



the happy
museum

Museums and happiness:

The value of participating
in museums and the arts

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MUSEUM OF
EAST ANGLIAN
LIFE



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Any opinions, statements or claims made in this paper are the author's own.

Foreword

Measuring what matters is one of the six Principles of the Happy Museum Project. We suggest that counting visitor numbers tells us nothing about the quality of their experience or our contribution to their wellbeing.

Museums are adept at storytelling, evaluation reports which speak of transformational experiences for individuals as a result of museum activity are legion. Qualitative research has been used by museums as effective advocacy, often influencing the hearts and minds of decision makers at local level. However, we think that quantitative evidence that robustly uncovers cause and effect is more likely to influence policy makers.

So with funding support from Arts Council England we asked Daniel Fujiwara from the London School of Economics to measure and value people's happiness as a result of visiting or participating in museum activity. This paper is one of a handful of studies that have applied robust quantitative methods on large national datasets to give us a better understanding of the impact of culture on people's lives.

By finding that the individual wellbeing value of museums is over £3,000 a year, the report makes a strong case for investing in museums. It also identifies what makes people more likely to visit museums, giving some direction into where that investment might be best placed. It sits alongside our qualitative research which digs into *how* museums make a difference.

We hope these striking results will encourage museums to think more about their impact on wellbeing just as they try to do for the local economy. The aim is to arm museums with compelling statistics to show how a healthy culture must be at the heart of a healthy society.

A handwritten signature in black ink, appearing to read 'Tony Butler', with a long horizontal flourish extending to the right.

Tony Butler, Director Happy Museum Project and Director Museum of East Anglian Life

1. Introduction

This paper looks at the relationships between museums, the arts and wellbeing using data from the *Taking Part* survey. We also look at self-reported health as this is likely to be a mechanism through which museums and the arts impact on happiness, and, since it includes mental health, is in itself an important outcome that fits closely with the Happy Museum Project's focus on resilience. We look at the impact on wellbeing and health of participating in and being audience to the arts and of being involved with museums and compare these impacts to other activities such as participation in sport. We attach monetary values to these impacts using standard methods set out in welfare economics and these results can be used in Cost-Benefit Analysis (CBA) or Social Return on Investment (SROI). Finally, the research also looks at the main determinants of involvement with museums in order to derive a better understanding of the barriers to participation.

There is a growing literature in economics on the value of the arts or being audience to the arts. These studies often use contingent valuation surveys, whereby people are asked their willingness to pay for a good or service in a hypothetical setting. In relation to the arts and museums this may be framed as, say, the willingness to pay to attend an exhibition or to participate in a cultural event at a museum. Contingent valuation and other stated or revealed preference techniques (where people are asked, or behaviour infers a value) require that people have good information and a set of underlying well-defined preferences for these types of activities and that they can report their values accurately. However much research in the psychological sciences has demonstrated that people's preferences are often not well-defined a-priori, that people may lack enough information to state a valid willingness to pay amount and that contingent valuation studies are susceptible to a large number of survey biases (for a detailed discussion see Fujiwara & Campbell, 2011). The upshot is that preferences and willingness to pay figures may not provide a fully accurate picture of how much people really value museums and the arts.

This paper takes a different approach, whereby rather than asking for or observing people's preferences we look at the impacts of the arts on people's subjective wellbeing and health and attach values to these impacts. This is the Wellbeing Valuation approach, which has been recently developed and which now features as part of HM Treasury Green Book guidance (Fujiwara and Campbell, 2011) and is hence prominent in government policy making (Dolan and Fujiwara, 2012). The Wellbeing Valuation approach estimates monetary values by looking at how a good or service impacts on a person's wellbeing and finding the monetary equivalent of this impact. In the present context, we would look at the impact of, say, going to a museum on wellbeing. The Wellbeing Valuation method derives robust value estimates in that they are in line with the welfare economic theory on valuation that underlies CBA and SROI (see Fujiwara and Campbell (2011) for details). The advantage is that the Wellbeing Valuation approach can be undertaken using any dataset that includes measures of wellbeing (as long as

there is data on the goods and things we are trying to value and other determinants of wellbeing, including income) and we do not need to ask people to consult their preferences and state a value themselves for a good/service like attending a museum. The central element of deriving values for museums and the arts in the Wellbeing Valuation approach will be to assess their impacts on wellbeing and we will look at how a number of different variables (factors) related to the arts and museums and then derive values for them for use in CBA, SROI and policy-making more generally.

Key findings

We find that visiting museums has a positive impact on happiness and self-reported health after controlling for a large range of other determinants that may confound the relationship. We also find that participation in the arts and being audience to the arts have positive effects on happiness. The effect of participation in the arts is of the same magnitude as the effect of participation in sports if we control for health. Our valuation headline figures are as follows:

- ✓ **People value visiting museums at about £3,200 per year.**
- ✓ **The value of participating in the arts is about £1,500 per year per person.**
- ✓ **The value of being audience to the arts is about £2,000 per year per person.**
- ✓ **The value of participating in sports is about £1,500 per year per person.**

We must apply some caution to these results though. As involvement in the arts and sport was not randomised across our sample, we are reliant on the data we observe and statistical methods for controlling for as many of the differences between people that are involved and those who are not involved in order to make inferences about causality. But there are always likely to be some important factors that we cannot observe and control for and hence these factors may be driving any observed relationships between the arts, happiness and health. For example, extraverted people may be more likely to participate in the arts and also are more likely to report higher happiness and wellbeing, which means that any observed relationship between the arts and happiness may in part be driven by this personality trait rather than the act of participation itself. Further, there may be the problem of reverse causality (wellbeing prompting attendance, rather than attendance creating wellbeing). However, we have taken steps to employ the most robust statistical methods possible given the data and this level of statistical rigour passes thresholds used by many OECD governments in impact assessments.

2. Literature Review: Museums, the Arts and Wellbeing

We used a range of academic journal search engines and found that there is not a lot of literature on museums, arts and wellbeing using national datasets and self-reported measures of wellbeing. Most studies seem to use qualitative survey approaches with small focus groups to assess the links between museums, arts and wellbeing. For example, Packer (2008) uses a qualitative approach to survey people about their experiences and perceptions regarding museums and finds that museums are important because of the experiences they create and because they provide a restorative environment for people where they can relax and unwind. Similarly, Binnie (2010) uses a qualitative approach and finds that people report reduced levels of anxiety and increased wellbeing after viewing art in museums.

However, we have to apply caution to qualitative approaches since there is no way to ensure causality – as the behavioural sciences literature shows, asking people about a perceived impact is problematic for a number of reasons, such as (i) people may give socially desirable answers to please the survey enumerator; (ii) it is very difficult for people to conceptualise and forecast what the counterfactual would have been (ie, what would have happened anyway) and people probably just compare outcomes pre and post the activity or programme intervention, which has been shown to be a highly biased estimation method; (iii) these types of studies tend to use very small sample sizes such that results are not generalizable and we cannot test statistical significance; and (iv) due to cognitive dissonance people will likely say that an experience was positive or beneficial for them purely because they had decided to do it as they would not want to seem inconsistent in themselves. For a full review of these issues see Dolan, Fujiwara and Metcalfe (2012). Qualitative survey techniques can be useful for understanding the different aspects of a positive (or negative) experience and they can guide us in showing some of the outcomes that may be of import, but their use in understanding and attributing causality are severely limited. The approach taken in this paper, therefore, is to use statistical analyses with a large national dataset so that causality in the links between museums, the arts and wellbeing can be better attributed.

The closest study to ours is Marsh et al. (Matrix) (2010). They use the British Household Panel Survey (BHPS) to look at impacts on wellbeing of participation in the arts and sport. They also value this impact using the Wellbeing Valuation approach that will be employed here. The BHPS is very restrictive when it comes to the arts and culture in that there are only a handful of relevant variables. Indeed Marsh et al were only able to assess the impacts and values of doing sport, going to the cinema and going to concerts. They found that all three activities impact on life satisfaction positively and that doing sport at least once per week is valued at about £11,000 p.a., and that going to the

cinema at least once per week and going to concerts at least once per week are both valued at about £9,000 p.a.

There are, however, a number of important differences between this paper and Marsh et al. (2010). First, we use the *Taking Part* survey rather than the BHPS in order to increase the number of variables related to museums, arts and culture in the analysis. We look at a much wider range of variables than the three used in Marsh et al., including participation in and visiting museums which was excluded from Marsh et al.

Second, Marsh et al. use overall life satisfaction as the wellbeing variable, which is the most commonly used variable in the Wellbeing Valuation literature. We have data on happiness in *Taking Part* and hence use this as the wellbeing measure for valuation (the question is described in more detail below). As described below, happiness and life satisfaction are different measures of a person's wellbeing and will tap in to distinct aspects of how a person's life is going. Happiness fits more closely with the concept of wellbeing and resilience set out in the Happy Museum Project.

We note that the results reported in this paper are not comparable to those presented in Marsh et al.

Third, we also look at the impacts on self-reported general health.

There is reason to believe that we will find some positive impacts on wellbeing from activities related to museums. Viewing art has been found to impact on physical sensations (Berleant, 1990), such as decreasing perceived intensity of pain (De Tommaso, Sardaro & Livrea, 2008). And hospital patients report higher life satisfaction scores and health status after participating in handling sessions with museum objects (Chatterjee, Vreeland & Noble, 2009) (see Binnie (2010) for these references).

3. Methodology

There are four aspects of the analysis. First, we look at whether involvement in museums impacts on wellbeing and self-reported health. Here, we look at four variables related to museums: (i) whether people go to museums in their free time, (ii) whether people volunteer at museums, (iii) the frequency of visiting museums, and (iv) the amount of time people spend visiting museums. Second, we look at the differential impacts associated with participation in and being audience to the arts (regardless of whether this is specific to museums). Third, we use results from these analyses to derive monetary values associated with museums and the arts. Finally, we assess the main barriers to involvement with museums so that we can better understand how to encourage more participation.

As discussed above, the preferred methodology here is to use quantitative methods to assess the impact of museums and the arts on wellbeing and health. The fundamental statistical approach will be to estimate the following types of regression models, where involvement in the arts and museums are determinants of happiness and self-reported health and along with other factors:

$$SWB_i = f(y_i, x_i, arts_i) \quad (1)^1$$

$$Health_i = g(z_i, arts_i) \quad (2)^2$$

where SWB_i is the level of subjective wellbeing (SWB) for individual i , $arts_i$ is a vector that includes any variable related to the arts and museums, y_i is income and x_i and z_i are respectively other determinants of SWB and health. Income (y_i) is explicitly shown in equation (1) since we will use the derivative f_y to derive values for the variables in $arts_i$.

The models set out in equations (1) and (2) are described schematically in Figure 1 below.

¹ This model simply states that wellbeing is determined by income, participation/involvement in the arts and museums and a range of other factors, such as education, region of residence, employment status and health status.

² This model states that health is determined by participation/involvement in the arts and museums and a range of other factors, such as education, region of residence and employment status.

3.1. Data

The data come from the *Taking Part* survey commissioned annually by the Department for Culture Media and Sport (DCMS). *Taking Part* surveys around 14,000 adult individuals per year (as of 2011) from 2005 as a repeated cross-section survey and asks a wide range of questions on involvement and attitudes concerning arts, culture and sport. More specifically, it provides a good source of UK evidence on:

- participation in culture and sport
- satisfaction with and enjoyment of culture and sport
- social capital
- volunteering
- barriers to participation

Taking Part is a representative sample of the population in England. In this paper we use data from 2005 – 2011, which results in about 100,000 observations or individuals for the statistical analysis. It should be noted that the latest wave of the *Understanding Society* dataset also includes a range of variables on involvement in the arts and museums, but *Taking Part* was preferred for this study for three reasons: (i) It has a large sample size than the single wave of *Understanding Society*; (ii) it includes a wider range of questions related to museums and the arts; and (iii) to our knowledge it has been under-used in academic research, especially on the links between museums, the arts, health and wellbeing (it has also not been used for the purposes of valuation before).

One thing to note about the data is that there is only one question related to SWB – this is a question on happiness, which asks respondents to answer the following question, "*Taking all things together how happy would you say you are?*", where responses are on a scale of 1 - 10 (10 = '*extremely happy*' and 1 = '*extremely unhappy*'). Happiness taps in to people's emotions, technically their affective state, and hence tries to gauge people's moods at that moment. This differs to wellbeing questions that contain an evaluative judgment such as life satisfaction or eudemonic wellbeing. Life satisfaction is held to contain a response about one's current emotions together with an evaluation of their life overall (how it measures up to their goals for instance) and eudemonic wellbeing questions tap in to people's perceptions of whether they are living a meaningful life. Since, these different measures of wellbeing all reflect different aspects of a person's life we can expect them to produce different results when looking at the impacts of museums and the arts; some things that are important for happiness may not be important for life satisfaction and vice-versa. For example, income does not show up very strongly in happiness reports, but does in life satisfaction. Museums and the arts

are likely to be important aspects of a person's evaluative and eudemonic wellbeing, but happiness (affective wellbeing) is also important. Affective wellbeing picks up our positive emotions related to museums and the arts and it is core to the Happy Museum Manifesto³.

We also look at self-reported health as health and wellbeing are highly correlated. Although our focus in this paper is on happiness, questions on general health will cover mental health and so we may be able to pick up some aspects of wellbeing or happiness that are not captured in the stand-alone happiness question. Also, the analysis of the health impacts can shed light on the mechanisms through which a factor impacts on wellbeing (ie, we can see whether, say, participation in the arts impacts on SWB (to some extent) through health. This is important because health is such a big determinant of SWB measures like happiness. Furthermore, as shown in the literature review health is an outcome that has been the focus of previous research on the arts. The health question in *Taking Part* asks respondents to answer the following question, "How is your health in general? Would you say it is?", where respondents answer on a scale of 1 - 5 (1 = 'very good' and 5 = 'very bad'). We flip this scale for convenience such that a higher score equates to better health.

Equations (1) and (2) are estimated using ordinary least squares and hence we are assuming that SWB_i and $Health_i$ are cardinal measures of wellbeing and health. This is a standard assumption made in much of the wellbeing literature (Fujiwara & Campbell, 2011) and Ferrer-i-Carbonell and Frijters (2004) show that it ultimately makes little difference for the results whether ordinality or cardinality is assumed. There is a wide range of variables related to the arts and museums in the *Taking Part* survey. However, many of them could not be used because either response rates to the question were too low or because there was minimal variance in the variable and so a statistically significant relationship could not be traced. Table 1 describes the arts and museums related variables that are used in the analysis.

³ As set out in 'What we know now' – an interim commentary by Tony Butler, Happy Museums Symposium, February 2013.

Table 1. Arts and museums variables

| Variable | Description |
|------------------------------|--|
| Log (income) | Log of personal earnings (in £5,000 bands) |
| married | 1 = married; 0 = not married |
| religious | 1 = reports religion; 0 = no religion |
| high education | 1 = Qualification of GCSEs and above; 0 = Less than GCSE qualifications |
| health | Self-reported health on a scale of 1-5 (5 = 'very good'; 1 = 'very bad') |
| male | 1 = male; 0 = female |
| employed | 1 = employed; 0 = not working |
| Frequency of meeting friends | 1 = if meets friends at least once or twice per month; 0 = if meets friends less than once per month |
| London | 1 = lives in London; 0 = otherwise |
| children | Number of children |
| satisfied with local area | 1 = if 'satisfied' or 'very satisfied' with local area as place to live; 0 = if otherwise |
| drinking | How often drinks alcohol on scale of 1-5 (1 = 'never'; 5 = 'everyday') |
| smoker | 1 = smokes; 0 = does not smoke |
| non-white | 1 = non-white ethnic group; 0 = white |
| volunteer | 1 = if volunteers; 0 = otherwise |
| visit museums | 1 = visit museums in free time; 0 = does not visit museums in free time |
| volunteer museums | 1 = volunteers in museums; 0 = otherwise |
| time spent in museums | Number of hours spent in museums per year |
| didn't go to museums | 1 = if parents did not take individual to museums as a child; 0 = otherwise |
| no. of museum visits | museum visits per year |
| participated sport | 1 = done sport of physical activity in the last 4 weeks; 0 = otherwise |
| participated arts | 1 = if participated in (ballet/dance/singing/playing music/painting & drawing/photography/crafts); 0 = otherwise |
| audience arts | 1 = if audience to (exhibitions/opera/concerts & live music/ballet/dance); 0 = otherwise |

3.2. Valuation

The results from equation (1) can be used to derive values for the arts. Here we estimate the compensating surplus (CS) of different elements of the arts and museums. CS is the amount of money, paid or received, that will leave the individual in his initial welfare position following a change in the (level of a) good/service. CS is the most widely used measure of value in CBA (and SROI since SROI uses valuation methods directly from CBA and welfare economics). This measure here is akin to willingness to pay for different elements of the arts and museums, but the values derived here should not be seen as traditional willingness to pay measures since we have not derived the values from preferences. The values identified in this paper are not what people would actually pay for these things in a market. Instead, they are purely a monetary representation of how large an activity's impact on happiness is – they provide a basis for us to compare the magnitude of different impacts on wellbeing.

We are valuing these outcomes using happiness as the outcome measure. The Wellbeing Valuation approach has predominantly relied on life satisfaction as the measure of wellbeing (SWB_i) in equation (1), but we use happiness here. Theoretically this is not problematic - we are simply using a different measure of wellbeing, but there are some technical considerations. As Powdthavee and van den Praag (2010) show using happiness rather than life satisfaction as the outcome measure generally increases value estimates because income has a smaller impact on happiness than on life satisfaction.

In essence, what we are measuring is the effect of arts and museums on happiness and the monetary equivalent of that effect. So for example if, say, that visiting a museum regularly increased happiness by 1 index point per year and that £5,000 of income also increases happiness by 1 index point, then the equivalent value of visiting museums regularly is about £5,000.

An approximation of the CS (ie, value) for the arts can be derived from the partial derivatives with respect to the arts and income in equation (1) as follows:

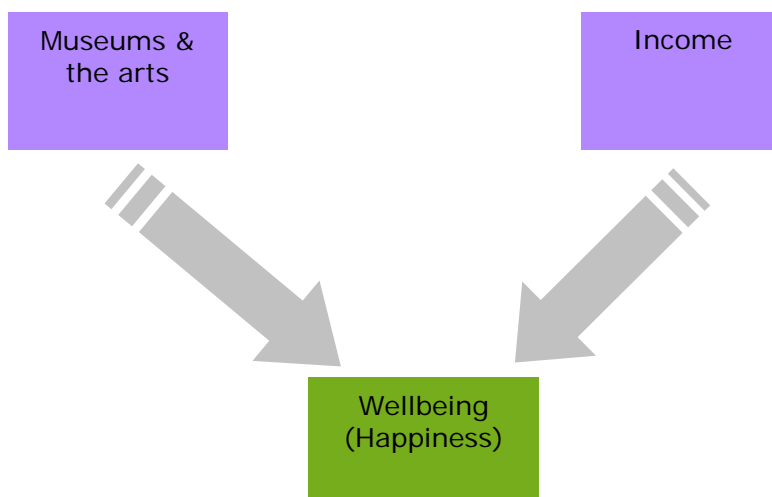
$$CS = \frac{\frac{\partial SWB}{\partial arts}}{\frac{\partial SWB}{\partial y}} \quad (3)$$

The **Annex** sets out the full derivation of the Wellbeing Valuation approach and equation (3). Figure 1 shows in a graph how equations (1) and (3) are estimated in order to derive valuations for outcomes related to museums and the arts.

The Annex shows that the Wellbeing Valuation approach can derive estimates of value that are fully consistent with the welfare economic theory of valuation. This valuation theory underlies the recommended approach to policy assessment in the UK as set out by HM Treasury Green Book guidance, and the Wellbeing Valuation approach now

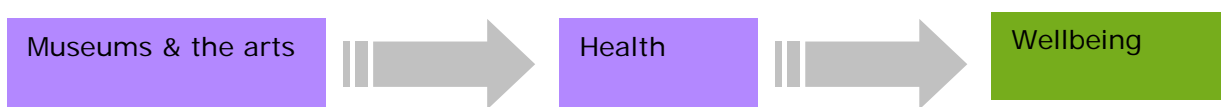
features as part of the official Green Book and is growing in prominence in UK public policy. The results derived here are therefore based on a robust methodology.

Figure 1. Diagram of Wellbeing Valuation approach



In essence, in equation (1) we are estimating the impact of involvement in museums and the arts on wellbeing (here happiness). This provides an estimate for $\frac{\partial SWB}{\partial arts}$ in equation (3). In equation (1) we are also estimating the impact of income on wellbeing, which is depicted in the right hand side of Figure 1. This is an estimate of $\frac{\partial SWB}{\partial y}$ in equation (3). The strength of the impacts (denoted by the arrows in Figure 1) determines how much value people place on different aspects of involvement in museums and the arts. In equation (2) we look at the impacts of involvement in museums and the arts on health, as this might be one important mechanism through which involvement in museums and the arts impacts on happiness. In other words, in the health model in equation (2) we would like to know whether there is an indirect impact of involvement in museums and the arts on happiness through health so here the left hand side of Figure 1 essentially becomes as set out in Figure 2.

Figure 2. Indirect effect of museums and arts on wellbeing



3.3. Caveats

As with all statistical analyses of observational data, causality can be an issue. Participation/involvement in the arts and museums is not randomly assigned in the *Taking Part* survey and hence we have to rely on selection on observables assumptions in order to infer causality in our modelling. In other words, since people in the survey are not randomly assigned to a treatment group (that gets involved in the arts) or a control group (that isn't allowed to), the only way we can attempt to infer causality is by controlling for as many of the observable differences between those who are involved in museums and the arts and those who are not and we do this through regression analysis. In the wellbeing and health models (1) and (2) we have used as many of the potentially confounding explanatory variables as possible, but we cannot rule out the possibility that some of the results may be susceptible to selection bias and reverse causality: certain types of people who would have higher health and wellbeing anyway may select into involvement in the arts and it could also be that happiness 'causes' people to go to museums and the arts rather than the other way around.

Given the nature of the data, multivariate regression analysis or matching techniques are arguably the best methods that can be used (there were no suitable instrumental variables⁴ or cases where natural experiments could be exploited in the data). This level of rigour (multivariate analysis) is anyway normally acceptable in public policy-making and policy evaluation in OECD governments and hence we believe that it can be informative here, with the caveat that we are unable to be fully confident of attributing causality.

⁴ For example, parent encouragement in arts participation when the individual was young was one possible instrumental variable but it was weak and there were issues regarding the exclusion restriction in the first stage which lead to biased results.

4. Results

4.1. Museums, wellbeing and health

First we estimate equation (1):

$$SWB_i = f(y_i, x_i, arts_i) \quad (1)$$

using ordinary least squares (OLS) for a number of arts and museums related variables. Table 2 shows the impact of a number of museum related variables. In line with previous studies we find that the standard explanatory variables included in wellbeing regressions explain about 10% to 15% of the variation in wellbeing⁵. The museum-related variables are included piece-wise (one by one) since they may be correlated if included all together, which would make it difficult to decipher the marginal impacts. In other words we run four separate models – one for each museum-related variable. But in Table 2 we present all results in the same column for simplicity. Coefficient sizes on the other explanatory variables were similar across all four models and so we only report the results on the other variables from the first model. We find that there is a positive effect on happiness for people who visit museums in their free time. The number of museum visits people make, the length of time spent visiting museums and volunteering in a museum all have positive effects, but they are not statistically significant. For some of these variables (eg, volunteering in a museum), this is likely to be because there are so few respondents in the survey who respond affirmatively to these questions (hence very little variation in the variable of interest). These results therefore are probably more a problem of the data (and non-response in the survey) rather than there being no statistical effect. It could also be that our measure of SWB (happiness) would not pick these micro-level activities up unless respondents had recently been to a museum.

Going to museums in one's spare time leads to an increase in happiness of about 0.1 index points on a scale of 1 – 10. This seems small but as we shall see when we value this impact it is a significantly important impact.

⁵ The negative finding for employment is contrary to the wellbeing literature although it is only significant at the 10% level.

Table 2. Museums and happiness

| Explanatory variable | Coefficient (Standard error) | Explanatory variable | Coefficient (Standard error) |
|------------------------------|------------------------------|---------------------------|------------------------------|
| Log (income) | 0.055*** (0.018) | satisfied with local area | 0.568*** (0.034) |
| Married | 0.453*** (0.024) | drinking | -0.005 (0.010) |
| religious | 0.212*** (0.025) | smoker | -0.245*** (0.027) |
| high education | -0.080*** (0.024) | non-white | 0.230*** (0.038) |
| health | 0.529*** (0.013) | visit museums | 0.088*** (0.025) |
| male | 0.011 (0.023) | volunteer at museums | 0.426 (0.419) |
| employed | -0.048* (0.027) | no. of museum visits | 0.014 (0.050) |
| frequency of meeting friends | 0.204*** (0.025) | time spent in museums | 0.014 (0.012) |
| London | -0.114*** (0.034) | constant | 4.518*** (0.077) |
| children | -0.042*** (0.012) | N | 21369 |
| | | R-sq | 0.13 |

Notes: Significance: *** = 0.01; ** = 0.05; * = 0.10.

In Table 3 we show the results from the health model using OLS:

$$Health_i = g(z_i, arts_i) \quad (2)$$

Table 3. Museums and health

| Explanatory variable | Coefficient (Standard error) | Explanatory variable | Coefficient (Standard error) |
|----------------------|------------------------------|-----------------------|------------------------------|
| Log (income) | 0.051*** (0.007) | non-white | -0.041*** (0.014) |
| high education | 0.095*** (0.009) | visit museums | 0.040*** (0.009) |
| male | -0.083*** (0.009) | volunteer museums | -0.286** (0.130) |
| employed | 0.416*** (0.010) | no. of museum visits | 0.029 (0.019) |
| children | 0.063*** (0.004) | time spent in museums | -0.004 (0.006) |
| drinking | 0.075*** (0.004) | Constant | 3.489*** (0.018) |
| smoker | -0.236*** (0.010) | N | 36748 |
| | | non-white | -0.041*** |

Notes: Significance: *** = 0.01; ** = 0.05; * = 0.10.

Again, as in Table 2 the different museum-related variables were entered separately but we show the results in the same column (coefficients for the other explanatory variables come from the first model with the visit museums variable). Again, there is a positive significant coefficient on visiting museums, which shows a positive relationship between

this variable and self-reported health. Number of museum visits and time spent in museums do not have an impact. Interestingly we find that volunteering in a museum is negatively associated with self-reported health: people who volunteer at museums report significantly lower health than those who don't. This seems to be an anomaly for two reasons. First, there is a lot of evidence that volunteering impacts positively on wellbeing (see Meier & Stutzer, 2004) and so it is hard to see why it should have a detrimental effect on health, which is closely related to wellbeing. Second, given the types of programmes run at museums, this finding of a negative association is likely to be due to reverse causality – in other words, it is people in poorer health to begin with (including elderly people) who are encouraged or are more likely to volunteer at museums, rather than volunteering in museums having a negative impact on health. We should therefore see this result as an anomaly, probably being caused by the fact that less healthy people select into volunteering in museums.

In sum, visiting museums impact positively on health and since health in turn impacts positively on people's happiness, we can deduce that one important mechanism through which visiting museums impacts on happiness is through health.

4.2. Arts audience, arts participation, wellbeing and health

In Table 4 we present the results for participation and audience in the arts. We also include participation in sports. We find that participation and audience in the arts and participation in sports all have significant positive effects on happiness at the 10% level. As stated above, since the arts audience and participation variables are constructed to encompass the same activities, they are directly comparable. There are two important findings from the analysis. First, we find that being audience to a variety of artistic and cultural events and activities has the biggest impact on happiness out of these three activities. And second, we also find that participation in sport has about the same impact on happiness as participating in arts and culture.

Table 4. Arts audience, arts participation and happiness

| Explanatory variable | Coefficient (Standard error) | Explanatory variable | Coefficient (Standard error) |
|---------------------------|------------------------------|---------------------------|------------------------------|
| Log (income) | 0.062*** (0.017) | satisfied with local area | 0.592*** (0.031) |
| married | 0.474*** (0.022) | drinking | -0.004 (0.009) |
| religious | 0.191*** (0.023) | smoker | -0.241*** (0.025) |
| high education | -0.085*** (0.022) | non-white | 0.232*** (0.035) |
| health | 0.525*** (0.013) | participated in sport | 0.040* (0.022) |
| male | 0.011 (0.022) | participated in arts | 0.039* (0.022) |
| employed | -0.068*** (0.025) | audience to arts | 0.054** (0.022) |
| frequency of meet friends | 0.190*** (0.024) | constant | 4.458*** (0.071) |
| London | -0.098*** (0.031) | N | 25069 |
| children | -0.044*** (0.011) | R-sq | 0.13 |

Notes: Significance: *** = 0.01; ** = 0.05; * = 0.10.

It should be noted that this difference with sport is understated in the analysis in Table 4 because as we show in Table 5, participation in sport has a much bigger impact on self-reported health than being audience to and participating in arts and culture events and since health is held constant in Table 2, this will apply downward pressure on the coefficient on participation in sports. In fact, in analysis we do not show here, dropping the health variable in Table 2 leads to a vast increase in the size of the sport coefficient (and not much in the arts related coefficients). This analysis is not presented here because clearly dropping health from the SWB function can lead to omitted variable bias, but the outcomes we get if we do drop health are as we would expect.

Table 5 shows that participation in the arts has a positive effect on health, but that it is statistically insignificant. Being audience to arts has a positive impact on health. As we would intuit, participation in sport has a large positive effect on health (four times larger than the effect of being audience to arts).

We can conclude that being audience to the arts and participation in sport will have indirect effects on happiness through health - the former, probably through mental health and the latter, most likely through physical health.

Table 5. Arts audience, arts participation and health

| Explanatory variable | Coefficient (Standard error) | Explanatory variable | Coefficient (Standard error) |
|----------------------|------------------------------|-----------------------|------------------------------|
| Log (income) | 0.047*** (0.006) | non-white | -0.058*** (0.012) |
| high education | 0.074*** (0.008) | participated in sport | 0.230*** (0.008) |
| male | -0.099*** (0.008) | participated in arts | 0.004 (0.008) |
| employed | 0.373*** (0.009) | audience to arts | 0.066*** (0.008) |
| children | 0.050*** (0.004) | constant | 3.449*** (0.016) |
| drinking | 0.063*** (0.003) | N | 47333 |
| smoker | -0.227*** (0.009) | adj. R-sq | 0.119 |

Notes: Significance: *** = 0.01; ** = 0.05; * = 0.10.

We ran a number of models with interactive effects for different demographic groups, for example to see if the impact of participation in the arts is larger for men or women or for more educated groups, but in general sample sizes were too small to derive statistically significant results, possibly due to low variance in the variables of interest.

4.3. Valuation

The results in Tables 2 and 4 are now used to derive monetary values for activities related to museums and the arts more generally using the wellbeing valuation approach in equation (3) and the methodology set out in the Annex. We have discussed the issue

of bias that can arise when using this kind of survey data. It has been frequently found that the income coefficient is understated in OLS wellbeing models compared to two-stage least squares with an instrumental variable for income. On average the size of the income coefficient is about two to ten times larger when using an instrument for income to solve for endogeneity in life satisfaction models⁶ (Pischke, 2010; Fujiwara, forthcoming; N. Powdthavee, 2009)⁷. In work using the BHPS that is not presented here (since the happiness variable is different in the BHPS) we find that when using lottery wins as an instrument for income, (lottery wins are exogenous for lottery players and hence make a suitable natural experimental setting so that we can get a good estimate of the causal effect of income) the size of the impact of income on happiness increases more than ten-fold. This is part of the reason why Wellbeing Valuation studies that do not instrument for income derive implausible large value estimates for non-market goods. Since there is no suitable instrument for income in the *Taking Part* data we also estimate values using an income coefficient that has been multiplied by 8 (which is in the scale between 2 to 10, which is the level of bias found in the studies above, but weighted more towards 10 since the analysis of happiness data using the BHPS suggests that the true impact of income on happiness may be more than ten times larger than the OLS coefficient). From Tables 2 and 4 the coefficient on log of income is about 0.06. We derive values using this estimate and an income coefficient value of 0.5 (about 0.06×8) to try and account for the endogeneity issue (by multiplying the original coefficient by 8). Using the larger coefficient will produce lower estimates of value for non-market goods and the values derived using the 0.5 coefficient should be seen as the core results here. This is because we know from many previous studies that OLS estimates of the impact of income are under-biased and because this also provides conservative estimates of value since they will always be lower when using a larger income coefficient.

Table 8 presents estimates of the compensating surplus associated with museums and the arts. We look at the values associated with any participation/attendance variable that is statistically significant from Tables 2 and 4. These are:

- Visiting museums in one's free time.
- Participation in the arts.
- Audience to the arts.
- Participation in sports.

⁶ Note these studies focus on life satisfaction but the findings are likely to be relevant for happiness models.

⁷ Fujiwara (forthcoming) originally presented at the Government Economic Service *Conference on Wellbeing in Policy*, May 2012.

The 'core' results are values estimated using a coefficient of 0.36 for income. The values in the final column are estimated from the original income coefficient value of 0.06 and are presented just for information purposes here. It should be noted that some variables (eg, audience to art and participation in sport) had impacts on health (see Tables 3 and 5) and that health is controlled for in the happiness regression. This means that the values presented in Table 6 are values that do not include any indirect effect through health. This will somewhat understate the values associated with audience to arts and participation in sports (especially the latter), but there may be other indirect effects at work too (eg, some of the activities may also impact on happiness indirectly through better social relationships, which is held constant in the wellbeing regression). We show the wellbeing valuation results as they are normally presented in the literature (which is *net* of any indirect effects).

Table 6. Values associated with museums, arts and sports

| Activity | Impact size (coefficients) | Value (Core estimate) | Value |
|-------------------------------|----------------------------|-----------------------|---------|
| Visiting museums in free time | 0.088 | £3,228 | £15,400 |
| Participation in the arts | 0.039 | £1,500 | £9,600 |
| Audience to the arts | 0.054 | £2,047 | £11,868 |
| Participation in sports | 0.04 | £1,538 | £9,731 |

Note: Values represent per year estimates. They are estimates of compensating surplus for these goods. Values are calculated from the sample average level of income. The income variable is banded in *Taking Part* – so we estimate how many income bands people would have to move to derive the same impact on wellbeing and convert this into a monetary scale using the rate 1 Band = £5,000.

These values represent the compensating surplus for these activities. In other words, it is the amount of money people would in theory give up in order to undertake the activity and is related to the concept of willingness to pay. We find that:

- ✓ People value visiting museums at about £3,200 per year.
- ✓ The value of participating in the arts is about £1,500 per year per person.
- ✓ The value of being audience to the arts is about £2,000 per year per person.
- ✓ The value of participating in sports is about £1,500 per year per person.

Being audience to the arts and participating in sports and the arts all have about the same value. In fact, if we look at Table 4 we see that the 95% confidence intervals for

the three variables overlap and so there is no real distinction in the size of the impacts in a statistical sense. The values derived in Table 6 are based on point estimates of the impacts from Table 4, but there is some uncertainty involved in any regression analysis outputs due to sampling error and so it could be argued that we can treat the impacts and values of (i) being audience to the arts, (ii) participating in sports and (iii) participating in the arts as pretty much the same (around £1,500 - £2,000 per year), but we should caveat (as discussed above) that the indirect effect through sport is not included in these figures.

Visiting museums has the largest value. People who visit museums in their spare time value this at about £3,200 per annum. This is quite large even for people who visit regularly. We can speculate that this figure may include a value that people place on the existence of museums as well as any value they derive from physically visiting museums (what economists call '*existence value*'). This could be one reason for its comparatively higher value than the other arts related activities. Another reason for the relatively high value of visiting museums is the other activities related the arts that are valued in Table 6 are to some extent a subset of visiting museums. The variables on participation and audience to arts includes drawing, photography and exhibitions, all of which may have taken place in museums and survey respondents probably include these activities when they say they visit museums. To some extent then it is likely that the value of visiting museums encompasses some of the value of participating in and being audience to the arts.

It is interesting to note that the value derived here for museum visits far exceeds the value derived from a stated preference (contingent valuation) study by Bolton Metropolitan Borough Council (2005)⁸, which found that when asked people were willing to pay a maximum of £33 annually to visit museums in Bolton. As explained, values between preference and wellbeing valuation methods can differ for a number of reasons. One issue that is relevant here is that there is no opportunity to bias the values in any way in Wellbeing Valuation, but when asked in contingent valuation it is unlikely that people will state a high value for a currently publicly available service in case they may get asked to pay for it in the future (strategic bias). Also, this figure of £33 is unlikely to include an existence value for museums. Furthermore, two very distinct measures of wellbeing are being used across these studies - we use happiness here and preference satisfaction is being used in the Bolton study and there is no philosophical or theoretical reason why values from these methods should converge in anyway. We should note that the wellbeing values derived in Table 6 do not need to reflect, in any way, people's

⁸http://webarchive.nationalarchives.gov.uk/20120215211001/http://research.mla.gov.uk/evidence/documents/bolton_main.pdf

income constraints as we are simply looking at the impact of museums and arts on people's happiness and attaching an equivalent monetary value to this. The size of an activity's impact on happiness should have nothing to do with the level of someone's initial income – for example, clearly people don't care about or appreciate their health any less just because they are or become poorer. As we explain in section 3.2 these are not necessarily amounts of money that people would actually pay.

The values derived here using Wellbeing Valuation seem like reasonably sized values, but how do these values compare to other activities that have been valued using the Wellbeing Valuation approach? For example, we can compare these values to the values associated with adult learning. Dolan and Fujiwara (2012) used a similar methodology to that employed here (but using life satisfaction instead of happiness) and find that people who participate in adult learning classes (on average about 2 courses per year) value this at about £1,600 per year. Fujiwara (2013) finds that the value of living in a house which does not suffer from neighbour noise is about £1,100 per year and that the value of socialising with friends regularly is about £3,000 per year. All in all although these studies use life satisfaction, which will usually lead to lower values than when using happiness, it seems that museums, arts (and sports) have a relatively large impact on wellbeing.

4.4. Determinants of visiting museums

Given the important role that museums seem to play as determinants of people's happiness, it is crucial to assess how we might reduce barriers to participation and we can do this in the *Taking Part* data. We first look at self-reported reasons regarding involvement in museums. Respondents are asked what factors would encourage them to go to museums more often (for those that say they would like to go more often) and about the factors that prevent them from going to museums (for those that say they don't go to museums). Table 7 shows the top three reported reasons in each category.

Table 7. Self-reported reasons regarding encouragement and barriers to museum visits

| Ranking | Encouraging factors | Barriers |
|---------|--|-----------------------------------|
| 1 | 'If I had more time' | 'Not really interested' |
| 2 | 'Exhibition or display of a subject I am interested in' | 'It's difficult to find the time' |
| 3 | 'More information about events and exhibitions' / 'Cheaper admission prices' | 'Health isn't good enough' |

Next we look at the determinants of people visiting museums as revealed through their behaviour. Table 8 shows that people with low incomes, low levels of education and smokers are less likely to visit museums and that volunteers, married people, women, and people who live in London are more likely to visit museums controlling for a number of other potential explanatory variables. Interestingly, there seems to be an inter-generational effect in that people who were never taken to museums by their parents in their childhood are far less likely to visit museums as adults. In fact, we find that this is the largest determinant of the likelihood of adults visiting museums. People who were not taken to museums in their childhood by their parents are 17% less likely to visit museums now. As a comparison this is about three times the magnitude of the impact of being in low income groups (income under the UK average); low income groups are about 6% less likely to visit museums. As other examples, people with higher levels of education (5 GCSEs or more up to degree level) are 16% more likely to visit museums, married people are 3% more likely and those living in London are 8% more likely⁹.

⁹ Marginal probabilities are estimated from odds-ratios using the sample average levels for each of the other explanatory variables.

Table 8. Determinants of visiting museums

| Explanatory variable | Coefficient (Standard error) | Explanatory variable | Coefficient (Standard error) |
|----------------------|------------------------------|----------------------|------------------------------|
| low income | -0.236*** (0.041) | drinking | 0.095*** (0.016) |
| didn't go to museums | -0.672*** (0.038) | smoker | -0.257*** (0.045) |
| male | -0.151*** (0.039) | non-white | 0.448*** (0.063) |
| married | 0.118*** (0.039) | volunteer | 0.539*** (0.042) |
| high education | 0.649*** (0.039) | children | -0.025 (0.020) |
| employed | -0.036 (0.041) | constant | -1.186*** (0.125) |
| health | 0.092*** (0.023) | N | 13311 |
| London | 0.333*** (0.057) | | |

Notes: Significance: *** = 0.01; ** = 0.05; * = 0.10. Logit model with dependent variable = whether people visit museums.

Taken together the results in Tables 7 and 8 provide some interesting implications. As we probably would have guessed, lack of time, lack of museums or good quality museums (people living in London are more likely to go to museums), steep admissions prices and lack of interesting exhibition content all seem to act as barriers to visiting museums. In addition an important less obvious finding is that probably one of the biggest barriers to visiting museums is not having been taken to museums as a child by

your parents, which is assumed here to work through the mechanism of creating a preference and affiliation for museums that continues in to adult life. This is probably not salient to people (at least when they are asked about it) but is clearly important from the analysis here.

The data and results suggest that in order to increase participation and visits to museums, which is good for people's wellbeing and health, we need make museums accessible, affordable and interesting and we need to get parents involved with their children from a young age in order to have a growing sustainable impact.

5. Caveats

As discussed, as with all statistical analyses of observational data, causality can be an issue and these results may be biased somewhat from self-selection and reverse causality. However we have applied a level of rigour in the statistical analysis (ie, multivariate analysis) that would be acceptable in many public policy-making and policy evaluation decisions in OECD governments, and hence we believe that the results can be informative here. We have noted, especially, that the income coefficient is problematic in wellbeing models and we have taken a corrective approach by multiplying the size of the income coefficient. This was the best approach given the data, but a more robust method would of course be to use instrumental variables for income in the actual data if they were available.

The wellbeing valuation techniques used here are in line with welfare economic theory on valuation (which underlies all cost-benefit analysis and SROI techniques), but we should note that these values should not be seen as amounts that people would *actually* be willing to pay per year for these activities. This would only be the case if people satisfy their preferences solely on the basis of what makes them happy, but other factors may impact on people's preferences and market decisions. These values should be seen as the equivalent amount of money required to create the same impact on people's happiness and they are useful as they show us the magnitude of importance of museums and the arts to people.

Furthermore, these are average values. They are average values for the sample. No doubt different groups will value these activities in different ways but we were unable to pursue this analysis by different demographic groups due to sample size restrictions.

It is clear overall that more data and some use of experimental methods, where treatment or involvement in the activity of interest is randomised, are essential next steps in the future to develop on the analysis undertaken here.

6. Conclusion and discussion

This study looks at the impact of involvement in museums and the arts on health and wellbeing. We also looked at the determinants of why people visit museums and the impacts of participation in sports as a benchmark comparison. After noting issues around causality, we find that (some of the main findings):

- (i) Visiting museums has a positive impact on happiness and self-reported health after controlling for a large range of other determinants;
- (ii) Participation in the arts and being audience to the arts also have positive effects on happiness, and being audience to the arts has a bigger impact on happiness.
- (iii) The wellbeing impact of participation in the arts is of the same magnitude as the effect of participation in sports (after controlling for health);
- (iv) Lack of time is the main self-reported barrier to visiting museums more frequently;
- (v) Not being taken to museums by parents as a child is the biggest barrier for people going to museums when we look at people's behaviour (rather than self-reports).

In terms of valuation these results imply that:

- ✓ People value visiting museums at about £3,200 per year.
- ✓ The value of participating in the arts is about £1,500 per year per person.
- ✓ The value of being audience to the arts is about £2,000 per year per person.
- ✓ The value of participating in sports is about £1,500 per year per person.

These are important findings with lots of implications for policy and future research. It creates a strong positive foundation and argument for the role of museums and the arts in society. As new waves of *Taking Part* will include time-series elements for some of the survey respondents we will be able to use panel data methods to better understand causality, but clearly we need some robust experimental methods where treatment or involvement in the arts and museums is randomly assigned across different groups so that we can infer causality with confidence - to verify our findings here and to re-assess some of the anomalous findings. It need not always be the case that we randomise the actual intervention, activity or programme (if this is difficult), and instead it is possible to work with data where *encouragement* to participate in museums and the arts has been randomised. In other words, we need not try to put people in to intervention and non-intervention groups but simply randomise encouragement to go to museums through say

information campaigns. With careful planning it would be possible to derive more robust estimates of the impacts of museums and the arts on wellbeing and health using this technique. The UK Government is one of the leading governments in the world in terms of running randomised trials within policy interventions (Haynes, Service, Goldacre, & Torgerson, 2012) and hence experimental methods are becoming increasingly common and popular in public policy and wellbeing valuation can be carried out with data from randomised trials too.

Annex

The Wellbeing Valuation approach

A central assumption of the wellbeing valuation approach is that measures of wellbeing (here happiness) are good proxies of an individual's underlying utility. In this sense, the utility function and its level sets (the indifference curves) can be directly observed and it is possible to estimate the marginal rates of substitution (MRS) between income and the non-market good to provide an estimate of value. For example, if a 20% reduction in local crime rates increases happiness of an individual by 1 index point and an increase in household income of £2,000 p.a. also increases their happiness by 1 index point, then we would conclude that the value of the 20% reduction in crime to them is £2,000 per year.

Formally, compensating surplus (CS) is estimated as follows in the wellbeing valuation approach:

$$v(p^0, Q^0, M^0) = v(p^1, Q^1, M^1 - CS) \quad (\text{A.1})$$

where $v(\cdot)$ is the indirect utility function; M = income; Q = the good being valued; p = prices. The 0 superscript signifies the state before Q is consumed (or without the good) and the 1 superscript signifies the state after consumption (or with the good). For our analysis in this paper Q refers to the activities related to the arts and museums.

In practice in wellbeing valuation we work with an 'observable' measure of welfare (ie, self-reported wellbeing rather than preferences) and it is possible to estimate the MRS between M and Q to measure CS using the *direct utility function* $u(\cdot)$:

$$u(Q, M, X) \quad (\text{A.2})$$

where X is a vector of other determinants of welfare (u). Empirically what we measure is:

$$SWB(Q, M, X) \quad (\text{A.3})$$

where SWB = happiness. Equation (A.3) is usually estimated by applying regression analysis to panel or cross-sectional survey data. Using the cross-sectional data from *Taking Part* the following happiness function is estimated:

$$Happiness_i = \alpha + \beta_1 M_i + \beta_2 Q_i + \beta_3 X_i + \varepsilon_i \quad (A.4)$$

Now we can substitute (A.4) into (A.1):

$$SWB_i(\alpha + \beta_1 M_i^0 + \beta_2 Q_i^0 + \beta_3 X_i^0 + \varepsilon_i) = SWB_i(\alpha + \beta_1(M_i^1 - CS) + \beta_2 Q_i^1 + \beta_3 X_i^1 + \varepsilon_i) \quad (A.5)$$

And solve for compensating surplus (CS):

$$CS = M^0 - e^{\left[\ln(M^0) - \frac{\beta_2}{\beta_1}\right]} \quad (A.6)$$

(A.6) derives estimates of welfare change that are consistent with welfare economic theory. (A.6) is equivalent to equation (3) in the paper. We use average sample income for M^0 and the coefficients β_1 and β_2 from (A.4) to populate equation (A.6). The term $e^{[\cdot]}$ accounts for the logarithmic format of the income variable. Since income is measured in income bands (in intervals of £5,000) we estimate CS as changes in bands of income and multiply by £5,000 to derive the estimates in Table 6.

Glossary

Here we include a brief description of some of the technical terms in the report. The order is set so that some of the terms can follow off descriptions of the previous ones.

Affective state - people's emotions and moods. It picks how people feel emotionally at the time when asked.

Life satisfaction – a broader measure of wellbeing that picks up current mood and as well as an overall assessment of one's life is going in comparison to one's goals and objectives and in comparison to other people.

Eudemonic wellbeing – an assessment of the extent to which people think the things they do in their lives are worthwhile and valuable.

Control for... - controlling for a variable simply means taking out its effect through statistical methods. So if we are looking at the impact of X on Z and control for Y we can find the effect of X on Z after any impact of Y on Z has been taken out of the relationship. This gives us a better understanding of the role of X on its own.

As an example, say Z = wage income, X = years of education and Y = innate ability. In this simple example, just looking at relationship between wages and education would be a misleading estimate of whether years of education impacts on wage income in later life because ability will play a role in determining wage income and level of education (people with higher innate ability are more likely to stay in education for longer). Here, we would at least want to control for the effect of ability before looking at the relationship between wage and education. We say 'at least' because there may also be other variables that we want to control for too. Here ability is known as a **confounding variable** because it is associated with both Z and X. Once we have estimated this relationship in regression analysis the size of the impacts of Y and X on Z are shown as **coefficients**, which show the magnitude of impact on Z.

Endogeneity – if we cannot control for all confounding factors a variable will be endogenous, which in the simplest sense means that we cannot properly estimate the true effect it has on the outcome variable because other factors that we cannot control for will influence the relationship.

Explanatory variables – in the example above we often use the terminology explanatory variables to indicate the Y (ability) and X (education) variables. This is because here ability and education 'explain' wages.

Ordinary least squares – this is a common statistical technique that allows us to run models where a large number of explanatory variables can be controlled for at the same time. It generates coefficients for each explanatory variable included in the model.

Instrumental variables - these variables allow us to get better understanding of cause and effect in the relationship we are modeling. In our wage income example an instrumental variable for education would allow us to make stronger claims about the causal effect of education on income than in a model where other factors are controlled for. Randomised trials are seen as the '*gold standard*' approach to causal inference and instrumental variable techniques can be robust enough to allow us to get close to a randomized trial setting without actually having to randomize the intervention. The methodology is involved and hence is not described in full here.

Statistically significant - statistical significance is a test of whether the impact we estimate for a variable (as shown in the coefficient) is not just simply due to random chance. A statistically significant effect or impact is one that the evidence suggests is important because it is unlikely to be just due to chance.

Cardinality and Ordinality – a cardinal variable is one for which the scale is the same grade throughout. So a variable measured say on a scale of 1-100 is cardinal if a jump from 2 to 3 is the same magnitude as the jump from 90 to 91. People's height is an example of a variable with a cardinal scale. An ordinal scale is one that does not have this equal interval scale. This is a technical issue, which matters mainly for the type of statistical analysis we can use. With cardinal data we can use ordinary least squares, but for ordinal data we need to use other methods.

Partial derivatives - in the simplest form another term for coefficient.

Randomly assigned – when an intervention or programme is assigned to people through randomization. Doing so means that we can properly account for the causal effect of the programme as through virtue of randomization the only difference between the two groups is that one group did receive the programme and the other did not. Any difference in outcomes that we observe between the two groups can then solely be attributed to the effect of the programme.

Selection on observables – this simply states that all of the explanatory variables in a model are observable and can be measured by the statistician.

Compensating surplus – a standard measure of value used in welfare economics. CS is the amount of money, paid or received, that will leave the individual in his initial welfare position following a change in the (level of a) good/service. So if an individual consumes a service which increases his welfare the CS is the amount of money one would have to take away from him to return him back to his original level of welfare or wellbeing. It is synonymous with the term willingness to pay.

Reverse causality – in our example above this is when Z impacts on X rather than the other way around.

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