Exploring the use of a subjective well-being approach to monetize the health benefits associated with volunteering in Hong Kong: A working paper

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Abstract

There is an increasing trend in Hong Kong to apply social return on investment (SROI) analysis for measuring social impact on a given policy. However, one challenge in applying this method is to identify appropriate financial proxies for the variable of interest. In this exploratory analysis, we demonstrate the use of a novel economic valuation approach (the subjective well-being approach) to monetize non-market social goods in the local context. In particular, we estimated the monetary value of the positive health impact associated with volunteering in Hong Kong and in five other locations (United States, Australia, Netherlands, Singapore, and Taiwan). Data used in this analysis was extracted from the latest wave from the World Value Survey. We estimated the "value" of the health benefits associated with volunteering in Hong Kong is approximately HK$11,300. This can be interpreted as the amount of extra annual household income that would be required to make a randomly chosen non-volunteers to have self-rated health status as if they were actively participating in volunteering in Hong Kong SAR. However, we must stress that our estimated value has a wide confidence level (95%CI: HK$-1,000 - HK$17,400) and our analysis is only exploratory in nature, thus it only currently represents a "rough" estimate. Our work also shows there is likely a large by-location variability in the "value". SROI practitioners in Hong Kong should be aware of the danger of directly applying estimates from other countries in the local context, as it may lead to incorrect valuation, and worse, misinform the public on the extent of the social impact created from a policy innovation.

Introduction

Researchers in Hong Kong have increasingly applied the method of Social Return On Investment (SROI) as means of measuring the effectiveness of social innovation policies [1-3]. One difficulty in applying this method in the local context is that it is hard to identify appropriate "financial proxies" for a social good. This is particularly challenging when the subject of interest do not have an equivalent market price. Conventionally, economic valuation research has typically estimated the "willingness-to-pay" (WTP) or willingness-to-accept" (WTA) for non-market goods by use of revealed-preference or stated-preference methods (e.g., contagion valuation) [4,5] However these methods have been empirically shown to have a number of shortcomings [6,7].

Recently a new line of research in economic valuation has emerged, which is referred to as the "subjective well-being approach" [8,9]. In this novel approach, measures of subjective well-being (e.g., life-satisfaction and health measures) are conceptualized as an empirical approximation of individual's experienced utility [10]. This method measures how the good of interest impacts on an individual's subjective well-being. Additionally it estimates the amount of increase/decrease in financial condition (e.g., household income) would be required in order to obtain an equivalent change in the individual's subjective wellbeing. In other words, individual's subjective welfare serves as a link between his/her financial condition and the good of interest, and by this linkage, it establishes the monetary value of the goods, that is, the marginal rate of substitution (MRS) of income for the good in interest. MRS can be further converted into monetary units (either as WTP or WTA), i.e., parallel to the concept of equivalent surplus (ES) and compensating surplus (CS) [11]. This method of non-market good valuation has been increasingly applied in valuing environmental goods in Western developed countries [8,12,13]. Few other attempts have been applied on social and health outcomes in Western developed countries [9,14]. However, there is not much work using this method of valuation in other locations (i.e. Far East countries).

In this exploratory study, we have demonstrated the use of "subjective well-being" approach to monetize a non-market social good in Hong Kong SAR. In particular, we have monetized the health benefits associated with volunteerism. An extensive body of literature has shown that engaging in pro-social voluntary activities would enhance an individual's well-being. Empirical studies have shown that volunteering is associated with an increased level of happiness [15], life satisfaction [16], self-rated health [17], and reduced depression and mortality risk [18]. Recent studies have shown that the positive effect of pro-social activities appears to be similar in different cultural, economic, and geographic settings [17,19]. Based on this overwhelming evidence, we hypothesized the positive effect of

volunteering on health exists in the local context, and thus using the "subjective well-being" approach, we can value the positive health impact of volunteering in a monetary unit.

Empirical strategies

Data used in this analysis was from the latest wave of World Value Survey (Wave 6 in WVS). World Value Survey is an international well-known dataset that surveys sample from over 60 locations using uniformly-structured questionnaires. The samples from each location have minimum sample size set as 1000. Within each within location, sampling was stratified by geographical regions, in order to obtain representative national samples [20]. As the purpose of our exploratory study is illustrative, we selected data from six locations for demonstration: three from Eastern locations (Hong Kong SAR, Singapore, Taiwan) and another three from the West (Australia, Netherlands, United States).

Sample used in this analysis include 9,575 individuals from six regions (Hong Kong: n = 997; Singapore: n = 1971; Taiwan: n = 1,210; Australia: n = 1,398; Netherlands: n = 1,899; United States: n = 2,100). In the WVS, individuals were asked whether they are members of a number of voluntary organizations. We followed previous approach to compute volunteerism by summing the number of voluntary organizations individuals were actively involved in [21]. As suggested in literature, "church membership" and "union membership" may not always be as "voluntary" unlike the other types of association, so in our analysis, we also follow previous approach and excluded them for computing volunteerism [21]. In this study, individuals who are active members of at least one voluntary organization are counted as volunteers; while those who are not actively involved in any voluntary organization are defined as non-volunteers. Table 1 provided the statistics of volunteerism of the samples.

Table 1: summary statistics of volunteering in the six selected locations.

	n	volunteers	%
Australia	1,398	774	55.4%
Netherlands	1,899	871	45.9%
United States	2,100	967	46.0%
Hong Kong SAR	997	270	27.1%
Singapore	1,971	446	22.6%
Taiwan	1,210	556	46.0%

n: sample size

The economic status of individuals in these samples was measured in WVS by a single item ten-point Likert scale, with 1 indicating that the sample is in the lowest household income group and 10 are those in the highest household income group. The individual's self-rated health (SRH) is measured by a one-item question: "All in all, how would you describe your state of health these days?" and there are four responses: *(4) very good*, *good*, *fair*, and *poor (1)*.

Analysis

In this exploration, we used methods similar to a number of previous studies [22]. More specifically, in step 1, we estimated the effect of volunteering on self-rated health using OLS regression analysis, with equation expressed as:

$$SRH = \beta_0 + \beta_v X_v + \boldsymbol{\beta_2 X_2} + \epsilon \qquad [1]$$

where SRH denotes the sample's perceived self-rated health status, β_0 is the intercept of the regression, X_{v} is as the indicator of volunteering with regression coefficient, β_{v}, and $\boldsymbol{X_2}$ is the hypothesised covariates vector, with components age, sex, marital status, education and employment status, and regression coefficient vector, $\boldsymbol{\beta_2}$.

Next (step 2), we estimated the effect of income on self-rated health.
To address the potential endogeneity issue in the association between income and self-rated health, we applied the two-stage least squares (2SLS) method to estimate the relationship [23], with equation expressed as:
The 1st stage regression:

$$Income = \gamma_0 + \gamma_1 Z_1 + \boldsymbol{\beta_2 X_2} + \epsilon_1 \qquad [2]$$

where income denotes the endogenous variable, i.e. individual's income, Z_1 is the instrumental variable, i.e. perceived social class, $\boldsymbol{X_2}$ is the hypothesised covariates vector(age, sex, marital status, education and employment status).

The 2nd stage regression:

$$SRH = \beta_0 + \beta_i \hat{X}_i + \boldsymbol{\beta_2 X_2} + \epsilon_2 \qquad [3]$$

where $\hat{X}_i$ is the fitted values of the income derived from the 1st stage regression and ϵ_2 is the composite error term, which is uncorrelated to $\hat{X}_i$ and $\boldsymbol{X_2}$.

We ascertained the endogeneity issue by the Durbin Wu- Hausman test [24]. In the 2SLS analysis, we used social class as an instrument variable [25, 26]. Then, we used the

Staiger and Stock rule of thumb to examine the strength of the instrument. The instrument is considered as weak when the F-statistic is less than 10 [27].

Based on the estimates of volunteering and income on self-rated health, we then calculate MRS of income for volunteering (i.e. β_v/β_i, which is adjusted effect of volunteering on self-rated health / adjusted effect of income on self-rated health). Then, applying the MRS into the concept of CS,

$$\text{WTP} = M^0 - e^{[ln(M^0) - \frac{\beta_v}{\beta_i}]} \qquad [4]$$

we then estimated the WTP of volunteering (i.e., the implicit monetary value of the health benefits associated with volunteering).

Results

Table 2 shows the self-rated health status of the sample by volunteering status in the six locations. Consistently, we noted samples who participated in voluntary activities on average have a better health (i.e., a higher score of self-rated health) than their "non-volunteering" counterparts.

Table 2: Mean score and standard deviation of SRH for volunteers and non-volunteers in six locations

	Volunteers	Non-volunteers
Australia	2.19 ± 0.76	1.89 ± 0.80
Netherlands	2.01 ± 0.66	1.76 ± 0.71
United States	2.18 ± 0.72	1.97 ± 0.74
Hong Kong SAR	1.74 ± 0.85	1.64 ± 0.77
Singapore	2.05 ± 0.71	1.76 ± 0.72
Taiwan	2.18 ± 0.68	1.97 ± 0.70

Figures are presented as mean ± SD.

Step 1: Associations between volunteering and self-rated health

Table 3 shows estimates of the associations between volunteering and self-rated health among the six locations. All associations are adjusted for demographic characteristics: age, sex, marital status, educational attainment, and employment status. There are a couple of notable observations. First, the associations between volunteering and self-rated health in all six locations are consistently positive, indicating that those who participated in voluntary activities are more likely to report better health when their demographic characteristics have been controlled for. Second, although the associations in all locations are positive, the magnitude of the associations vary. Generally, stronger associations are noted in United

States, Australia, and Netherlands (i.e., economically developed Western countries) than the Eastern locations. It is worth pointing out that the association between volunteering and self-rated health in Hong Kong SAR only reaches significance at the ten percent level, whereas estimates in all other locations do reach significance at the five percent level. The weaker "significance" of the association detected in Hong Kong SAR may partially related to its relatively smaller sample size. Nevertheless, it appears that the association between volunteering and self-rated health, despite being positive in all locations, has great location variability.

Table 3: Associations between volunteering and self-rated health in the six locations derived from OLS regression models

location	βv (SE)	t-statistic	95% CI
Australia	0.146 (0.051)	2.867**	(0.046, 0.246)
Netherlands	0.143 (0.033)	4.331***	(0.088, 0.215)
United States	0.151 (0.032)	4.679***	(0.088, 0.212)
Hong Kong SAR	0.104 (0.056)	1.848+	(-0.004, 0.213)
Singapore	0.114 (0.038)	2.977**	(0.039, 0.190)
Taiwan	0.091 (0.039)	2.338*	(0.015, 0.168)

Note: †p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001; The OLS model adjusts for age, gender, marital status, education and employment status. SE: Standard error

Step 2: Associations between household income and self-rated health

Next we conducted the 2SLS analysis for the association between household income and self-rated health in all six locations. Results of the Wu- Hausman test are significant at the five percent level in most of the locations, suggesting the existence of endogenous problems. Thus, social class was used as an instrument to address the endogeneity issue. Estimates of the association between household income and self-rated health for the six locations are shown in Table 4. They are consistently positive and mostly reach statistical significance at the one percent level. However, similar to what is observed in the relationship between volunteering and self-rated health, there are also great region-by-region variability in the strength of the associations between income and self-rated health.

Table 4: associations of household income and self-rated health in the six locations derived from the 2SLS regression model

	IV regression		Wu- Hausman test
	βi (SE)	t-statistics	
Australia	0.085 (0.027)	3.069**	1.95†
Netherlands	0.071 (0.020)	3.561***	7.46***
United States	0.123 (0.015)	8.445***	18.23***
Hong Kong SAR	0.158 (0.028)	5.579***	11.02***
Singapore	0.116 (0.023)	5.086***	6.50†
Taiwan	0.153 (0.024)	6.267***	17.03***

Note: †p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001; The model adjusts for age, gender, marital status, education and employment status.

The Staiger and Stock rule of thumb are all greater than 10 for the six locations, which rejecting it is the weak instrument hypothesis.

Computing the MRS of income for volunteering and its implicit monetary value

Based on the estimated effects of volunteering on self-rated health (step 1) and household income on self-rated health (step 2), we compute the MRS of income for volunteering in all six locations. To illustrate the calculation, we use the case of Hong Kong SAR. From step 1, we estimated the adjusted association of volunteering and self-rated health in Hong Kong SAR is 0.104 (βv in table 3). In this context, we interpreted the result as "volunteers tend to report a better self-rated health than non-volunteers by 0.104 unit (on a 4-point likert scale)". Then, from step 2, the adjusted association of household income and self-rated health is 0.158 (βi in table 4), implying that a 1 unit increase in household income is related to a 0.158 unit increase in self-rated health (on a 4-point likert scale). Therefore, the MRS of income for volunteering in Hong Kong is estimated to be 0.658 ($\beta v / \beta i$, =0.104 / 0.158).[1] Converting it into a monetary term, the implicit monetary value (i.e., WTP) for the health benefits associated with volunteering is approximately HK$11,300 (95%CI: HK$-1,000 - HK$17,400).[2]

[1] MRS is the rate of exchange between some units of goods X (self-rated health) and Y (household income) which are equally preferred. In this context, the MRS of income for volunteering can be interpreted as the unit of household income (on a 10 point likert scahle) to be given up for obtaining the positive health benefits associated with volunteering (i.e., increase in .104 unit of self-rated health on a 4-point likert scale).

[2] Estimated based on equation 4; M_0 is set to HKSAR's medium household income in 2014 = HK$23500; $WTP_{Hong\ Kong} = \$23{,}500 - e^{ln\,\$23{,}500 - 0.656} = \$11{,}300$;
$Lower\ CI = \$23{,}500 - e^{ln\,\$23{,}500 - (-0.04)} = -\$1{,}000$; $Upper\ CI = \$23{,}500 - e^{ln\,\$23{,}500 - 1.352} = \$17{,}400$
The monetary value is rounded to the nearest hundreds.

Table 5 summarizes the MRS of income for volunteering in all six locations. Interestingly, we observed estimates of MRS appear to be greater in the Western developed locations (Australia, Netherlands, United States) than the Eastern locations (Hong Kong SAR, Singapore, Taiwan). The largest difference of MRS across region is more than three-fold (Taiwan vs. Netherlands).

Table 5: MRS of income to volunteering in the six locations

	$\beta v / \beta i$	*95% CI of* $\beta v / \beta i$
Australia	1.727	(0.545, 2.909)
Netherlands	2.029	(1.110, 2.949)
United States	1.227	(0.713, 1.742)
Hong Kong SAR	0.656	(-0.040, 1.352)
Singapore	0.985	(0.336, 1.634)
Taiwan	0.598	(0.091, 1.100)

MRS: Marginal rate of substitution.

Discussions

In this exploratory study, we have demonstrated the potential use of the subjective wellbeing approach to value a non-market social good in the local context. In particular, we explored the implicit monetary value of the health benefit associated with volunteerism in Hong Kong SAR and five other locations (Australia, United States, Netherlands, Taiwan, and Singapore). Our analysis first showed that, in five of the six locations, the positive associations between volunteering and self-rated health are significant at the five percent level. In addition, we also observed the increase in household income is significantly related to an increase in self-rated health in all six locations. Based on these two sets of estimates, we calculated the MRS of income for volunteering, which are consistently positive in all locations; however their magnitudes vary substantially. This implies the implicit monetary value of the health benefits associated with volunteering may also differ largely across locations.

We estimated the implicit monetary value of the health benefits associated with volunteering is approximately HK$11,300 in Hong Kong. This can be interpreted as the amount of extra annual household income that would be required to make a randomly chosen non-volunteers to have self-rated health status as if they were actively participating in volunteering in Hong Kong SAR. However, we must stress that our estimated value has a wide confidence level (95%CI: HK$-1,000 - HK$17,400) and our analysis is only exploratory in nature, thus it only currently represents a “rough” estimate. A number of

more detailed analysis should be conducted. First, a number of previous studies have highlighted that the positive health effects of volunteering do differ across age and sex sub-groups [17, 28, 29]. In this sense, the attached "monetary value" may also vary by age-and-sex strata. In addition, the health effect of volunteering may moderate by the types of voluntary activities engaged and frequency of volunteering [29]. Further, our analysis, due to data availability, did not take into account how the nature of volunteerism may influence its "monetary value". Third, our exploratory work is cross-sectional, we thus cannot address the temporality of volunteering and health. Despite previous longitudinal studies ascertaining the causal role of volunteering on health [15,30], we should still be mindful the possibility of an inverse causal relationship (e.g., social selection process), that may subsequently influence the value estimation.

It is widely documented that endogeneity issue may exist in the estimation of the relationship between health and income [23]. A common practice in the field is to use an instrumental variable for adjustment. In our analysis, we use perceived social class (due to its availability in the dataset), which is similar to previous studies [26]. However the use of this instrument has been criticized in the literature and there are suggestions that other proxy as an instrument may be better [31]. It is still an on-going academic debate on what may be an appropriate instrument to use for the estimation.

Lately there appears to be an increasing demand for using the SROI method in Hong Kong to measure social "value" created by a given policies. However, lack of "appropriate" financial proxies, particularly for non-market social goods, still very much limits the use of this approach in proper social value accounting. To the best of the authors' knowledge, this work represents the first attempt to use subjective well-being valuation approach to estimate the monetary value of non-market social goods in Hong Kong. This line of research should help to establish a "social value" bank in Hong Kong, and in a long-term, will be conducive for the development of social impact accounting in the local context.

Some recent SROI practices have directly applied "financial proxies" estimated from Western countries for policy valuation in the local context. We strongly advise caution in this procedure. To illustrate, we conducted a simple demonstration. Estimates presented in table 6 are the "monetary value" of volunteering in Hong Kong when we directly applied MRSs from the other five locations in the calculation. As estimates of MRS in other locations (e.g., the Western developed countries; see table 6) are greater than those for Hong Kong, it influences the subsequent valuation. For instance, if we were to directly apply MRS for Netherlands into our valuation, the "monetary value" (M_0) derived for volunteering in Hong Kong is HK$20,400, resulting in an overestimation by more than

HK$9,100.Clearly, applying "valuation estimates" from other locations to our local policy valuation risks making an incorrect valuation estimates, and at worse, misinform the public of the "extent" of the impact related to the subject of interest.

Table 6: Monetary value of volunteering of Hong Kong SAR when using MRS estimates derived from other locations[3]

location	$\beta v / \beta i$	*95% CI for* $\beta v / \beta i$
Australia	$19,300	($9,900 , $22,200)
Netherlands	$20,400	($15,800 , $22,300)
United States	$16,600	($12,000 , $19,400)
Hong Kong SAR	$11,300	($-1,000 , $17,400)
Singapore	$14,700	($6,700 , $18,900)
Taiwan	$10,600	($2,200 , $15,700)

[a] the estimates are calculated based on equation 4; M_0 is set to HKSAR's medium household income in 2014 = HK$23,500; The monetary value is rounded to the nearest hundreds.

Conclusion

Our exploratory study illustrates the potential use of the so-called "subject well-being" approach in valuing non-market social goods in the local context. Our work showed that the MRS of income to a social good of interest may vary substantially across locations, and by the same token, the monetary value of the social good may also differ greatly. We believe the "subjective well-being" approach may be one way to establish "financial proxies" of non-market social goods in Hong Kong. This needs more research effort in the local context. The use of SROI methods in social impact accounting is still at its infancy in Hong Kong. For a conducive development of social impact measurement, there is much more work to be done to establish "locally applicable" financial proxies for non-market social goods. Trying to applying the values from other locations to Hong Kong without taking into account the local context simply doesn't work.

[3] Example of Netherlands: $WTP_{Netherlands} = \$23{,}500 - e^{ln\,\$23{,}500-2.029} = \$20{,}400$
$Lower\ CI = \$23{,}500 - e^{ln\,\$23{,}500-1.1} = \$15{,}800$; $WTP_{Netherlands} = \$23{,}500 - e^{ln\,\$23{,}500-2.949} = \$22{,}300$

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