.254	0.646**	0.276
Ln(Household income)	0.652**	0.276	0.841***	0.279	0.928***	0.307
Gender	0.178	0.292	0.246	0.284	0.163	0.314
Age	-0.127*	0.075	-0.096	0.075	-0.148*	0.080
Age^2	0.001	0.001	0.001	0.001	0.001	0.001
Married	1.082***	0.346	0.993***	0.338	0.653*	0.371
Cohabiting	-0.139	0.480	0.108	0.477	-0.915*	0.546
Divorced	0.941*	0.488	0.951**	0.476	0.640	0.518
Separated	-1.927**	0.759	-1.407*	0.783	-2.723***	0.974
Widowed	-0.160	0.786	-0.431	0.817	-0.730	1.122
Employed part-time	-0.020	0.182	0.065	0.381	0.236	0.418
Self-employed	1.906***	0.710	1.449**	0.653	2.468***	0.759
Unemployed – looking for work	-1.034*	0.612	-0.727	0.603	-0.773	0.667
Unemployed – not looking for work	-1.034**	0.446	-0.703	0.439	-0.243	0.483
Student	1.231*	0.676	1.346**	0.667	1.122	0.700
Retired	0.653	0.601	0.980	0.594	1.053	0.715
Constant	2.291	3.194	-0.231	3.256	0.105	3.563
N	229		225		187	
Adjusted R^2	0.24		0.23		0.23	
Average household income	£18,378		£18,578		£18,848	
IC for regeneration	£24,900		£17,400		£19,000	

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively. Reference groups are Single and Employed full-time. Regression (1) compares populations A (living on a regeneration road) and B (living in the regeneration area but not on a regeneration road) versus C (living in control area). Regression (2) compares population A versus B and C, and regression (3) compares population A versus C.

Table 8: Robustness checks for the SWB equations

Dependent: Life satisfaction	(1)		(2)		(3)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.738***	0.283	0.623**	0.283	0.652	0.427
Ln(Household income)	0.704**	0.305	0.629**	0.304	0.729***	0.197
Gender	0.036	0.318	0.073	0.313	0.271	0.273
Age	-0.150*	0.080	-0.140*	0.079	-0.116	0.083
Age^2	0.001	0.001	0.001	0.001	0.001	0.001
Married	0.609	0.383	0.602	0.377	0.571	0.214
Cohabiting	-0.776	0.568	-0.691	0.560	-0.764	0.514
Divorced	0.128	0.499	-0.109	0.499	-0.118	0.641
Separated	-1.818	1.139	-1.361	1.134	-1.193	0.723
Widowed	-0.596	1.125	-0.503	1.107	-0.569	0.379
Employed part-time	0.020	0.424	0.025	0.417	0.059	0.515
Self-employed	2.651***	0.720	2.291***	0.720	2.289***	0.466
Unemployed – looking for work	-1.314*	0.687	-1.394**	0.676	-1.415*	0.616
Unemployed – not looking for work	-0.182	0.491	-0.305	0.486	-0.246	0.572
Student	0.916	0.682	0.877	0.671	0.991**	0.405
Retired	0.334	0.707	0.492	0.697	0.579	0.425
Speaking to family	0.126	0.197	0.157	0.196	0.165	0.218
Speaking to friends	0.421**	0.196	0.447**	0.196	0.467**	0.184
Speaking to neighbours	0.096	0.148	0.068	0.146	0.059	0.176
Crime			-0.241*	0.132	-0.239***	0.059
Noise from neighbours			-0.210*	0.115	-0.219**	0.080
Ln(Reference income)					-1.755	1.204
Constant	0.169	3.625	1.160	3.593	16.904	11.182
N	185		185		185	
Adjusted R^2	0.33		0.36		0.37	
Average household income	£18,986		£18,986		£18,986	
IC for regeneration	£35,200		£32,100		£27,500	

Notes: ***,**,* represents significance at the 1,5 and 10% levels respectively. Reference groups are Single and Employed full-time. Robust standard errors are adjusted for clustering at the cell level for reference income in regression (3).

Table 9: Instrumented regressions

Dependent: Life satisfaction	(1)		(2)	
	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.708**	0.290	0.811	0.531
Ln(Household income)	2.449***	0.891	2.418***	0.839
Other controls…				
First stage *F* statistic	12.20		6.05	
First stage partial R^2	0.13		0.10	
Over-identification test	0.707	(p=0.401)	0.444	(p=0.505)
Average household income	£18,943		£18,986	
Income compensation	£6,350		£7,600	

Figure 1: Average house price every six months by area

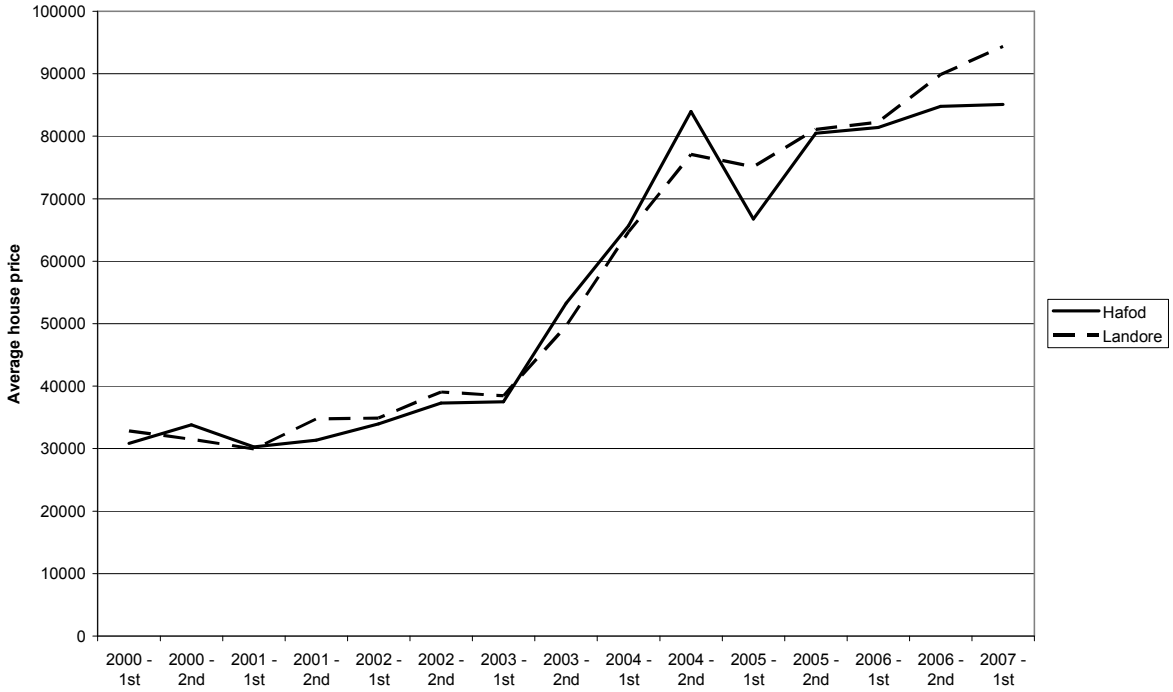


Figure 2: Distribution of WTP values

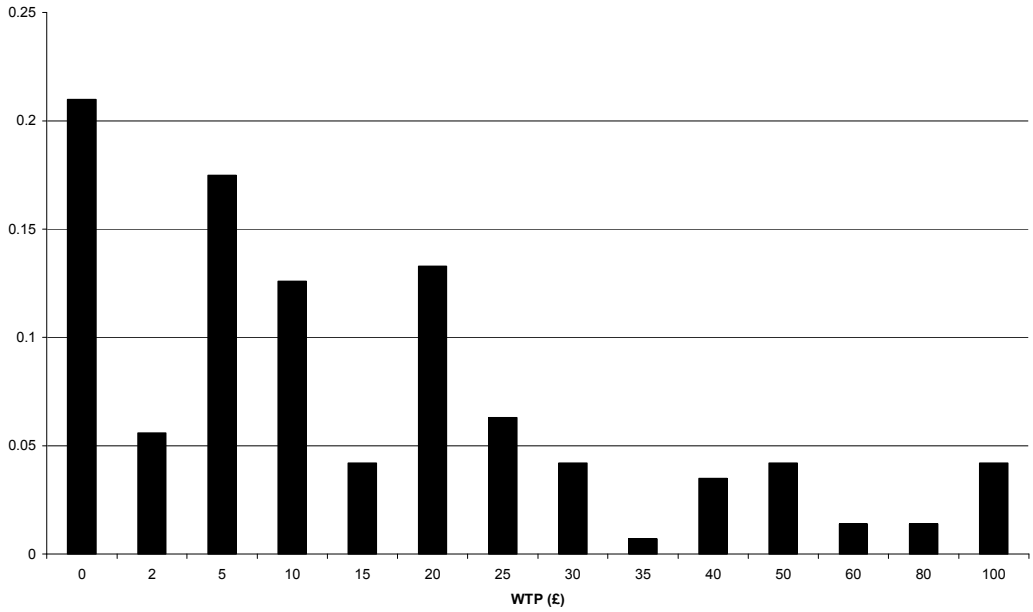
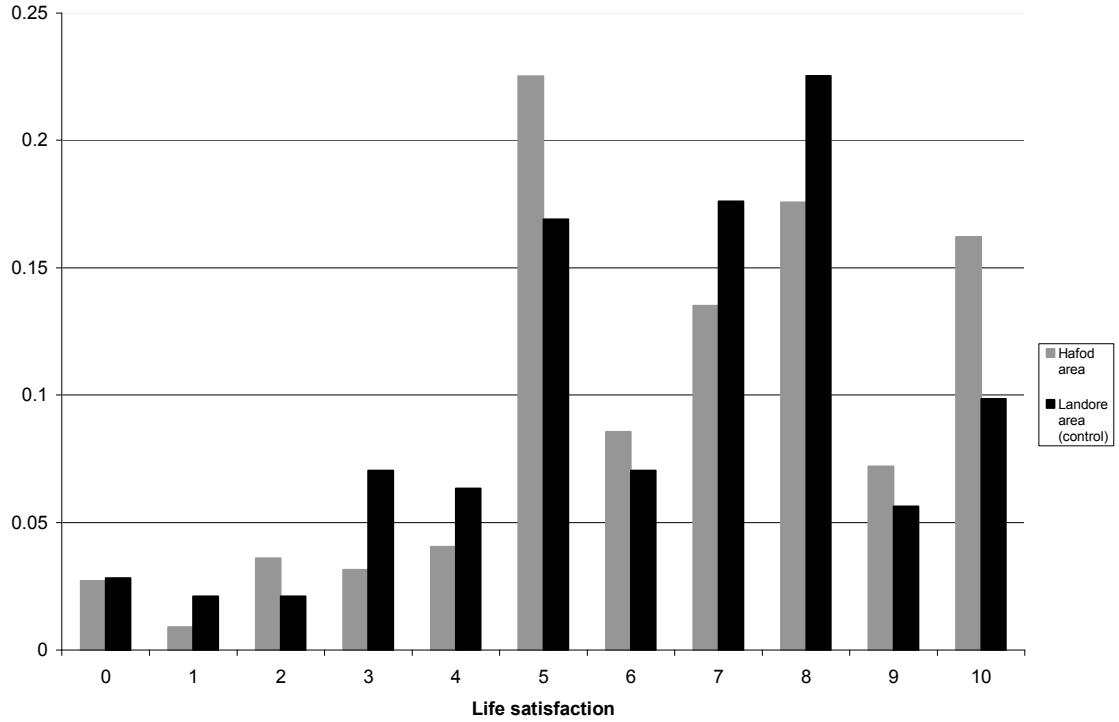


Figure 3: Distribution of general satisfaction by area



Appendix 1

Variable name	Variable definition
Age	The age of respondent in years.
Co-habiting	Marital status as co-habiting: 0 (no) – 1 (yes).
Crime	Does your house experience any crime or vandalism. Bounded from 0 (never) to 4 (always).
Divorced	Marital status as divorced: 0 (no) – 1 (yes).
Employed full-time	Employed in full-time work: 0 (no) – 1 (yes).
Employed part-time	Employed in part-time work: 0 (no) – 1 (yes).
Freehold	Whether the house is freehold (1) or leasehold (0).
Gender	Dummy variable: 0 (female) – 1 (male).
Ln(Household income)	The natural logarithm of household gross income of the respondent.
Ln(Reference income)	The average annual income in both neighborhoods (i.e. Hafod and Landore) with respect to age and sex.
Married	Marital status as married: 0 (no) – 1 (yes).
Noise from neighbours	Does your house experience noise from neighbours. Bounded from 0 (never) to 4 (always).
One way road	Whether the house resides on a one way road (1) or not (0).
Overlooking a park	Whether the house overlooks a local park (1) or not (0).
Partner	Whether the respondents partner is in employment (1) or not (0).
Regenerated area	Whether the respondents' house is in the regeneration area irrespective of whether the respondents' actual house has been regenerated or not. Bounded from 0 (no) to 1 (yes).
Regeneration	Whether the respondents' house has been regenerated. Bounded from 0 (no) to 1 (yes).
Rent	Whether they rent (1) their accommodation or not (0).
Retired	Retired and not in work: 0 (no) – 1 (yes).
Self-employed	Self-employed: 0 (no) – 1 (yes).
Semi-detached	Whether the house is semi-detached (1) or not (0).
Separated	Marital status as separated: 0 (no) – 1 (yes).
Single	Marital status as single: 0 (no) – 1 (yes).
Speak to family	How often the respondent speaks to family. Bounded from 0 (never) – 4 (most days).

Speak to friends	How often the respondent speaks to friends. Bounded from 0 (never) – 4 (most days).
Speak to neighbours	How often the respondent speaks to neighbours. Bounded from 0 (never) – 4 (most days).
Time trend	The time trend variable takes on the value of 1 if a property is sold in April 2000 and up until 86 if a property is sold in May 2007.
Unemployed – looking for work	Unemployed and looking for work: 0 (no) – 1 (yes).
Unemployed – not looking for work	Unemployed and not looking for work: 0 (no) – 1 (yes).
Widowed	Marital status as widowed: 0 (no) – 1 (yes).
WTP	How much an individual is willing-to-pay for the urban regeneration using the payment card method.

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