Measuring the Social Impact of Community Investment:

The Methodology Paper

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1. Introduction

This paper sets out the methodology and analytical approach underlying the work on community investment and social value. The broad aim of the project is to:

Estimate the social value created by community investment programmes that are run by housing providers.

The methodology follows HM Treasury Green Book[1] and Magenta Book[2] guidelines on policy evaluation. The Green Book sets out the theoretical approach of policy evaluation in the context of cost-benefit analysis and the Magenta Book provides technical guidelines on the statistical techniques to be used for inferring the impacts of policy interventions. They form the basis of all public sector policy and programme evaluation frameworks in the UK and are consistent with policy evaluation methodology in all other OECD countries and international organisations like the World Bank and United Nations.

Housing providers work in a number of areas when it comes to community investment. This includes initiatives aimed at crime reduction, local regeneration projects, employment assistance, mental health interventions and community projects. These interventions are intended to impact positively on people's lives and hence create social value. This programme of work has developed metrics that apply monetary values to the broad range of outcomes associated with community investment.

The methodology draws heavily on the Green Book and its supplementary guidance on valuation methodology developed in 2011 (Fujiwara and Campbell, 2011[3]). The value metrics are derived using a consistent methodology that makes them fully comparable across different community investment domains. The values are fully consistent with the strict economic theory and principles underlying cost-benefit analysis (and SROI) and use statistical methods at the forefront of valuation methodology and so in this respect they provide a level of rigour to allow the analyst to use the values with confidence in cost-benefit analysis or social return on investment (SROI) analyses. This project derives values for community investment outcomes that are unparalleled in terms of their robustness and hence represent the best source of information on the social value associated with community investments. A discussion of the role of wellbeing valuation in social impact measurement can be found in Annex B.

The values produced through this process have been developed using the optimal techniques and data available to us today. But they inevitably come with limitations (some of which we already know about and acknowledge where relevant), and any knowledge of this sort is subject to revision and updating as time goes on. However, at the time of

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[1] https://www.gov.uk/government/publications/valuation-techniques-for-social-cost-benefit-analysis

[2] https://www.gov.uk/government/publications/the-magenta-book

[3] *Valuation Techniques for Social Cost-Benefit Analysis*
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf

publication we are confident that the set of values have been developed using techniques that make them both robust and internally consistent.

2. Methodology

Welfare economic theory sits at the heart of valuation methods in cost-benefit analysis (CBA) and Social Return on Investment (SROI). These methods are the dominant frameworks for valuation in public policy in OECD countries. In its most basic form, the theory of value states that the monetary value an individual attaches to a good or service is the amount of money that would be required to leave the individual just as '*well-off*' as he would have been had he consumed or experienced the good/service. In other words we are seeking the equivalent amount of money that would have the same effect on the individual's life as the good or service being valued.

There are two ways to think about this. We could think about someone's willingness to accept (WTA), which is the amount of money we need to compensate someone for having a bad outcome or we could think of their willingness to pay (WTP), which is the amount of money we would need to take off somebody if they benefitted from a good outcome[4].

For the purposes of valuation '*well-offness*' needs to be defined so that it is measurable and operationalisable. Here we are talking about how someone's **quality of life** in the very broadest sense of the term. We are, therefore, fundamentally interested in people’s welfare and we can measure this in two different ways for valuation:

(i) Preference satisfaction. This method is based on the premise that welfare is reflected in people’s preferences and choice. In this context, we can infer welfare from people’s choices because “*what is best for someone is what would best fulfil all of his desires*” (Parfit, 1984). This method requires that people’s preferences adhere to the axioms of revealed preference (Samuelson, 1948), which state that people have well-informed, stable and coherent preferences. Preference-based valuation approaches use market price proxies for value where they exist (Revealed preference techniques), or surveys to ask individuals their willingness to pay (Stated preference techniques) and have been the standard method used in economics for the past 40 years.

However, in recent years preference methods have come under increasing attack and scrutiny from psychologists and economists alike, who have found evidence that people may not always choose what's in their best interests; they may make choices with poor information and are easily susceptible to reversing preferences. This all means that it may be very hard to get an accurate description of someone's welfare based on what they choose or what they say they want.

(ii) Self-reported wellbeing. A different way of measuring someone's welfare is to ask them directly about how they feel. These are measures of subjective wellbeing (SWB) and can take many different forms. Typical questions include asking people "all things considered" how happy they are or how satisfied with life they are and respondents rate their answers

[4] In technical terms this relates to notions of *compensating surplus* and *equivalent surplus.*

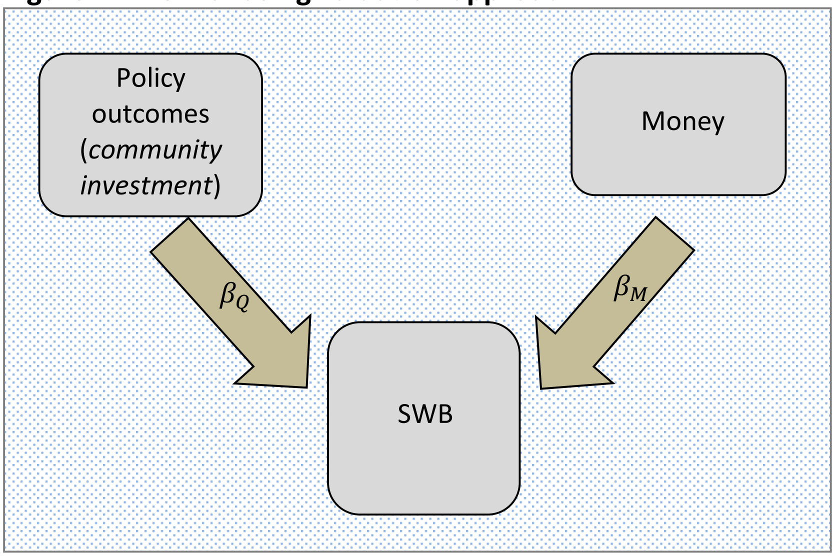
on numeric scales (usually 1-7 or 0-10). These data are then matched to the conditions in the respondent's life in order to assess how different things impact on their welfare.

Notice that the preference satisfaction and subjective wellbeing accounts of welfare represent very different ways of thinking about human welfare. If we wanted to know how much somebody likes or values living in a safe and quiet area in the preference satisfaction account we would ask them directly about how much they want or desire the safety and quietness. But in the SWB account we would look at how area safety and noise impact on people's self-reported wellbeing, say life satisfaction.

2.1. Wellbeing Valuation

In response to the criticisms aimed at preference-based valuation methods, a new set of methods has been developed that use SWB data to attach values to different goods and services. The **Wellbeing Valuation** (WV) approach estimates the impact of the good or service and income on people's SWB and uses these estimates to calculate the exact amount of money that would produce the equivalent impact on SWB. This is depicted in Figure 1.

Figure 1. The wellbeing valuation approach



The method requires us to measure the impacts on SWB of the goods and services we want to value (community investment outcomes) and of income or money. These effects are measured as β_Q and β_M respectively. In the WV framework the standard measure of SWB is life satisfaction, which as we discuss in more detail below has been validated as robust measure of wellbeing.

We can now discuss a more concrete example of the methodology behind the wellbeing valuation approach. Say we are interested in the value of volunteering - that is the value that people place on doing voluntary work. In statistical analysis we would use data on life satisfaction to estimate the impact that volunteering once per week has and let's say that we find that volunteering leads to a 5% increase in people's life satisfaction because of the enjoyment and sense of purpose they get out if it (this is our estimate of β_Q). We then want to know the exact amount of money that would induce the same 5% positive impact on life satisfaction and this can also be estimated using the same types of statistical methods. Let's assume that the analysis finds that £8,000 per year in extra income would also induce a 5% change in life satisfaction (we would derive this results from our estimate of β_M). Then we can conclude that the value of volunteering to the individual is on average £8,000 per year for the sample we looked at. This is an exact measure of monetary value that aligns with welfare economic theory.

In effect the value of community investment outcomes can be estimated from the ratio of impacts (which in economics is known as the *marginal rate of substitution* (MRS):

$$MRS = \frac{\beta_Q}{\beta_M}$$

The technical details of the wellbeing valuation method employed in this project can be found in Annex A.

2.2. Advantages of Wellbeing Valuation

The key point in WV is that we are not asking people about how much they think they value different outcomes and services and this brings with it a lot of advantages. Much of non-market valuation (i.e., valuation of goods without a market price, such as health, education and environmental quality) relies on stated preference methods, whereby respondents are given a description of the good (e.g., the policy will reduce CO_2 emissions by x%) and asked how much they would be willing to pay for this good or outcome through, say, high taxes.

These methods are notoriously problematic because people often do not have any experience or adequate information of the outcomes or goods and they may succumb to a whole host of biases in the survey. Common phenomena include, for example, the finding that people can change their WTP responses dependent on the decor in the room at the time of the survey and they tend to anchor their WTP amounts on random numbers presented to them in the environment - i.e., if I were to start you off by first asking whether you would pay £10 million for the outcome (CO_2 reductions) and then letting you tell me how much you would actually pay, this would elicit a much higher WTP value from you compared to if I had initially asked you if you would be willing to pay £1 for the same level of CO_2 reduction. People may also deliberately state very high (or low) values to influence policy in the knowledge that they are not usually asked to pay the amount they stated in the surveys.

Arguably, though, the biggest problem with preference-based measures comes from what is known as the focusing illusion. This is the well-known psychological finding that when asked about their preferences for something people focus only on the salient aspects of the outcomes or goods and this often does not reflect in any way how people would actually experience these outcomes in real life. In other words, we may think that we really want something and hence would be willing to pay a lot of money for it, but in reality when we actually experience our lives the thing in question actually plays a very trivial role. This type of phenomenon is common when we try to value environmental issues. For example one study found that people (who don't live near wind farms) would be willing to pay large sums of money to avoid having wind farms near their homes, but if we look at how similar people in general actually experience their lives we see that wind farms actually have very little if any impact on how satisfied or happy we are.

The wellbeing valuation approach instead uses data on people's actual experiences in that we look at how experiencing certain outcomes impacts on SWB. This gets around a lot of the problems we see with traditional preference-based methods. In WV we do not need to ask people about how much they value something and so there are no issues related to whether they have good information about the outcomes, there are no survey related biases and it is impossible for people to influence the results in any way. Most importantly, though, we are able to estimate the value of different goods and outcomes as people experience their lives rather than from data about their hypothetical preferences, which are tainted by people's focussing illusions. In sum, we can value outcomes like reduced crime, cleaner air, better schools and improved health in terms of how people experience these things in real-life.

The only thing that we require is that people's reports of their life satisfaction are accurate measures of their overall welfare. Life satisfaction can be seen as being made up of a balance of affect (positive and negative emotions and feelings) together with a cognitive assessment of how well one‘s life measures up to aspirations and goals (Diener, 1984; Kahneman and Krueger, 2006). A life satisfaction response will incorporate to some extent a retrospective judgement of one‘s life together with how one feels now (Kahneman and Krueger, 2006).

There is some evidence that this can be problematic as people do not always correctly remember past experience and their present feelings can be influenced by contextual factors present at the time of the interview (Bertrand and Mullainathan, 2001; Kahneman and Krueger, 2006; Schwarz, 2010; Schwarz and Strack, 1999). Biases can also arise in the stage of verbally reporting life satisfaction scores (Schwarz and Strack, 1999). For example, life satisfaction can be affected by the question order in surveys, people may provide socially desirable answers to not look too happy or sad and life satisfaction responses can be affected by factors that we would expect to be too insignificant to really have any meaningful impact on how our lives are going overall such as the weather on the day of the interview.

On the other hand, however, there is also a variety of evidence to suggest that overall life satisfaction is a good measure of well-being. Pavot and Diener (1993), Eid and Diener (2004), Fujita and Diener (2005) and Schimmack and Oishi (2005) find mood and contextual effects to be limited. Sandvik et al. (1993) and Shizgal (1999) demonstrate that there is a strong positive correlation between well-being ratings and emotions such as smiling and frowning. Research shows that Duchenne smiles (i.e. a type of smiling that involves a muscle near the eye called orbicularis oculi, pars laterali, which can distinguish between true and feigned enjoyment) are correlated with subjective well-being (Ekman et al., 1990). Urry et al. (2004) show that reports of life satisfaction are correlated with activity in the left pre-frontal cortex of the brain, which is the area associated with sensations of positive emotions and pleasure. Furthermore, well-being is a good predictor of health, such as heart disease

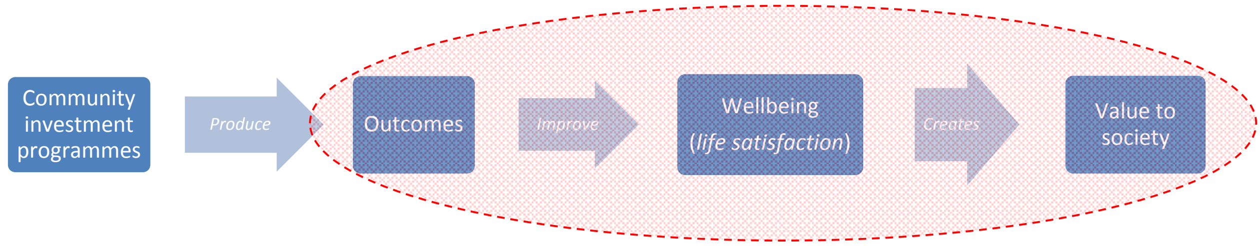
(Sales and House, 1971) and strokes (Huppert, 2006). Cohen et al. (2003) find that people who report higher life satisfaction were less likely to catch a cold and would recover quicker if they did. Kiecolt-Glaser et al. (2002) find that people with higher life satisfaction heal more quickly from wounds. Krueger and Schkade (2008) assess the test-retest reliability of life satisfaction responses and conclude that retest reliability levels "*are probably sufficiently high to yield informative estimates for……research*". Finally, we should note that life satisfaction, a global measure of wellbeing, that respondents usually take only a minute or so to answer in large surveys, is extraordinarily responsive to the things in life we would expect to be impactful on us. Life satisfaction, even measured on simple 7 or 11-point scales, varies in the direction and kind of magnitude we would expect with for example marital status, income, employment, housing conditions, environment and crime levels and even at a more micro-level with cinema visits and levels of PM10 in the air. We believe that life satisfaction responses can provide informative information about how a person's life is going for them and ultimately about their welfare and hence are robust measures for valuation.

In sum, wellbeing valuation is a recently developed method for valuing goods and services that are not traded in markets (non-market goods). Because it relies on people's actual experiences it overcomes a large number of serious problems related to preference-based valuation methods, the main one being that when people are asked about how much they will like and value something they are often poor at predicting how much those things will actually matter in reality and hence their willingness to pay responses are often very misleading. The wellbeing valuation method values different outcomes and non-market goods according to how they impact on people's lives as they live them.

2.3. Wellbeing valuation of community investment

The power of wellbeing valuation grows as more data on wellbeing and its drivers or determinants becomes available. The process of value-creation for community investment programmes can be depicted as in Figure 2.

Figure 2. Community investment programmes and social value creation



Community investment programmes will lead to a diverse set of **outcomes** such as increased employment, reduced crime and better health. These outcomes are important because they improve individuals' **wellbeing** and this in turn has **value to society**. There are two approaches we could use in this project:

Option 1. We could assess the full value-creation process. Here we would look at the impacts of specific community investment programmes on people's wellbeing (life satisfaction) and value the associated outcomes. This would require that we have data on whether respondents in the survey participated in the community investment programmes we are valuing. This level of data detail is unfortunately not available in large national datasets.

Option 2. This method instead looks at the value process from,

OUTCOMES → VALUE TO SOCIETY

This is the area highlighted by the red ring in Figure 2. Here we derive from large national datasets a matrix of values associated with a large set of different outcomes, such as increased employment, reduced crime and better health, for people that resemble those that participate in community investment programmes. And with knowledge of the outcomes delivered by different community investment programmes we can go on to attach values to specific programmes. **This is the approach taken in this project.**

The analysis draws on the following four UK datasets:

The **British Household Panel Survey (BHPS)** is a household survey run by the University of Essex that follows the same people over time (Panel data). It surveys 10,000 - 15,000 people each year and there are 18 years (waves) of data. It includes (and is representative of) England, Scotland, Wales and Northern Ireland and consists of a large range of variables covering all aspects of people's lives.

Understanding Society (U Soc) incorporated and replaced the BHPS in 2010. It follows the same individuals as the BHPS plus about 60,000 new participants and it has added a new set of variables. It is a panel dataset that surveys over 70,000 individuals each year on all aspects of people's lives. It is representative of England, Scotland, Wales and Northern Ireland and there are currently two years (waves) of data available. The BHPS and now Understanding Society is the largest panel (longitudinal) dataset in the UK.

The **Crime Survey for England and Wales (CSEW)** (formerly the British Crime Survey) is a survey on all aspects of crime run by the Office for National Statistics. It contains data on reported and unreported crime, police and criminal justice. It surveys about 40,000 households each year as a repeated cross-section and is representative of England and Wales. It is the largest crime-related survey in the UK. We use the two most recent years of data since this is when questions on subjective wellbeing were introduced.

The **Taking Part (TP)** survey collects data on aspects of leisure, culture and sport in England, as well as an in-depth range of socio-demographic information on respondents. Taking Part is the largest survey of its type (leisure, culture and sporting activities) in the UK. It is a repeated cross-sectional survey run by the Department for Media, Culture and Sport. It has surveyed around 15,000 people every year since 2005 and is representative of England.

Under **Option 2** we estimate values associated with the **different outcomes** from these data (53 distinct outcomes). These outcomes are estimated for the general sample population and also broken down by the factors of age and geographic region.

Armed with knowledge of the value to people of different outcomes like better health, participation in sports and employment we can assess the overall social value created by community investment by housing providers and determine which interventions have the greatest impacts. So, for example, if we find frequent moderate exercise to be worth about £2,000 to the individual and that a community investment programme helped 100 people to exercise frequently this would represent the creation of £200,000 of social value from the project. This is important information because we can assess the overall social value created by the programme and run cost-benefit analysis (or SROI) by comparing the value created against the costs of programme implementation. **The final part of the analytical puzzle will be for housing providers to take the value estimates for different outcomes and attach them to actual outcomes observed in the community investment programmes.**

2.4. Introduction to the statistical methodology used in the project

As is clear from Figure 1, understanding causal relationships between the outcomes, income and life satisfaction is the key aspect to this project (indeed it is the key part of any social impact assessment generally). Focussing first on the impact of the outcomes (e.g., better health, employment etc.) on life satisfaction we can think of two different groups of people. Group A represents those who are employed and group B those who are unemployed. It is by no means sufficient to simply compare the life satisfaction levels between groups A and B and attribute any difference we see in life satisfaction scores (group A will probably have a higher average level of life satisfaction) to employment status of group A. This is because unless employment status has been randomly assigned in an experimental setting, the two groups will differ on a whole host of factors in addition to their employment status. That is, group A will probably be comprised of people who are more motivated, higher educated and healthier as these are the types of people that will have success in finding jobs. The problem is that these factors also directly impact on life satisfaction - clearly healthier people will have higher levels of wellbeing. So group A is likely to have higher levels of life satisfaction anyway in comparison to group B even if they were not employed. This problem is known as *selection bias*.

It is also useless trying to compare group A's life satisfaction before and after they become employed. This is because there is likely to be a host of other factors going on in addition to the change in employment status in between the periods when life satisfaction was measured for the group. So for example, these people may have also benefitted from a national policy (say a reduction in NHS waiting times) that was implemented around the same time that most of them found work. Life satisfaction would then have risen because of finding employment *and* the new NHS policy and so we would end up overstating the effect of employment on life satisfaction. This problem is known as a *history effect.*

There are also other potential biases such as *regression to the mean, reverse causality* and *selection on gains to treatment,* which we shall not discuss here since they are involved, but which we will attempt to solve in the statistical methodology.

Differences between groups (that leads to selection bias) and simultaneously occurring events (that lead to history effects) come in two types. They can either be observable or unobservable to the statistician. If all possible differences and events are observable (say the only group-level differences are in age, gender and educational attainment and the only event was a local level NHS policy) then we can use statistical methods to *control* for them, which means that we can exclude them from the analysis. This way, after controlling for these factors a simple comparison of life satisfaction between groups A and B will provide a robust (unbiased) estimate of the effect of employment on life satisfaction. The major problem is that not all characteristics and events are known or observable to the statistician. For example, we may not know that motivation and ability differ across the two groups and even if we suspected that it did we may not have methods to measure motivation accurately. Either way, we cannot control for motivation and ability in the statistical analysis and we would have biased estimates of the causal effect of employment on life satisfaction.

In this project we will employ **multivariate analysis techniques**. These are methods that control for as many of the possible differences across different groups as possible. This is undertaken in **multivariate regression analysis**, where we control for all the main determinants of life satisfaction. The empirical evidence on life satisfaction is such that we now have a fairly well-determined set of factors that all regression models should capture (see Fujiwara and Campbell, 2011). Although in this type of technique we can never control for all factors because some will be unobserved, regression analysis is the most commonly used technique in wellbeing analysis and it is of a level that is sufficient for publication in academic social science journals. The method is robust enough to pass technical thresholds for policy evaluation in UK government policy-making and hence is deemed robust enough for use in this project. The model will be run using all four datasets.

Recall that we also need to estimate the impact of income on life satisfaction in the WV model (see Figure 1). This is more problematic because modelling the relationship between wellbeing and income has been notoriously difficult in the wellbeing literature, because the potential for bias seems to be even greater. The methodology will follow that set out in Fujiwara (2013) *The social value of housing providers*, which used data on small to medium-sized lottery wins in an **instrumental variable model** (IV) to derive a robust causal estimate of the impact of income on life satisfaction. The model will use data from the BHPS. This method is unbiased because lottery wins are essentially randomly assigned amounts of money (among lottery players), which means that it replicates an experimental setting. Where any kind of intervention or event has been randomly assigned we can be confident of estimating robust causal effects because by virtue of randomisation all characteristics and factors (both observable and unobservable) are on average the same across the groups.

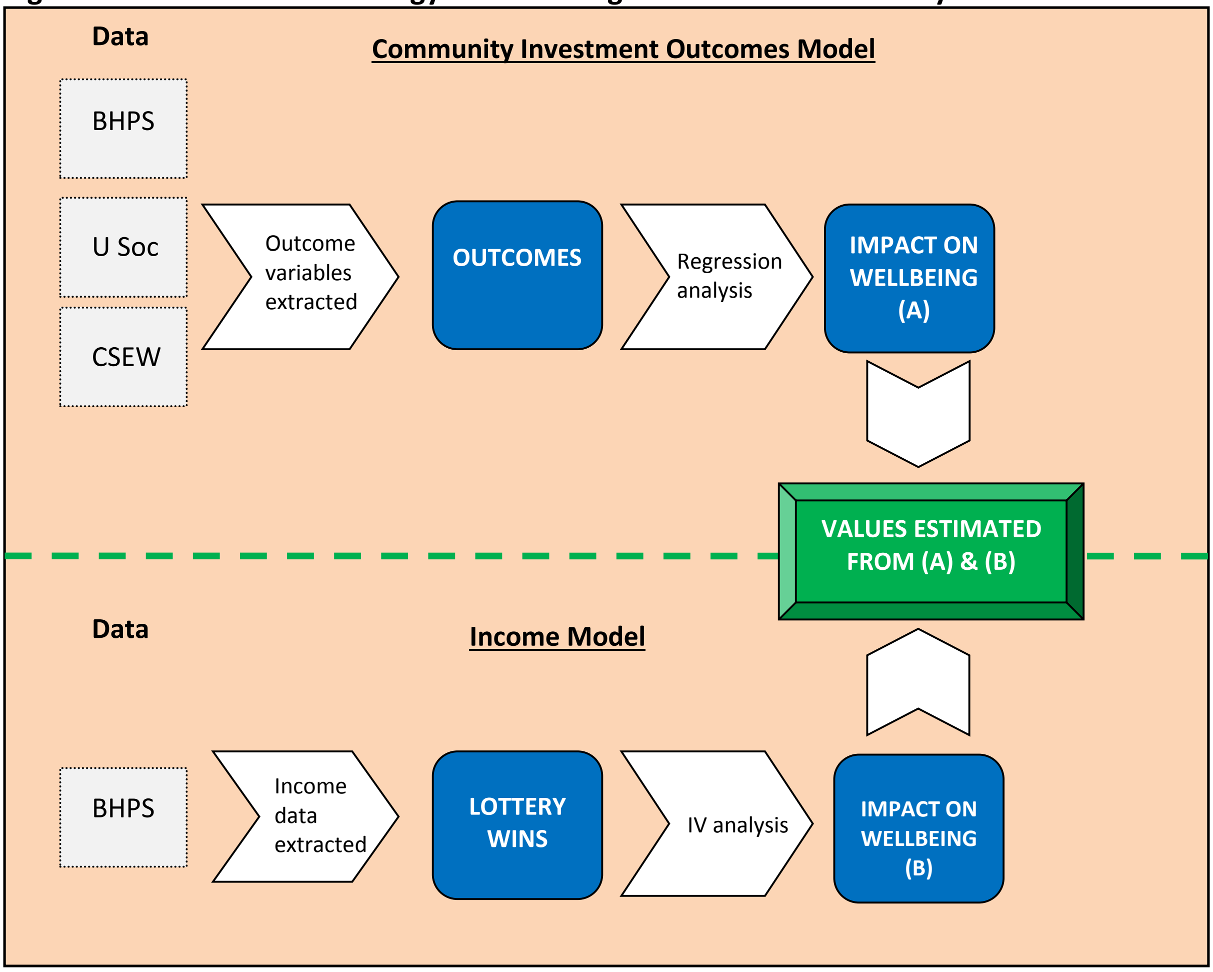
In sum, we will estimate two different models for each value. Figure 3 provides a detailed description of the overall method incorporating Figure 1 and Figure 2 to give a depiction of the datasets and statistical methods used in the project. First, we use a **multivariate regression model** for the outcomes of interest, which will derive an estimate of the impact of the outcomes on life satisfaction. This estimate is depicted as (A) (for example, (A) could represent the impact of improved health on life satisfaction). Then the **instrumental variable (IV) model** for income is employed to derive an estimate of the impact of money on life satisfaction, depicted as (B). The models will be run on the same or similar sample groups and the results from these two models will be used to estimate the monetary values associated with the outcomes. This is essentially achieved by comparing the ratio of (A) to (B) (in this example this would be the value associated with improved health),

$$Monetary\ value = \frac{(\boldsymbol{A_n})}{(\boldsymbol{B})}$$

Here the subscript n represents the nth outcome in the list of outcomes (e.g., if improved health was the 31st outcome, then health = A_{31}).

The **simultaneous model methodology** set out in Figure 3 represents the most robust and up-to-date version of wellbeing valuation currently being used. It provides the most accurate measures of monetary value using wellbeing data. All estimated values feed into a **matrix** that will be a tool for organising and searching different values to input into a decision-making framework like cost-benefit analysis or SROI.

Figure 3. Statistical methodology for wellbeing valuation of community investment



ANNEX A

Wellbeing Valuation Methodology

This section provides an outline of the statistical methodology used in the UK Valuation Repository. The methods derive from the recent London School of Economics Publication: Fujiwara (2013) '*A General Method for Valuing Non-Market Goods Using Wellbeing Data: Three-Stage Wellbeing Valuation'*. For a more in-depth discussion of the methodology interested readers are asked to consult the original paper.

Background
The Wellbeing Valuation (WV) approach requires us to estimate the impact of community outcomes and income on subjective wellbeing. We use life satisfaction measured on a 1-7 scale.

To measure impacts we use a mix of multivariate regression and instrumental variables (IV) methods. For the IV we use a control function approach rather than more typical IV estimators such as the Wald estimator or two-stage least squares. We follow the framework set out in Fujiwara (2013) '*A General Method for Valuing Non-Market Goods Using Wellbeing Data: Three-Stage Wellbeing Valuation'*[5], which represents the latest developments in WV methodology in line with Green Book recommendations (2011).

Three- Stage Wellbeing Valuation (3SWV)
3SWV runs two separate models: one for the impact of community investment programmes on life satisfaction and one for the impact of income on life satisfaction as follows:

Income Model
(1) $LS_i = f(\ln(M_i))$

Community Investment Model
(2) $LS_i = g(Q_i)$

where LS = life satisfaction, Q = the community investment outcome (eg, improved health) and M = income. Income enters as a logarithmic function to acknowledge the diminishing

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[5] http://cep.lse.ac.uk/pubs/download/dp1233.pdf. This paper sets out new methodology for wellbeing valuation that solves for the main technical issues highlighted in the 2011 Green Book.

marginal utility of income. Further explanatory variables can be added to models (1) and (2) where required.

3SWV separates the estimation process into two models in order to estimate the full effects (total derivative) of income. Single equation methods that have been customarily used in WV cannot derive total derivatives, which means that estimates of compensating and equivalent surplus are biased. Then in the third stage of the process values are derived from the results of the income and community investment models. 3SWV derives more robust value estimates than previous wellbeing valuation methods which are in line with welfare economic theory.

From models (1) and (2) the value of community investment outcomes (Q) can be estimated from the derivatives as follows:

(3) $$Value\ of\ Q = {-\frac{\partial LS}{\partial Q} \cdot \Delta Q} \Big/ {\frac{\partial LS}{\partial M}}$$

Equation (3) is specifically the compensating surplus of Q. There are two theoretical concepts of value in economics known as compensating surplus (CS) and equivalent surplus (ES), which broadly align with lay definitions of willingness to pay and willingness to accept. CS and ES are what we should technically be measuring for CBA (and consequently for SROI too since SROI replicates CBA valuation methodology). We can measure both CS and ES in WV as shown in Table 1. Here I adjust equation (3) to use the same terms as set out in equations (1) and (2) and to explicitly account for the log function of income.

Table 1. Estimating CS and ES in wellbeing valuation

	Compensating Surplus (CS)	Equivalent Surplus (ES)
Welfare gain	$CS = M^0 - e^{\left[\ln(M^0) - \frac{g'_Q}{f'_M}\right]}$	$ES = e^{\left[\frac{g'_Q}{f'_M} + \ln(M^0)\right]} - M^0$
Welfare loss	$CS = e^{\left[\frac{-g'_Q}{f'_M} + \ln(M^0)\right]} - M^0$	$ES = M^0 - e^{\left[\ln(M^0) + \frac{g'_Q}{f'_M}\right]}$

In general, we estimate the compensating surplus for community investment outcomes, which is the left hand column in Table 1. Although SROI is silent on this issue CBA is usually undertaken using CS. So for positive effects or outcomes we estimate value as:

(4) $$CS = M^0 - e^{\left[\ln(M^0) - \frac{g'_Q}{f'_M}\right]}$$

And for negative effects or outcomes we estimate value as:

(5) $$CS = e^{\left[\frac{-g'_Q}{f'_M} + \ln(M^0)\right]} - M^0$$

M^0 is set at the median level of annual household earnings which is about £30,000 in our data.

CS and ES relate to the more lay or common notions of willingness to pay (WTP) for a good outcome and willingness to accept (WTA) a bad outcome as follows.

Table 2: The relationship between ES, CS, WTP and WTA

	Compensating Surplus	**Equivalent Surplus**
Welfare gain	*WTP for the positive change*	*WTA to forego the positive change*
Welfare loss	*WTA the negative change*	*WTP to avoid the negative change*

These measures matter because for a given good or outcome one can derive different values based on CS and ES. For example, for a good outcome (or a welfare gain) WTP for the positive change will often differ from the WTA to forego the same positive change. There are many reasons for this but one is that WTP is constrained by one's ability to pay or level of income, whereas WTA is not.

Cost-benefit analysis (CBA) is usually based on CS measures of value (this is known as the Kaldor version of the potential compensation test in CBA). That is, that good outcomes are assessed in terms of WTP and bad ones in terms of WTA. We take this same approach in the Social Value Bank and measure all values in terms of CS. Thus for good outcomes (e.g., employment and hobbies) we estimate a value akin to the WTP for the outcomes. And for bad outcomes (e.g., anti-social behaviour and poor health) we estimate a value akin to the WTA the outcomes, which resembles a monetary compensation.

We define an outcome as positive or negative based on how the outcomes have usually been analysed in the wellbeing literature to date. Therefore, all outcomes are positive except for those related to crime events and health conditions, since it is more common to assess the impact of these as negative events on wellbeing. Thus values related to crime events or incidents and to health conditions and behaviours should be seen as resembling WTA these bad outcomes. And all other values relate to the WTP for the good outcome. We follow the wellbeing literature because it allows comparisons of effects sizes with the broader literature.

The Income Model

The income model is used to estimate f'_M in equations (4) and (5). It is estimated using exogenous changes in income due to lottery wins in order to derive robust *causal* estimates. We look at the impact of lottery wins among the population of lottery players because for lottery players wins are by law random and this creates a strong instrument for income. We use a *control function* which allows us to extrapolate the results from the small sample of lottery players to the general population. Under more traditional IV estimators, such as the

Wald estimator and two-stage least squares, we are only able to derive causal effects for an unobservable sub-sample of lottery players (i.e., the compliers to the instrument) which makes the results far less generalisable. The control function allows us to derive estimates of the sample average effect of income on life satisfaction, rather than just the local average complier effect of income. The results for the control function are as follows:

Table 3. The causal effect of income on life satisfaction

First stage regression

Dependent variable: Log(household income)

Independent variables	Coefficient	S.E.
lottery win	0.102***	(0.015)
previous lottery wins	6.82e-06***	(0.000)
constant	9.999***	(0.007)
Observations	10,461	

Control Function

Dependent variable: life satisfaction

Independent variables	Coefficient	S.E.
log (household income)	1.103***	(0.252)
previous lottery wins	-0.00001***	(0.000)
$\hat{\vartheta}_2$	-1.108***	(0.260)
$\hat{\vartheta}_2 \cdot \ln(M)$	0.011*	(0.006)
constant	-5.777**	(2.530)
Observations	10,328	

Notes: * = significance at 10%, ** = significance at 5%, *** = significance at 1%. Heteroscedascity-robust standard errors used. Source: Fujiwara (2013).

This provides our estimate for the income model in equation (1) and f'_M in equations (4) and (5). We find that the *causal effect* of a log-point increase in household income is to increase life satisfaction by 1.103 index points per year. In other words f'_M= 1.1. We use this estimate for the effect of income on life satisfaction in all of the value estimations.

The Community Investment Model

Community investment models will provide estimates of the effect of community investment on people's life satisfaction (g'_Q in Table 1 and equations (4) and (5)). The Community investment models (equation (2)) are estimated using the following type of multivariate regression analysis for one community investment outcome at a time[6].

(6) $$LS_i = \alpha_i + \beta_1 Q_i + \beta_2 X_i + \varepsilon_i$$

where α_i $is\ the\ constant\ term, X_i$ and ε_i are respectively a vector of other determinants of life satisfaction for individual i and the error term. Depending on the dataset used equation

[6] Exogenous changes or valid instruments were not available for the community investment variables and hence we used multivariate regression as the next-best option. Regression analysis will provide results that are useful and robust enough for use in policy.

(6) may be run on panel data over time which would mean that there is an additional time (t) subscript which is not included here. β_2 from equation (6) equals g'_Q in valuation equations (4) and (5).

We also derived differentiated values for different sample groups. We derived an overall value based on equation (6) and the following differentiated values:

i. **Age:** Values by different age groups (under 25/25-49/50 and over). This was done by adding an interaction term between Q and the three different age categories to equation (6). This would produce 3 extra values per outcome.
ii. **Region:** Values by region (London/Non-London/Unknown (national average). Regional analysis was undertaken by running equation (6) for samples in the different regions as interactive models were not possible since the regions are not mutually exclusive categories.
iii. **Age & Region:** Values by age and region (combinations of the above categories – e.g., under 25 & London, 25-49 & Non-London etc.). This would produce 9 extra values per outcome (and by all GOR in Value Insight).

In terms of the other determinants of life satisfaction we use a set of variables that are included as standard in most wellbeing research and as we set out in Green Book guidance on wellbeing valuation. These are[7]:

- Income
- Age
- Gender
- Marital status
- Educational status
- Employment status
- Health status
- Number of children and other dependents (including caring duties)
- Geographic region
- Housing and environmental conditions and crime levels in the vicinity
- Social relations

Data
The following four datasets were analysed:

The **British Household Panel Survey (BHPS)** is a household survey run by the University of Essex that follows the same people over time (Panel data). It surveys 10,000 - 15,000 people each year and there are 18 years (waves) of data. It includes (and is representative of) England, Scotland, Wales and Northern Ireland and consists of a large range of variables covering all aspects of people's lives.

[7] Note that we did not include religious affiliation and personality traits (which are sometimes used in wellbeing analysis) in the models as there were no data on these variables.

Understanding Society (U Soc) incorporated and replaced the BHPS in 2010. It follows the same individuals as the BHPS plus about 60,000 new participants and it has added a new set of variables. It is a panel dataset that surveys over 70,000 individuals each year on all aspects of people's lives. It is representative of England, Scotland, Wales and Northern Ireland and there are currently two years (waves) of data available. The BHPS and now Understanding Society is the largest panel (longitudinal) dataset in the UK.

The **Crime Survey for England and Wales (CSEW)** (formerly the British Crime Survey) is a survey on all aspects of crime run by the Office for National Statistics. It contains data on reported and unreported crime, police and criminal justice. It surveys about 40,000 households each year as a repeated cross-section and is representative of England and Wales. It is the largest crime-related survey in the UK. We use the two most recent years of data since this is when questions on subjective wellbeing were introduced.

The **Taking Part** survey is a survey of over 11,000 adults and children in England and collects a wide range of data about engagement and non-engagement in culture, leisure and sport. It has run since 2005.[8]

Number of models and statistical inference

Each outcome could have up to **12 values** (1 (average) + 3 (age-differentiated) + 2 (region-differentiated) + 6 (age & region-differentiated)) associated with it if all coefficients are statistically significant.

In total we assessed **53 different outcomes**. For nearly every outcome we estimated the Age, Region and Age & Region differentiated models (some of the differentiations were not applicable to some outcomes – e.g., youth related outcomes did not have an age differentiation).

We used heteroscedascity-robust standard errors in all models. In general the R^2 values were in line with the wellbeing literature (around 10%-20%). Multicollinearity as tested through the variance inflation factor (VIF) was not a problem in the models. All variables had a VIF score under 4 (except age and age^2 which is acceptable as they a functions of each other) and VIFs for most variables were around 1, which represent no inflation of standard errors. If age variables are dropped, mean VIF = 1.49.

Residuals from the main models looked normally distributed and in the Ramsey RESET test the independent variables do not add any extra descriptive power when entered as explanatory variables.

Any outcome coefficient (β_2 in (6)) that was significant at the 10% level was used to attach values to the outcome. The values represent the average value per person per year for the sample (the UK for the BHPS and Understanding Society and England and Wales for CSEW). Values from the differentiated models represent the value per person per year for the average person in that specific sub-category of the population (e.g., under 25s).

[8] While this dataset was analysed, the results were not used as they were not fully compatible.

Having established a set of statistically significant national average values, we adopted a process for creating differentiated values that ensures that all values are within a moderate band of the national average because the information contained in the national averages represent the most valid estimates as sample sizes are maximised. As the samples are differentiated into smaller categories, individual outlying respondents (e.g. someone who has poor health but is very happy) have more of an impact on the value. The differentiated values as calculated were accepted as the best central estimate of the relevant value, subject to caps ensuring no value was excessively far from the average to nullify the impact of these outliers.

The selection of the boundaries used in the process inherently creates a trade-off between accepting outlying results that are artefacts of individual outliers and rejecting ones that are due to genuine variation between categories of people. Consequently, an empirical approach was taken to the setting of boundaries, by examining the degree of variation that the age-differentiated values displayed around their respective overall (national average) values. The age differentiations were selected for this process as age has been found in previous analyses to be an important determinant of the wellbeing effect of different outcomes, and because we have only three age categories, so sample size reduction is not too great.

Specifically for each outcome it was calculated how far the lowest age-differentiated value was below the overall figure and how far the highest one was above it. It was found that, on average, the lowest result for each outcome was approximately 60% of the overall figure and the highest result was approximately 160% of the overall figure. These were selected as the upper and lower bounds for accepting all differentiated values (including the age-differentiated values). On the small number of instances where a differentiated value had been calculated that was of the opposite sign to the overall value, its value was still set to the nearest point in the acceptable band (i.e., at 60% of the overall value).

Example

Table 4 presents the results from a community investment model for employment outcomes, including for example, employment, self-employment and government training programmes. The coefficient for 'employed' of 0.489 is our estimate of the annual impact of employment on life satisfaction. It is significant at the 1% level so β_2 = 0.489, which equals g'_Q in equation (4) (we use equation (4) since employment is a positive outcome).

Table 4. Regression results for employment outcomes

Linear regression					Number of obs =	98617
					F(32, 98584) =	826.26
					Prob > F =	0.0000
					R-squared =	0.2615
					Root MSE =	1.0711

lfsato	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_HH_y	.0257849	.0058483	4.41	0.000	.0143224	.0372474
employed	.4886766	.0181275	26.96	0.000	.4531469	.5242063
s_employed	.5367591	.0212184	25.30	0.000	.4951712	.5783469
retired	.6070839	.0230145	26.38	0.000	.5619757	.652192
student	.4133966	.0234674	17.62	0.000	.3674008	.4593925
gov_trng	.4164094	.0890723	4.67	0.000	.2418288	.5909899
family_jb	.4800784	.0223694	21.46	0.000	.4362348	.5239221
high_educ	-.0206177	.0094493	-2.18	0.029	-.0391381	-.0020972
good_health	.564967	.0088361	63.94	0.000	.5476483	.5822857
male	-.041822	.0071666	-5.84	0.000	-.0558686	-.0277755
age	-.0231243	.0015215	-15.20	0.000	-.0261064	-.0201422
age2	.000254	.0000168	15.13	0.000	.0002211	.000287
married	.0861241	.0105142	8.19	0.000	.0655164	.1067319
separated	-.5083828	.0387847	-13.11	0.000	-.5844004	-.4323652
divorced	-.3086102	.0247066	-12.49	0.000	-.3570348	-.2601856
widowed	-.2296613	.0359649	-6.39	0.000	-.300152	-.1591706
nchild	-.0183797	.0042982	-4.28	0.000	-.0268041	-.0099552
carer	-.1968315	.015363	-12.81	0.000	-.2269427	-.1667203
Scotland	.0431842	.0119883	3.60	0.000	.0196873	.0666811
Wales	.0223289	.0126189	1.77	0.077	-.002404	.0470619
N_Ireland	.0634869	.0135677	4.68	0.000	.0368943	.0900795
NE	.0430191	.0221519	1.94	0.052	-.0003985	.0864366
NW	.0150263	.0147766	1.02	0.309	-.0139356	.0439882
York_hmb	.0298042	.0159277	1.87	0.061	-.0014139	.0610224
E_mid	.0601553	.0163277	3.68	0.000	.0281531	.0921575
W_mid	.0289622	.01644	1.76	0.078	-.00326	.0611844
E_Eng	.0629704	.0150495	4.18	0.000	.0334736	.0924672
SW	.0234491	.0154954	1.51	0.130	-.0069217	.05382
house_sat	.3246093	.0032013	101.40	0.000	.3183348	.3308838
safe_area	.0068334	.0100684	0.68	0.497	-.0129006	.0265674
talk_neigh	.1095723	.0075586	14.50	0.000	.0947575	.124387
meet_people	.0759299	.007303	10.40	0.000	.0616161	.0902436
_cons	2.728023	.0658967	41.40	0.000	2.598866	2.85718

We know from the control function results in Table 3 that f'_M= 1.1 and M^0 = £30,000. Thus equation (4) becomes:

$$CS = 30{,}000 - e^{\left[\ln(30{,}000) - \frac{0.489}{1.1}\right]} = \text{£}10{,}767$$

Therefore, the compensating surplus for (i.e., the value of) **employment is £10,767 per person per year** in addition to the wage income (since income is held constant in Table 4). This is the estimate of the value of employment for the average person in the UK.

ANNEX B

Introduction to the theory of social impact measurement and the role of wellbeing valuation

The dominant approaches to social impact measurement used by governments, international organisations and the not-for-profit sector are what is known as **welfarist** approaches. This means that social impact is measured in terms of the impact that interventions have on people's welfare, where welfare is a taken to be a broad measure of quality of life. Another word for this is their wellbeing.

Cost-benefit analysis (CBA), the dominant form of policy evaluation in government and the basis of the HM Treasury Green Book manual, and **social return on investment** (SROI), the growing form of evaluation in the not-for-profit sector, are fundamentally welfarist approaches. Other well-documented approaches to social impact measurement such as **cost-effectiveness analysis** (CEA), **cost-utility analysis** (CUA) and **multi-attribute utility analysis** (a branch of **multi-criteria analysis**) are welfarist too. Non-welfarist approaches to social impact also exist (e.g., the **capabilities approach**), but in practice they are less frequently employed in the public policy arena.

Welfare is at the centre of methods like CBA and SROI[9]. Broadly speaking welfare can be measured in one of three ways (Parfitt, 1984):

(i) Desire satisfaction account of welfare

The desire satisfaction account is based on the premise that we can infer wellbeing from people‘s choices because —*what is best for someone is what would best fulfil all of his desires"* (Parfitt, 1984: 494). Economic theory is based on this account of wellbeing (it is usually termed *preference satisfaction* in economics). The information that preferences reveal is called *utility* in economics which fundamentally refers to the notion of welfare or wellbeing. The underlying assumptions in the desire satisfaction account are that people's preferences are consistent and well-informed (known as *rational preferences* in economics), because in this sense they can be shown to reveal something meaningful about someone's quality of life. If preferences are inconsistent in the sense that someone prefers A to B but then suddenly prefers B to A, or that they prefer A to B, B to C but C to A (known as intransitivity), then it is hard to infer whether that person's life is better when they have A, B or C. Here A, B and C could be outcomes related to different policy interventions and hence we would not know which policy is best for the individual. Preferences also need to be well-informed such that an individual chooses A over B because he knows that his life is better with A than with B. These requirements on preferences were mainly derived from Paul Samuelson's work in the early twentieth century and are summarised in Samuelson's axioms of revealed preference.

(ii) Mental state accounts of welfare

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[9] CBA makes this explicit as it is developed from microeconomic theory, which has a long history of welfarism. SROI does not have an explicit philosophical foundation, but a welfarist approach can be interpreted from the valuation methods it uses that are derived directly from microeconomic theory. For all intents and purposes therefore SROI is a welfarist approach to social impact.

Mental state accounts refer to people's subjective experiences of their own wellbeing, which is usually measured through self-reports in a survey. There is a large range of wellbeing questions and these include questions on happiness, emotions, life satisfaction, purpose in life, sadness, anxiety and goal attainment. Each one taps into different theoretical concepts of wellbeing[10]. These measures can be used in policy by assessing the impacts of different outcomes on self-reported wellbeing.

(iii) Objective list accounts

Objective list accounts of well-being are based on assumptions about basic human needs (Dolan et al., 2011a). Wellbeing is measured in terms of a set of pre-determined indicators such as mortality rates, health, and literacy rates. These indicators are deemed to be essential determinants of wellbeing for any individual. Policies would be measured in terms of how they fair against these indicators.

CBA and SROI are distinct from other social impact methods because they involve monetary valuation of the outcomes. In theory valuation should measure impacts on people's welfare in monetary equivalent terms. This is the theory of compensating surplus and equivalent surplus (Hicks and Allen, 1934), which broadly align with the notions of willingness to pay and willingness to accept. Traditionally monetary values have been measured using the desire satisfaction account of welfare in economics. These are the methods of revealed preference and stated preference. In revealed preference methods, values are derived from people's market behaviour. In stated preference, survey respondents state a (hypothetical) willingness to pay value for the outcome (or a willingness to accept a bad outcome).

Valuation can also be undertaken using subjective measures of wellbeing (the mental state account of welfare). The **wellbeing valuation** method does just this, basing values on how outcomes of an intervention impact on people's self-reported wellbeing (usually life satisfaction). In wellbeing valuation we assess the impact of the intervention on life satisfaction and then find the amount of money that would produce the equivalent effect on life satisfaction. Wellbeing valuation, therefore, offers an alternative way of valuing policy outcomes for CBA and SROI, basing values on the mental state rather than the desire satisfaction account of wellbeing.

In this project we look at the impacts of a range of different outcomes related to community investments and attach a monetary value to these outcomes from the perspective of the stakeholders. This is achieved through statistical analyses of large national UK datasets that contain data on subjective wellbeing. The values estimated in this project represent the monetary equivalent value of the welfare impacts of community investments on stakeholders and they are hence fully consistent with economic theory and can be used directly in CBA and SROI analyses. We use the most advanced statistical methods in this project as set out in Fujiwara (2013). The results can be used to attach values to the positive outcomes of different interventions in order to compare back to the costs of the

[10] Although strictly speaking mental state accounts often refer to hedonic wellbeing (emotions and affect), I include global/evaluative measures such life satisfaction in the mental state account here since they fit best in this category out of the three.

intervention and assess value for money using CBA, which is the recommended method in most OECD governments, or SROI.

We produced the first government-level guidance on the wellbeing method for HM Treasury as part of the Green Book (Fujiwara & Campbell, 2011) and we are currently working with Treasury to develop new best-practice guidance in this area. The wellbeing valuation approach aligns with the Government and Office for National Statistics' National Wellbeing Programme as it is a critical method for using the new data on wellbeing that is being generated as part of the programme. In light of all this, wellbeing valuation is one of the fastest-growing areas of policy evaluation in the UK. It has been/is being used by a wide range of central departments, including the Department for Business Innovation and Skills, the Department for Culture, Media and Sport, the Department for Work and Pensions, HM Treasury, the Cabinet Office, the Department for Communities and Local Government (their work in this area can be found online). It is also a firm part of OECD recommendations on wellbeing analysis in public policy.

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Social Value Bank Data additional licencing information

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