

VALUING THE IMPACT ON WELLBEING OF URBAN AMENITIES IN BEIJING

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ABSTRACT

Survey data for a sample of respondents in Beijing are used to evaluate the determinants of subjective wellbeing. The data are rich and allow the impact on wellbeing of amenities associated with housing to be evaluated alongside the impact of household income, thus enabling us to attach a value to characteristics such as neighbourhood tranquility, air quality, and access to infrastructure. The evidence suggests that the value of such amenities is high, and this has clear implications for urban design.

JEL Classification: A13, I31, O18, R23

Keywords: wellbeing, housing, urban design

1. Introduction

Economics concerns choices that are made to maximise an objective function in the presence of constraints. Often the objective is utility. While data considerations have led to a focus on income as a proxy for individuals' utility, more recent work has focused on measures of subjective wellbeing; and, as evidence has mounted that these measures are highly correlated with objective indicators, the literature on happiness has mushroomed.

Initially using data from developed western economies, empirical analysis has established a number of stylised facts – relative income influences happiness, but long term growth of economic variables such as national income has not secured gains in subjective wellbeing (Easterlin, 1974). A robust relationship has been found to exist between age and happiness (Blanchflower, 2020). Research has uncovered similar patterns across a wide range of countries at various stages of development.

In this paper, we consider the research question: how is happiness affected by the amenities offered by the place of residence? We exploit the availability of rich information in a survey of respondents living in various communities in Beijing. All are located in areas that have urbanised relatively recently, but the facilities available in the communities selected for the research differ markedly, thus allowing us to assess how different characteristics of these areas are valued. The insight that our analysis affords into the valuation of amenities is particularly important in the context of such recently urbanised areas, because optimal design of further urban developments should be able to take into account the importance that people place on various characteristics of the places in which they live. From a theoretical perspective, we would expect people to place a positive valuation on amenities that make their lives better.

The paper is organised as follows. The next section provides an overview of the relevant literature. Then the data are described. The main analytical section follows along with reporting and commentary on the results. A short concluding section ends the paper.

2. Received Literature

Early analyses of self-reported measures of happiness originated in disciplines other than economics (see, for example, Inkeles, 1960). But interest in these measures was stimulated by the work of Easterlin (1974), who identified the paradox that, while cross-section analyses reveal a positive relationship between income and happiness, time-series investigations do not seem to suggest that economic growth enhances wellbeing. A popular explanation for this finding is that humans may be more concerned with relative positioning than absolute income (Layard, 1980).

The characteristic approach to evaluating the determinants of happiness has been to estimate equations in which some measure of wellbeing (life satisfaction or happiness) is regressed against a plethora of explanatory variables (Blanchflower and Oswald, 2011). The latter include personal characteristics such as age, ethnicity, gender, education, and income, but may also include aggregate measures to do with, for example, the performance of the economy. An particularly insightful example of a study that includes the latter type of variable is a contribution by Di Tella et al. (2001) implying that unemployment should be assigned considerably more weight than inflation in the construction of a 'misery' index, since a percentage point increase in inflation adversely affects happiness less than a percentage point

increase in the unemployment rate. Other work (Alesina et al., 2004) finds that happiness is reduced by the presence of high levels of inequality.

Other work has focused more on microeconomic issues. A common and robust finding has been that happiness varies nonlinearly with age. Specifically, younger and older respondents appear happier, other things being equal, than those aged in between (Blanchflower and Oswald, 2008; Blanchflower, 2020). Benefic events such as marriage enhance happiness, while adverse events such as divorce and unemployment reduce it. Using the impact of a higher income on happiness as a yardstick, the effect that these events have on happiness appears to be substantial. So, for example, Blanchflower and Oswald (2004) find that, over and above the loss of income, being unemployed confers on an individual a loss of happiness that is tantamount to \$60000 per annum.

Chen and Davey (2008) note that several hundred empirical studies of happiness have been conducted in China, though many of these are restricted to demographic subsets. Indeed some, such as Zeng et al. (2004) confine their analysis to samples that researchers can readily obtain from the population of their students. In Chinese studies with more catholic samples, many of the findings of analyses conducted elsewhere in the world are replicated. So, for example, inequality has an impact on happiness (Smyth and Qian, 2008; Jiang et al., 2012; Zhang and Churchill, 2020)¹, happiness is u-shaped in age, increases with marriage and declines with divorce (Oshio et al., 2011; Knight and Gunatilaka, 2011; Jiang et al., 2012), and while relative income positively influences happiness (Smyth and Qian, 2008), the substantial economic growth of recent decades has not resulted in a corresponding increase in happiness (Brockmann et al., 2009; Wang et al., 2019).

Numerous papers have attempted to evaluate the impact that the characteristics of the area in which individuals reside have on their happiness. For example, Beidenweg et al. (2017), using data from the Puget Sound area, provide evidence that a wide range of measures of how people experience nature have a small but positive impact on subjective wellbeing. Critical path analysis has been applied by Cao (2016) within a structural equation model to examine data from Minneapolis-St.Paul, and finds that high population density and poor road connectivity are both deleterious to life satisfaction. County level data on urbanicity and climate have been grafted onto individual level data from the US by Winters and Li (2016), who find that wellbeing is negatively related to urbanicity and positively related to winter temperatures. Beyond the weather, however, the spatial level of aggregation used in this study does not allow consideration of local amenities. Ambrey and Fleming (2014) use data from Household Income and Labour Dynamics in Australia (HILDA) survey and find that public green space in the respondent's locality (collection district, the smallest spatial area identifiable in the Australian data) has a positive and statistically significant effect on wellbeing.² A useful review by Weźiak-Białowolska (2016) uses Eurobarometer data to evaluate the determinants of life satisfaction and finds strong and significant effects of green spaces, air quality, cleanliness and noise. Dissatisfaction with amenities tends to have a stronger impact on measures of wellbeing than does satisfaction; this is an intriguing finding and suggests that framing may be an important aspect of how wellbeing is determined (Kahneman and Tversky, 1979).

¹ Jiang et al. (2012) argue that the relationship is complex; between group inequality lowers happiness, but, controlling for this, an increase in the Gini coefficient raises happiness, presumably because, within groups, an increase in inequality signals the possibility of future income gains.

² This paper is also notable for including, amongst the regressors, measures of the 'big five' psychological traits; extraversion, agreeableness, conscientiousness and emotional stability are all found to have a significantly positive impact on wellbeing; openness does not have a significant effect.

Other papers have gone further, and provide an evaluation of how near amenities need to be, and how much needs to be provided, in order to confer a positive effect on happiness. Krekel et al. (2016) use German Socioeconomic Panel data to evaluate the impact on life satisfaction of being resident near green areas (such as parks) and also near ‘brown’ land (waste land). They find significant effects in the expected direction, but also that these effects are nonlinear so that they vanish within about a mile. They find no effect of proximity to water or to forests. Using their findings, the authors conduct some back-of-envelope calculations to find how the value of parks can be compared with the cost of developing more parkland space in cities – and find that there is considerable under-supply of parkland in German cities. Another paper to use German data, but in this case from a specially conducted survey undertaken in Berlin, is that of Bertram and Rehdanz (2015). They find nonlinear effects that are very much in line with those of Krekel et al. (2016), with a rapid falling-off of the impact on happiness as distance from the amenity increases. Moreover, the bespoke nature of the survey used in this study (with highly detailed information on the location of respondents’ residence) allows the authors to estimate the proportion of urban land that should be covered by green space in order to optimise wellbeing. This amounts to around 11%, equivalent to around 38 hectares of parkland within a kilometre of the respondent’s home.

A few papers focus on the role played by amenities in determining life satisfaction specifically in the Chinese context. Liu et al. (2017) use survey data on Chinese migrants in Guangzhou, and find no evidence to support the hypothesis that wellbeing is influenced by the cleanliness and amenities of the area in which the migrants reside. However, the sample is drawn exclusively from the inner city area. Moreover, since a (small) majority of the sample have migrated for work while leaving their families in their area of origin, this group of respondents may not regard their residence in Guangzhou as a permanent home. Nevertheless the respondents do value social ties within their host city. The most obvious antecedent of our work, however, is a paper by Ma et al. (2018) which analyses the determinants of happiness in Beijing using data from a 2013 survey. They find that the perceived safety of an area has a positive impact on the happiness of its residents, as does travel convenience. Their analysis uses a logit function, and so does not allow evaluation of these various amenities on a common (financial) scale – and this is the gap in the literature that we seek to address in the remainder of this paper.

3. Data

The survey used in this analysis was conducted by Qiao et al. (2019) in Beijing during May and June 2017 as part of a project sponsored by the UK Economic and Social Research Council.³ About 150 respondents were selected in each of 15 neighbourhoods, mostly located between the fourth and fifth ring roads in Beijing. The fourth ring road was opened in 2001 and passes through areas that are by now quite densely developed; the fifth ring road, meanwhile, was opened in 2003 and, particularly to the west and south of the city, passes through areas near the Yongding river that remain relatively undeveloped; by way of contrast, the northeastern section of this road passes through the Olympic village and close to the airport. The neighbourhoods covered by the survey have thus been subject to very rapid development over recent years, leading to a variety of living environments at the time of the survey. This is, to some extent, captured in house price differentials, which, for a given distance from the city

³ The data and documentation are available at <http://reshare.ukdataservice.ac.uk/853640/>, accessed 16 June 2020.

centre, highlight the value placed on recent development (Zhao et al., 2019). The analysis undertaken on the survey data by Qiao et al. (2019) provides useful insights about how average wellbeing varies across latent classes of respondents; it does not, however, provide a microdata based model of wellbeing that conforms with much of the received literature (for example Blanchflower and Oswald, 2004) and does not offer an economic perspective by exploiting data on income.

The survey is particularly interesting because it contains information about both subjective wellbeing⁴ and about household income; this is particularly useful in the context of our analysis because it allows a financial value to be placed on the various amenities associated with housing. Further questions elicit respondents' views about the quality of various environmental characteristics of their locale. Respondents are invited to record their 'view on the environment' – air quality, tranquility / noise level, walkability, access to nature, green space etc. – according to a five point Likert scale, ranging from 'very dissatisfied' to 'very satisfied'. It is important to note that it is the respondents' views on these amenities, rather than an objective measure, that is being assessed; these views are what might be expected directly to influence measures of life satisfaction and happiness.⁵ That said, on objective criteria, there is considerable variation across residential districts in Beijing in the quality of amenities. While some of the amenities assessed here (such as air quality and noise levels) cannot be 'designed in' by construction companies, others (such as access to green space) can. In practice, those living in small residential districts share ownership of such facilities, and the residents of these districts choose widely varying levels of provision (Deng et al., 2011).

Descriptive statistics are reported in Table 1. The typical respondent is in his or her mid-forties, and household income amounts to almost 130000 RMB. (The current exchange rate is about 7 RMB to one US dollar.) Gross regional product per capita and household incomes in Shanghai

Table 1 Descriptive statistics

Variable	mean	Standard deviation
Happiness (scale 1-5)	3.74	0.37
Age (years)	43.70	15.47
Male	0.51	0.50
Household income (annual, RMB)	128416.6	110549.9
Household income per person in household	44234.3	46466.5
Home ownership	0.53	0.50
Number of children in the home	0.61	0.71
Urban density (1= too high)	0.23	0.42
Living environment (1 = satisfied or very satisfied)	0.40	0.49
Poor air quality (1 = dissatisfied or very dissatisfied)	0.26	0.44
Poor tranquillity (1= dissatisfied or very dissatisfied)	0.17	0.38
Infrastructure quality (1=satisfied or very satisfied)	0.48	0.50
Walkability of the area (1 = satisfied or very satisfied)	0.46	0.50
Access to nature (1=satisfied or very satisfied)	0.44	0.50

⁴This is based on a 5 point Likert scale, ranging from 'very happy' to 'not happy at all' in response to the question: 'Are you happy with your quality of life?'

⁵ The approach taken here differs, therefore, from that of, for example, Bertram and Rehdanz (2016) who use an objective measure of the provision of amenities. Arguably (while perceptions are influenced by reality) it is the perception of amenity provision that directly influences people's satisfaction.

and Beijing are much higher than elsewhere in the country⁶, and this figure is broadly in line with what might be expected for a multi-worker household at the time of the survey.

4. Analysis

While recognising that happiness is here measured by a limited discrete variable, it is nonetheless useful as a preliminary exercise to report results of OLS regression. This is particularly the case because the ease of interpretation of the estimated coefficients obtained from OLS allows the impact on happiness of income to be readily compared with the impact of other variables, thereby allowing amenities to be valued. The results appear in Table 2. Two specifications of the model are reported, and they differ in the choice of income variable used as a regressor. The first specification uses household income, while the second uses household income per household member. The two models yield very similar results, and so in the remainder of the paper we focus on the first specification.

The linear and quadratic terms in age are statistically significant only at generous levels, the magnitude of these coefficients confirms the age-happiness relationship to be u-shaped with a turning point at around 43 years in the case of the first specification (and 44 in the case of the second). This matches closely the pattern observed across a large number of countries by Blanchflower (2020). Happiness rises with the presence of children; while some earlier analyses of happiness noted a negative relationship between children and happiness, the most recent analysis suggests that, once (as is the case here) financial difficulties are controlled for, the true relationship is positive (Blanchflower and Clark, 2019). In the Chinese context, fertility has been directly influenced by policy, such that few families other than those wealthy enough to pay fines have chosen to have more than one child.

Table 2 OLS coefficients

Variable	1		2	
	coefficient	t	coefficient	t
Age	-0.0115	1.83	-0.01223	1.94
Age ²	0.0001	1.96	0.0001	2.04
Male	-0.0883	3.16	-0.0956	3.39
Household income	2.53x10 ⁻⁷	1.89		
Income per household member			2.43x10 ⁻⁷	0.75
Home ownership	0.0484	1.61	0.0589	2.02
Number of children	0.0555	2.76	0.0656	3.21
Urban density	-0.0201	0.60	-0.0233	0.69
Living environment	0.1215	3.23	0.1200	3.16
Poor air quality	-0.0893	2.55	-0.0886	2.51
Poor tranquillity	-0.0818	2.02	-0.0837	2.05
Infrastructure quality	0.1078	3.62	0.1095	3.65
Walkability	0.0495	1.37	.0542	1.49
Access to nature	0.1236	4.01	0.1246	4.01
constant	3.7764	28.10	3.8071	27.80
R²	0.0815		0.0828	
n	2182		2143	

⁶ See the National Bureau of Statistics of China (<http://www.stats.gov.cn/tjsj/ndsj/2019/html/E0309.jpg>) and note also the observations of Wen (2018).

The impact of a change in household income is modest, and the coefficient falls marginally short of significance at the 5% level (and well short of significance in the case of income per household member). A one standard deviation increase in household income – and that is a large increase in relation to the mean – typically raises the happiness score by just 0.03. The low impact of income on happiness may be due to the role played by income as compensation for the disutility of work.

Other variables have coefficient signs that are in line with prior expectations, and are for the most part significant. In particular, all of the amenity variables are significant at conventional levels with the exception of walkability (which is, however, significant at better than 10%). While no one variable has a huge effect on the happiness score, it is worth noting that a congenial living environment with good infrastructure and access to nature together can raise predicted happiness by around 0.35 points. Given the low standard deviation associated with the happiness measure reported in Table 1, this is non-trivial. Moreover, it has clear implications for those interested in urban design.

Since the model allows evaluation of the impact on happiness both of changes in household income and of changes in the perceived quality of local amenities, it is possible to express the impact of a switch from a low to a high level of amenities in terms of the income change to which this is equivalent. Hence, satisfaction with tranquility and air quality are each equivalent to about a 350000 RMB gain in annual household income, while high quality infrastructure is equivalent to almost 450000 RMB. Access to nature is equivalent to a little over 500000 RMB. These are all very substantial sums, due to the low impact, noted above, that income has on the happiness score. The observation that increases in income typically accompany an increase in work commitment notwithstanding, the results suggest that considerable value can be built into the design of new communities by prioritising those amenities that enhance wellbeing.

Table 3 Ordered logit coefficients

Variable	coefficient	z
Age	-0.0380	1.92
Age ²	0.0004	2.09
Male	-0.3214	3.64
Income	9.81x10 ⁻⁷	2.25
Home ownership	0.1285	1.38
Number of children	0.1676	2.63
Urban density	0.0033	0.03
Living environment	0.4219	3.51
Poor air quality	-0.2367	2.18
Poor tranquillity	-0.2292	1.82
Infrastructure quality	0.3746	3.96
Walkability	0.1283	1.13
Access to nature	0.3919	3.98
Cut 1	-5.3126	
Cut 2	-3.6630	
Cut 3	-0.9744	
Cut 4	2.4681	
Pseudo R ²	0.0433	
n	2182	

Ferrer-i-Carbonell and Frijters (2004) note that, in many applications involving measures of happiness, the use of cardinal measures (such as those used as dependent variable in an OLS regression) leads to similar results to those obtained by interpreting the happiness scores as ordinal measures. Nevertheless, for completeness, we report also the results of an ordered logit analysis. These appear in Table 3, with the marginal effects in Table 4. The marginal effects for those with happiness scores of 4 or 5 (where most respondents are concentrated) confirm the findings of the OLS analysis. In particular, desirable properties of respondents' living space, such as access to good infrastructure and amenities, have a strong positive impact on reported happiness.

5. Conclusion

This paper confirms many of the findings of the happiness literature. Happiness is u-shaped in age, rises with income, and is influenced in a predictable manner by respondents' perceptions of their living conditions. The novelty of the paper concerns the detailed information about these living conditions that is offered by the dataset used here – on residents in recently urbanised areas around Beijing. Air quality, tranquility, access to good infrastructure, walkability, and access to nature all have value. In terms of the impact on individuals' happiness, this value is extraordinarily high. For example, moving to an area where one is satisfied (or very satisfied) with access to nature (from an area where this is not the case) is tantamount to an income gain of between three and four times the household income of the typical respondent. The gains in economic welfare that may be realised by designing such amenities into construction developments are thus considerable.

We would, of course, expect the value of such amenities to be capitalised in the value of real estate. Data from the Lianjia real estate agency in Beijing⁷ confirm substantial price differentials between areas of the city, with, for example, community average prices of 2.95 million RMB in Shunyi (north east of the city) and 5.41 million in Fengtai (to the south west) where much recent development has taken the form of well-appointed apartments.⁸

The robustness of measures of happiness and life satisfaction is now well established in the literature, and governments around the world have started to aim for wellbeing as an objective of policy (Bache, 2020). There is clear scope for the authorities to put incentives and regulation in place for developers both to choose favourable locations and to design their developments in a way that maximises the value of the amenities that augment the economic welfare of residents.

⁷ <https://www.kaggle.com/ruiqurm/lianjia>, accessed 16 June 2020. See also Zhao et al. (2019)

⁸ Indeed the average price in Fengtai is likely pushed up by sales of these newer properties; the area retains also some much older and less appealing accommodation which is less likely to come to the market.

Table 4 Ordered logit marginal effects

	Happiness = 1		Happiness = 2		Happiness = 3		Happiness = 4		Happiness = 5	
	marginal effect	z	marginal effect	z	marginal effect	z	marginal effect	z	marginal effect	z
Age	0.0002	1.72	0.0008	1.88	0.0069	1.92	-0.0053	1.92	-0.0025	1.91
Age²	-2.39x10 ⁻⁶	1.84	-9.51x10 ⁻⁶	2.03	-0.0001	2.09	0.0001	2.08	2.98x10 ⁻⁵	2.08
Male	0.0017	2.64	0.0068	3.33	0.0578	3.64	-0.0448	3.61	-0.0215	3.55
Income	-5.24x10 ⁻⁹	1.94	-2.08x10 ⁻⁸	2.17	-1.77x10 ⁻⁷	2.25	1.38x10 ⁻⁷	2.23	6.54x10 ⁻⁸	2.23
Home ownership	-0.0007	1.30	-0.0027	1.36	-0.0232	1.38	0.0181	1.38	0.0085	1.38
Number of children	-0.0009	2.17	-0.0036	2.51	-0.0302	2.63	0.0235	2.61	0.0112	2.61
Urban density	-1.76x10 ⁻⁵	0.03	-0.0001	0.03	-0.0006	0.03	0.0005	0.03	0.0002	0.03
Living environment	-0.0022	2.62	-0.0087	3.30	-0.0747	3.58	0.0562	3.65	0.0293	3.32
Poor air quality	0.0013	1.81	0.0053	2.00	0.0434	2.14	-0.0350	2.06	-0.0151	2.26
Poor tranquillity	0.0013	1.55	0.0052	1.66	0.0423	1.78	-0.0345	1.70	-0.0143	1.93
Infrastructure quality	-0.0020	2.75	-0.0080	3.57	-0.0673	3.97	0.0520	3.92	0.0252	3.85
Walkability	-0.0007	1.08	-0.0027	1.12	-0.0231	1.13	0.0179	1.13	0.0086	1.12
Access to nature	-0.0021	2.78	-0.0082	3.63	-0.0699	4.03	0.0534	4.04	0.0268	3.81
Predicted probability	0.0054		0.0220		0.2652		0.6357		0.0718	

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