Costs of domestic violence: a life satisfaction approach

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Abstract

This paper discusses and estimates the costs of domestic violence using a life satisfaction approach. It draws on a British cross sectional dataset which includes individual self-reported life satisfaction, household income and experienced domestic violence, and estimates the costs of domestic violence as the compensating variation of domestic violence resulting from estimating a life satisfaction regression equation. Some attempts to solve self-selection into abusive relationships, and to solve the endogeneity of household income are discussed and implemented. Results suggest domestic violence is costed very highly by its victims, with estimates ranging from £27000 up to over £70000. Hence this paper contributes to the literature on valuing non-marketable goods and discusses the usefulness of a life satisfaction approach when estimating the costs of domestic violence. It claims that despite its shortcomings, a life satisfaction approach allows for a valuation of the costs of domestic violence and provides answers often other valuation methods fail to.

1   Introduction

One of the major challenges of public policy is to value non-marketed goods and services, without which governments cannot make informed choices about how to allocate public spending. The absence of a price determined by a relevant market means that valuation methods used to estimate the costs of non-marketable goods and services are fraught with difficulty. This paper attempts to estimate the costs of one such non-marketed good, domestic violence, whose effects on the victims' integrity, economic outcomes, and mental health are overbearing. It will do so by estimating the compensating variation of domestic violence resulting from estimating a life satisfaction regression equation.

There are three main valuation methods of non-marketable goods at the individual level, revealed preference methods, hedonic regression, and stated preference methods. Revealed preference methods have been used, for instance, in Rao et al. (2003), who estimates the cost of safe sex as the price penalty prostitutes incur for using condoms with their clients. This method relies on there being a natural experiment which identifies a counterfactual group of people not exposed to the same treatment, which may not always exist. Gibbons & Machin (2008) uses a hedonic regression analysis to estimate the value of public services and school quality. This method relies on there being a marketable good, such as housing, whose price changes systematically with the quality of the non-marketed good, in this case both public services and school quality taken together. As long as house prices are in equilibrium, as long as houses only differ to the extent that they are located in areas with differing exposures to the good, and as long as the data is good enough that allows for individual self-selection to be accounted for, house prices will reflect the good's value. The third valuation method often used in valuation is somewhat different. Instead of relying on observed data to reveal information about the non-marketed good, it asks respondents directly about how they value it. Stated preference methods have been applied to assess the value of different types of crime. Atkinson et al. (2005) has estimated that different types of crime can cost each victim up to £36000 in the UK. However, asking individuals direct questions about their valuation of a specific

good invites strategic responses, and can give rise to unreflective or idiosyncratic answers framed by the particular context of the question. Moreover, there is evidence that average individual self reported willingness to pay does not often have the same magnitude average individual willingness to accept (see e.g. Knetsch, 2000).

In the context of domestic violence, its valuation is as important as it is challenging. Natural experiments which would randomly allocate individuals to different incidence levels of domestic violence may be rare if at all possible, and randomised trials which could fabricate such variation are rare (an exception to be made to Hidrobo & Fernald, 2013). Hedonic regressions rely on there being a market good whose price changes with domestic violence, which even if existing, would then require strong assumptions in terms of market equilibrium, and large demands on data quality to isolate the price variation attributed to domestic violence only. Stated preference methods, despite its limitations, have been used to estimate costs of crime. In England and Wales, Walby (2004) has estimated the costs of domestic violence at the national level, following a methodology proposed in Brand & Price (2001). They combine accounting techniques and stated preference methods to estimate different types of costs (using the latter mainly to estimate emotional costs of violence). Economic costs were estimated mostly by modeling and costing the relations crime has with marketed activities, or with outcomes such as industry turnover and absenteeism. Brand & Price (2001) estimate that the total cost of crime in England and Wales was 60 billion sterling in 2000. Walby (2004) finds that the costs of domestic violence alone were 20.06 billion sterling in 2006/7, out of which 13.88 billion were human and emotional costs.

This paper offers an alternative valuation method of domestic violence. Relying on individual data on self-reported life satisfaction, household income and experienced domestic violence, it estimates a life satisfaction regression equation dependent on income and domestic violence. Individual costs of domestic violence are derived as its estimated marginal rate of substitution with respect to household income. While not suffering from most of the limitations of more conventional valuation methods, it has limitations of its own. This paper assumes self-reported life satisfaction is a good indicator of utility

and is the ultimate variable to maximise. Sen (1990) argues that self assessments of life in general include adaptation and levels of resignation which invalidate the use of this variable. Others argue that, because self-reported satisfaction "is a global retrospective judgement, which in most cases is constructed only when asked and is determined in part by the respondent's own mood and memory, and by the immediate context" (Kahneman & Krueger, 2006), it is inadequate in assessing individual overall well-being, and in comparing responses across individuals. Despite these drawbacks, there is vast research from Psychology validating life satisfaction data against more objective measures of emotional state (see e.g. Clark et al., 2006). There is also mounting evidence showing that the relation between life satisfaction and several important socio-demographic and economic factors is stable across different studies (see e.g Frey & Stutzer, 2002); and that major events in a lifetime, such as divorce, job loss, or bereavement, often have permanent effects on one's life satisfaction (see e.g Lucas et al., 2003, for a discussion of the impact of transitions in marital status); and that the importance of different domains of life, such as health, intimacy, or material well-being, is also relatively stable (see e.g Cummins, 1996). So this paper assumes that it is reasonable to make these assumptions and explore the benefits of engaging with life satisfaction data in furthering our understanding of the weight domestic violence has on well-being.

Estimating consistent estimates of the effect of domestic violence and income on life satisfaction has additional caveats. To begin with, the relation between life satisfaction and income is often controversial and studies have traditionally found a weak relation between the two (an example is the seminal work from Easterlin, 1974, , which shows this weak correlation when looking across different countries; but similar evidence has been found when looking at time series data for a particular country, and for longitudinal data also). Individuals seem to adjust to changes in income very quickly and often completely, specially as a result of positive changes to income (Clark et al., 2006). If the degree of adaptation and social comparison effects are this strong, then there would not be a level of income which can compensate victims of domestic violence for their negative experience, because the monotonic relation between income and utility would be broken.

More recent studies have however shown that, when the endogeneity of income is accounted for, its effect on life satisfaction in longitudinal studies becomes larger and more significant (see e.g Powdthavee, 2009). Given the limits of the data, this paper will therefore attempt to account for the endogeneity of income and argue that adaptation may partly be accounted for by the inclusion of personality variables. We will include an imputed potential wage and local crime rates based on postcode information which can partly account for social comparisons, even if no systematic analysis of social comparisons and reference groups is being made.

It is also very likely that there is endogenous selection of exposure to domestic violence. Pollak (2002) develops an intergenerational model of domestic violence which explains the perpetuation of violence in homes where victims have been exposed to and therefore tolerate violence more. Part of the issue has to do with people conforming to their circumstances and there being personalities which tolerate abusive behaviour more than others (e.g Lundberg, 2010, shows how more agreeable people tend to divorce less). We assume that the personality variables will significantly reduce the impact of this source of bias. Local crime rates also proxy for exposure to crime and erosion of social norms.

The next sections describe the data and the methodology, alerting to the challenges that the data available add to this exercise. Section 5 presents and discusses the estimation of the marginal utility of income and violence, together with the estimates for the individual costs of domestic violence. Section 6 concludes.

2   Life Satisfaction Approach

Recent years have seen an increased interest in the economic consequences of domestic violence and on its social and private costs. Bowlus & Seitz (2006) shows that abused women are more likely to divorce and less likely to be employed. With a dynamic model, it also suggests that once violence has taken place, increasing women's employment may in fact worsen the incidence of domestic violence. Morrison & Biehl (1999), in turn, shows how children that have been exposed to domestic violence tend to underperform at school,

making the economic effects of domestic violence intergenerational and long lasting. Pollak (2002) went one step further and modeled the propensity to tolerating and perpetrating violence as a function of previous exposure to violence. He concluded that violence does tend to stay in families previously exposed to it. Tauchen et al. (1991), Farmer & Tiefenthaler (1997) and Aizer (2007) find that domestic violence is more likely to occur the lower the economic opportunities of the victims. More recently, Hidrobo & Fernald (2013) shows that cash transfers received by women in Ecuador decrease domestic violence for higher education groups, but for lower education groups, it can actually increase if the woman's education is at least as high as the man's. Given that domestic violence is one of the most costly types of crime and one of the main sources of crime suffered by women in the absence of armed conflict, this paper provides an estimate of the total costs of domestic violence for the victims using a methodology that has not been used so far.

Our approach assumes self-reported life satisfaction is a good proxy for utility and estimates a utility function U which depends positively on household income y and negatively on domestic violence DV. The compensating variation for domestic violence CV can be obtained by equating utility in a non-violent state 0 with utility in a violent state 1.

$$U^0\left(y^0, DV^0\right) = U^1\left(y^0 + CV, DV^1\right)$$

With a linear happiness equation

$$E\left(U_i | DV_i, y_i, X_i\right) = \alpha_0 + \alpha_1 DV_i + \alpha_2 y_i + \alpha' X_i + \varepsilon_i$$

where X represents all additional covariates, CV will solve the equation

$$E\left(U_i | DV_i = 0, y_i^0, X_i\right) = E\left(U_i | DV_i = 1, y_i^0 + CV, X_i\right)$$

and it is equal to[1]

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[1]This model produces a very simple parameter of the cost of domestic violence. We have experimented with log income, and results at mean income are only marginally

$$CV = -\frac{\alpha_1}{\alpha_2}$$

While never used to calculate the costs of domestic violence, this approach underlies the estimation of the tradeoff between unemployment and inflation discussed in Tella et al. (2001). Other applications of this approach now include a valuation of droughts and floods (Carroll, Frijters & Shields, Carroll et al.), informal care (van den Berg & i Carbonell, 2007), death of a loved one (Deaton et al., 2009; Oswald & Powdthavee, 2007), urban renewal (Dolan & Metcalfe, 2008), air quality (Levinson, 2012; Luechinger, 2009; van Praag & Baarsma, 2001) and terrorism (Frey et al., 2004).

3 Data

The main dataset of this paper is discussed in Anand et al. (2009). It was designed to demonstrate the notion that capabilities can be measured, taking a leap towards operationalising Sen (1993)'s capabilities approach. The design of the questionnaire relied on Nussbaum (2000)'s list of capabilities,

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higher than the results reported in this paper. Similar invariance to the specification is noted in Levinson (2012). We have also estimated a regression equation where income has been modelled as a Box-Cox function, while all other variables remain linear. The linear specification, even though not receiving strong statistical support, was the specification which failed to be rejected more often. The following table summarises the results obtained for the Box Cox specification of income. Coefficients estimated using maximum likelihood. Likelihood ratio tests used to test for a log specification, when $\lambda = 0$, and for a linear specification, when $\lambda = 1$.

Testing for alternative specifications of income in the life satisfaction equation: results from Box Cox specification, parameter λ

| | Domestic Violence ever | | | Domestic Violence recently | | |
	All	Women	Men	All	Women	Men
λ coefficient	3.086	5.694	0.212	3.198	5.863	0.302
λ standard error	(2.874)	(7.693)	(0.875)	(3.504)	(9.616)	(0.984)
p-value $H_0 : \lambda = 0$	0.012	0.004	0.802	0.025	0.012	0.746
p-value $H_0 : \lambda = 1$	0.178	0.038	0.462	0.226	0.072	0.558

and contains a set of 65 capability indicators together with a rich array of socio-demographic and economic variables. The survey instrument was delivered in 2005, between the 17th and the 22nd February, to a subsample of approximately 1048 individuals of the UK YouGov database. It was administered online and it is anonymous. This is, despite its modest size, one of the few datasets which includes information on experienced violence that does not come from a self-selected sample of reported victims.

The data set contains two main variables on experienced domestic violence. The wording of the most robust variable is as follows.

Have you ever been a victim of domestic violence (yes=1/no=0)
(Domestic Violence ever)

Victims of domestic violence often do not report incidents either to conform with social norms, or for fear of consequences (Moreno et al., 2005), or because they may have altruistic preferences for their spouse and may not want to expose them. Because this survey is anonymous, it is less likely that respondents will misreport their domestic violence experiences than it is in other existing data sets. Jarvinen et al. (2008) claims 1 in 4 women will experience an act of domestic violence in their lifetime. Our data suggest a similar incidence of domestic violence for women, and a not so negligible incidence for men. Out of the initial 1048 respondents, 15 people did not provide an answer to this question. Of these, 22.8% of women report having been a victim of domestic violence and this percentage is almost 10% for men.[2]

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[2]This paper also compared the incidence rates of this data set with the incidence rates from the self-completed British Crime Survey intimate personal violence (IPV) module. The IPV module asks two different questions about experienced violence. These questions are asked to all individuals in the sample, men and women, aged between 16 and 59 years old. The questions list the types of offenses, from verbal abuse to sexual abuse, the victim may have suffered, and respondents have to select yes or no to each item individually. It asks about experiences in the last 12 months prior to the interview, and about experiences since the age of 16. The question which mirrors more closely our first measure of experienced violence is the latter. In 2009/2010, 15.8% of men reported having been victims of domestic violence and this number grew to 17% a year later. For women, the percentage of victims varied from 29.4% and 29.9% in this period (Chaplin et al.,

This question is a bit unclear for the purposes of our paper because we do not know how long ago or how frequent and severe the incidents were, nor do we know whether they are still happening. The data set also includes a measure of vulnerability to domestic violence, which asks respondents to provide a number from 1 to 7 to represent how vulnerable they feel to future violence in their home (7 being the most vulnerable).

The actual wording is as follows.

> Please indicate how vulnerable you feel to domestic violence in the future - using a scale of 1 to 7 where 1 means "not at all vulnerable" and 7 means "very vulnerable"?

Table 1 shows how respondents who report having been victims of domestic violence or not answer the question about vulnerability to domestic violence. Everyone answered this question. Out of the 174 respondents report having been victims of domestic violence, only 78 report even the mildest vulnerability to future domestic violence (an answer larger than 1), and less than 10% reports extreme vulnerability (an answer of at least 6). From the 859 respondents who report no past incidents with domestic violence, only 52 report a number higher than 2. So while vulnerability to domestic violence is a more informative measure of how pervasive this experience is at the time of the interview, the number of people reporting any vulnerability is rather low. What is more, it makes comparisons between answers more difficult as there is a wide range of acts which could be considered domestic violence. It is well known that what is meant by domestic violence varies across people of different educational and social background, income levels, but mainly, of different sex. While domestic violence for women often entails physical abuse, domestic violence suffered by men is almost always of a verbal and emotional nature. Comparing answers between men and women is therefore

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2011). These percentages are higher than the percentages of our dataset, but this may be due to differences in the structure of the questions. The questions in the IPV BCS module, when changed from a list of offenses to a yes/no question on each type of offense, seems to have increased the percentage of respondents answering affirmatively (Hall & Smith, 2011). The fact the question in the data set used in this paper is an even coarser question may justify a slightly lower incidence.

problematic. However, the small percentage of men who report experienced domestic violence, makes their separate analysis infeasible. This paper will use both measures of domestic violence, and present the results separately just for women, for men, and for the whole sample.

Table 1: How vulnerable to current and future domestic violence is the sample?

Vulnerability at home	Not at al	2	3	4	5	6	Very vulnerable	Total
Never victims of DV	711	96	22	15	10	3	2	859
Victims of DV	96	28	12	12	10	11	5	174
Total	807	124	34	27	20	14	7	1,033

For estimation purposes, the vulnerability variable will be collapsed into a binary variable, which will take the value 1 for all individuals who report vulnerability to domestic violence at least as high as 4, and 0 otherwise. According to Table 1, the percentage of people in this sample who are currently subject to domestic violence is 7.06%, which represents a 4.90% percentage for men and 8.81% for women. This percentage is considerably lower than the original 16.84%, but ensures that domestic violence is much more likely to be present in one's life[3].

The self-reported measure of life satisfaction is the answer to the question

How satisfied or dissatisfied are you with your life as a whole?

The question is clearly aiming at an overall appreciation of one's life, so it can be argued that it is a good measure of utility. What is not so clear is what is meant by life as a whole. It is not clear if it invites an analysis of *current* life as a whole, or life as a whole *until now*. This ambiguity not

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[3]The percentage of IPV respondents who said they had been victims of domestic abuse in the last 12 months prior to the survey was 5.6% for men and 8.1% for women. These IPV percentages, in the period 2004-2011, varied between 6.4% and 8.2% for women, while for men, these percentages varied between 3.6% and 5.8%. Both IPV and our data set therefore produce similar magnitudes of the incidence of domestic violence more likely to be included in respondent's assessment of current life satisfaction.

only adds to measurement error because different respondents may have read the question differently, but what is perhaps more worrying, is that it makes the analysis of our coefficients, and the estimation of the costs of domestic violence much less clear. We have assumed that the answers represent an integral of how people perceive their lives *until now*, so that we estimate the CV as the change in this measure caused by the flow of violence. This question is asked both at the beginning and at the end of the survey. Several studies (e.g. Pudney, 2010) show how values of satisfaction vary significantly with the location of the question in the questionnaire. This paper uses the second measure on the grounds that it should be less subject to idiosyncracies and current mood because it comes after the respondents had to reflect on several relevant areas of their lives. This will be our measure of utility.

The income variable included in the data set is gross household income, a more natural measure of income, specially for women living in traditional households. The questionnaire includes the following question

> Gross household income is the combined money income of all those earners in a household including wages, salaries, or rents and BEFORE tax and contributions to national insurance are deducted. What is your gross household income?

- 0 - nothing
- £1 to £9,999 per year (£1 to £199 per week app)
- £10,000 to £19,999 per year (£200 to £389 per week app)
- £20,000 to £29,999 per year (£390 to £574 per week app)
- £30,000 to £39,999 per year (£575 to £774 per week app)
- £40,000 a year or more (£775 a week or more)
- Prefer not to answer
- Don't know

Over 4% of respondents said they did not know their household income and over 10% chose not to answer, so the sample with non-missing household income reduces to 883 respondents. While income data provided as an

interval makes it more likely respondents will answer truthfully, this study needs a continuous measure of income. What is more, previous studies have shown that not accounting for the endogeneity of income in life satisfaction regressions tends to underestimate the effect of income, and is claimed to be the reason why the estimated relation between income and life satisfaction tends to be statistically insignificant. In this paper, this underestimation would lead to an overestimation of the costs of domestic violence. For these two main reasons, the estimation of the marginal utility of income is the major weakness of this paper. Our continuous measure of gross household income is based on the gross household income data from the British Household Panel Survey (BHPS). We replace each income band value, from 1 to 6, by the BHPS average income in each interval. To deal with the same problem, Layard et al. (2007) uses the midpoint of each income band instead but, given the positive skewness of the household income distribution, the mean imputed from a comparable data set can be argued to be a better starting point. The survey used was designed using very similar questions to the BHPS, so the two measures of gross household income can be assumed to be comparable. To deal with endogeneity, this paper has considered and attempted several approaches. It used imputed income by matching on observables individuals from the BHPS and this survey, following Luechinger (2009). However, results were not satisfactory and the BHPS does not include a measure of experienced violence, which would lead us to overestimate the household income of victims. It also used the hour of the interview as an instrument, given the additional information this data set has on levels of distress (including insomnia), household composition and employment status. It turns out this instrument is too weak and led to very inaccurate estimates in the second stage. All these results are available upon request. But this paper will only present the estimated equations which use the continuous measure of income, without an attempt to instrument for it. As an empirical strategy, it will account for factors which may however reduce the simultaneity between income and life satisfaction, and which are often omitted from most surveys. These include a distress index which is likely to capture unexpected shocks to income; personality variables which partly capture the unobserved heterogeneity that explains positive correlations between happi-

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ness and income; and a predicted log hourly wage, which according to Pollak (2005), is the appropriate measure to capture outside options in a relationship, and can partially account for social comparisons and reference groups. Regrettably, this survey does not include information on spouses.

Appendix A shows a summary of all the variables used in this paper.

4 Domestic Violence in the UK: who are the victims

Table 2 shows how socio-economic and demographic factors affect the probability of experiencing domestic violence. We specified probability of domestic violence as a function of household income, log hourly potential wage, gender, age, marital status, presence of dependents, ethnicity, education, personality, the distress index and local crime rates. We have included the continuous household income measure as opposed to the income bracket dummy variables, mainly because of the small sample size. We have used both measures of experienced domestic violence, and estimated this model for the whole sample, but also for men and women separately.

Table 2: Marginal probit effects on experienced domestic violence

	Domestic Violence ever			Domestic Violence recently		
	All	Women	Men	All	Women	Men
Female	0.100***			0.020		
	(0.028)			(0.019)		
Household Income / 10000	-0.144	-0.212	-0.039	-0.167**	-0.141	-0.230**
	(0.099)	(0.163)	(0.108)	(0.070)	(0.104)	(0.108)
age	0.011	0.009	0.014	-0.004	-0.004	-0.003
	(0.008)	(0.012)	(0.009)	(0.005)	(0.007)	(0.006)
age^2	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
separated	0.212***	0.172**	0.183***	0.072	0.084**	0.056
	(0.063)	(0.069)	(0.054)	(0.046)	(0.042)	(0.040)
no partner	0.029	0.015	0.063	-0.000	0.040	-0.016
	(0.039)	(0.059)	(0.051)	(0.023)	(0.035)	(0.035)
non-White British	0.122**	0.112	0.083*	-0.020	-0.092	0.023
	(0.058)	(0.074)	(0.048)	(0.028)	(0.066)	(0.038)
at least 1 child	0.009	-0.026	0.055	0.012	-0.014	0.030
						Continued on next page

	Domestic Violence ever			Domestic Violence recently		
	All	**Women**	**Men**	**All**	**Women**	**Men**
	(0.035)	(0.055)	(0.042)	(0.023)	(0.035)	(0.028)
Vocational Diploma	-0.004	0.020	-0.011	-0.061	0.008	-0.104**
	(0.056)	(0.087)	(0.056)	(0.046)	(0.059)	(0.046)
CSE and A Levels	-0.026	0.023	-0.060	-0.045	0.006	-0.040
	(0.054)	(0.083)	(0.059)	(0.046)	(0.056)	(0.032)
Graduate	-0.049	-0.080	0.001	-0.066	-0.025	-0.068*
	(0.058)	(0.094)	(0.061)	(0.048)	(0.065)	(0.040)
At home	-0.009	0.001	-0.007	-0.028	-0.002	-0.048
	(0.034)	(0.053)	(0.043)	(0.021)	(0.032)	(0.033)
Extraversion	-0.045**	-0.047	-0.041*	-0.014	-0.031*	0.011
	(0.018)	(0.029)	(0.022)	(0.012)	(0.019)	(0.016)
Agreeableness	0.058***	0.068***	0.047**	0.027**	0.043**	0.015
	(0.016)	(0.025)	(0.019)	(0.011)	(0.017)	(0.013)
Conscientiousness	0.013	0.014	0.017	-0.009	-0.033**	0.013
	(0.017)	(0.026)	(0.020)	(0.011)	(0.016)	(0.013)
Emotional Stability	-0.012	-0.013	-0.014	-0.017	-0.027*	-0.005
	(0.017)	(0.027)	(0.021)	(0.011)	(0.016)	(0.014)
Openness	-0.005	-0.001	-0.013	0.012	0.012	0.011
	(0.016)	(0.025)	(0.020)	(0.011)	(0.015)	(0.014)
Log hourly wage rate	-0.028	0.018	-0.086*	0.031	0.036	0.041
	(0.037)	(0.057)	(0.047)	(0.029)	(0.038)	(0.048)
Local crime rates	-0.001	-0.003	-0.001	-0.001	-0.002	0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Pseudo-R^2	0.113	0.072	0.158	0.112	0.158	0.188
N	682	372	310	690	380	310

Significance levels :   * 10%   ** 5%   *** 1% Standard errors in parentheses

Omitted categories: being a man, married, other schooling, lower relative income, White British, working at least 8hrs/week, and no dependents. Standard errors of income multiplied by 10000.

Women are 10% more likely to have ever experienced DV, but this difference is not statistically significant when looking at current experiences of DV. Lower household income increases chances of experiencing violence, but this is only significant for our second DV measure and mainly for men. Separated individuals have a significantly higher chance of ever having experienced DV, but this is still statistically significant for women's current experiences. Incidence of Domestic Violence also seems to be more predominant amongst non-White British, and this is statistically significant for men. However, this incidence is not reflected in current feelings of vulnerability and experiences. Often domestic violence of non-White British in the UK is argued to be partly reinforced due to the lack of social networks and support. But these results do not seem to support this claim. It may be worth re-

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membering that the sample of non-White British who participates in Gallup polls does not represent the existing population in the country, so this result is to be interpreted with caution. Contrary to Agarwal (2006), having dependents and being at home do not seem to increase the incidence of domestic violence. The former may be a characteristic of a developed country where fertility choices are made by a self-selected group of households. And the latter because of the crude measure of employment status we are using. The incidence of domestic violence does not seem to vary greatly for women across different educational groups, but this is not the case for men. Both graduate men and men with vocational training are less likely to suffer from violence at home than those with lower schooling. This may not be surprising given the results in Hidrobo & Fernald (2013), which shows that what is more likely to matter is relative, rather than absolute educational achievement. But again, this is a study conducted in the UK, a developed country, and these findings may partly reflect the effects of small samples and the high correlation education tends to have with income, potential wage, and several other variables in the study. Not surprisingly, and confirming the results obtained in Lundberg (2010), personality is highly correlated with the probability of domestic violence. Agreeable people are more likely to be abused and extrovert people less likely to be abused. Women who are more conscientious and more emotionally stable are also less likely to be currently experiencing domestic violence, which suggests personality not only impacts on incidence of domestic violence, but also on the responses to these experiences. As suggested by Lundberg (2010), this may well be the case since more agreeable people are less likely to divorce. Unfortunately, this is a cross sectional data which does not have information on marital history. As suggested in Morrison & Biehl (1999), higher violent crime rates lower inhibitions against violent conduct, both via a demonstration effect (emulation of violent behaviour) and via erosion of social norms that regulate interpersonal relations. However, local crime rates do not seem to have any impact on what happens inside the household.

All in all, Table 2 shows that while domestic violence may hit more vulnerable groups in terms of education, outside options and income, these results show that domestic violence does cross cut the whole income distribution,

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specially for women, and is highly dependent on personality, which partly inhibits victims from complaining or from leaving an abusive relationship. There is however evidence that abusive relations do end, given that incidence of domestic violence is highest amongst separated and divorced victims.

5 Results

This paper estimates the costs of domestic violence as the compensating variation needed to compensate an individual for having experienced domestic violence. We use life satisfaction as a measure of utility and assume it depends linearly on domestic violence and household income[4] as follows:

$$E\left(U_i\middle|\,DV_i, y_i, X_i\right) = \alpha_0 + \alpha_1 DV_i + \alpha_2 y_i + \alpha^{'} X_i + \varepsilon_i \tag{1}$$

Table 3 shows the estimation results of life satisfaction equations defined according to Eq. 1. The first three columns use the measure of domestic violence which accounts for any act of domestic violence and the last three columns use the measure that accounts for current experiences of domestic violence. Results for each of the two measures are presented for the whole sample, women and men.

The socio-demographic indicators used are explained in Appendix A. We include a gender dummy, a quadratic function of age, marital status, ethnicity, presence of dependents, education, employment status. To account for the endogeneity of domestic violence and the self-selection of victims into abusive relations, we use personality indicators and a measure of outside options, the log hourly wage predicted from BHPS. We also use local crime rates which account for norms related to violence and quality of public services. To account for the endogeneity of household income, we also use the distress index, which should reflect the shocks to utility that lead individuals to revise their income generating decisions. Potential wage can partly also

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[4]We also attempted to use more flexible relations between happiness and household income, but results did not seem suggest that more flexible forms were better. We attempted to use a Box-Cox transformation of the income variable, and a quadratic specification.

account for the importance social comparisons and reference groups have for individuals.

Table 3: Happiness equations: estimation results

	Domestic Violence ever			Domestic Violence recently		
	All	**Women**	**Men**	**All**	**Women**	**Men**
Domestic Violence	-0.230**	-0.238*	-0.250	-0.460***	-0.550***	-0.352
	(0.108)	(0.130)	(0.199)	(0.168)	(0.210)	(0.294)
Household income/10000	0.845***	0.843**	0.921**	0.765***	0.747*	0.875**
	(0.269)	(0.396)	(0.391)	(0.269)	(0.392)	(0.394)
Female	0.257***			0.233***		
	(0.083)			(0.082)		
age	-0.119***	-0.141***	-0.090***	-0.130***	-0.157***	-0.095***
	(0.021)	(0.029)	(0.032)	(0.021)	(0.029)	(0.032)
age^2	0.001***	0.001***	0.001***	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Separated	-0.184	-0.203	-0.126	-0.194	-0.203	-0.167
	(0.147)	(0.193)	(0.242)	(0.143)	(0.187)	(0.238)
No partner	-0.493***	-0.469***	-0.505***	-0.514***	-0.486***	-0.527***
	(0.110)	(0.146)	(0.182)	(0.110)	(0.144)	(0.182)
Non-White British	0.011	-0.066	0.186	-0.021	-0.111	0.169
	(0.142)	(0.194)	(0.221)	(0.142)	(0.192)	(0.220)
At least 1 child	0.091	0.118	0.038	0.117	0.162	0.034
	(0.099)	(0.138)	(0.152)	(0.098)	(0.136)	(0.152)
Vocational diploma	-0.049	0.179	-0.305	-0.057	0.188	-0.335
	(0.154)	(0.221)	(0.223)	(0.153)	(0.218)	(0.224)
CSE A level	0.055	0.190	-0.077	0.044	0.185	-0.087
	(0.149)	(0.209)	(0.223)	(0.148)	(0.205)	(0.224)
Graduate	-0.099	0.017	-0.247	-0.091	0.059	-0.276
	(0.163)	(0.231)	(0.242)	(0.162)	(0.227)	(0.243)
Not employed (at home)	-0.051	-0.074	0.016	-0.090	-0.128	0.002
	(0.099)	(0.131)	(0.165)	(0.098)	(0.129)	(0.166)
Extraversion	0.187***	0.155**	0.240***	0.192***	0.154**	0.252***
	(0.053)	(0.073)	(0.081)	(0.053)	(0.072)	(0.081)
Agreeableness	-0.028	-0.027	-0.034	-0.027	-0.018	-0.042
	(0.045)	(0.064)	(0.067)	(0.045)	(0.063)	(0.066)
Conscientiousness	0.078	0.110*	0.049	0.072	0.095	0.050
	(0.048)	(0.067)	(0.070)	(0.047)	(0.065)	(0.070)
Emotional stability	-0.020	-0.022	-0.010	-0.025	-0.032	-0.008
	(0.049)	(0.067)	(0.074)	(0.049)	(0.067)	(0.074)
Openness	0.019	0.114*	-0.106	0.024	0.113*	-0.100
	(0.046)	(0.063)	(0.069)	(0.045)	(0.061)	(0.069)
Predicted log hourly wage	0.499***	0.476***	0.513**	0.516***	0.484***	0.542***
	(0.111)	(0.139)	(0.198)	(0.111)	(0.138)	(0.198)
Distressed	-0.287***	-0.303***	-0.284***	-0.283***	-0.296***	-0.282***
	(0.020)	(0.027)	(0.032)	(0.020)	(0.027)	(0.032)
Local crime rates	0.003	-0.001	0.005	0.003	-0.002	0.005
	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)
						Continued on next page

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	Domestic Violence ever			Domestic Violence recently		
	All	**Women**	**Men**	**All**	**Women**	**Men**
Constant	6.499***	7.265***	5.944***	6.740***	7.591***	6.037***
	(0.505)	(0.694)	(0.770)	(0.503)	(0.686)	(0.773)
R^2	0.379	0.374	0.374	0.388	0.393	0.374
N	682	372	310	690	380	310

Significance levels : $*$ 10% $**$ 5% $***$ 1% Standard errors in parentheses

Omitted categories: being a man, married, other schooling, lower relative income, White British, working at least 8hrs/week, and no dependents. Standard errors of income multiplied by 10000.

Using either measure, domestic violence has a significantly pervasive impact on life satisfaction for women. The effect is not significant for men, which again suggests the nature of the violence suffered by men may be different and requires different behavioural responses. However, one must bear in mind that part of the effect of domestic violence is being captured by our index of distress, which is very large, a clear inhibitor of life satisfaction and significant. Gross Household income, measured as the average income in each income band according to the BHPS has a clear positive impact on individual life satisfaction, even if slightly higher in magnitude for men than for women. For every £10000 increase in household income, life satisfaction increases on average by around 0.8, which represents an 8% increase. The inclusion of covariates often missing from surveys, which can affect life satisfaction also through household income, may partly explain why these coefficients are higher than in other cross sectional studies which claim income does not buy happiness. As observed in so many previous studies, women are happier than men, the age-happiness profile is U-shaped, and education does not seem to have a significant impact on happiness. Not having a partner, either through widowhood, or through never having had one is a major factor decreasing life satisfaction, of similar magnitude to current feelings of vulnerability to domestic violence. But contrary to other studies, not being employed does not seem to decrease life satisfaction. Again, this may be because of the crude nature of the variable used. More extrovert individuals are happier and more conscientious and more open women are happier than other women. Potential wage is very significant and contributes to higher life satisfaction in all six equations. This coefficient estimate is of very similar magnitudes for both men and women and is of no negligible magnitude. A

doubling of the hourly wage rate leads to an average increase of 5% in life satisfaction.

Table 4 shows our estimates of the compensating variation of domestic violence according to Eq. 2.

$$CV = -\frac{\alpha_1}{\alpha_2} \tag{2}$$

Using experienced DV, costs of DV are estimated to be over £25000, and this value more than doubles when we use a measure of DV which reflects current exposure to violence in the home. These results are not far off from the results obtained in Atkinson et al. (2005) using revealed preference methods.

Table 4: Income compensation for different income levels

	Domestic Violence ever			Domestic Violence recently		
	All	Women	Men	All	Women	Men
Individual costs (£)	27170.26	28217.07	27155.95	60123.32	73665.39	40209.33

Note that the estimates for men are less reliable because the coefficient of domestic violence was not. significant.

6 Conclusion

This paper provides an estimate of the costs of domestic violence at the individual level. It uses a life satisfaction equation where compensating variation is a function of the coefficients of income and domestic violence. It draws on a survey that includes data on whether the respondent has ever been a victim of domestic violence, household gross income and a self-reported life satisfaction variable. The analysis is conditional on socio-demographic characteristics, potential wage, a distress index, personality and local crime rates. We use personality indicators, potential wage and local crime rates to account for the endogeneity of domestic violence and the self-selection of victims into abusive relations. To account for the endogeneity of household income, we also use the distress index, which should reflect the shocks to utility that lead individuals to revise their income generating decisions.

This paper shows that a satisfaction approach produces estimates which are in line with estimates produced using stated preference methods, as in Atkinson et al. (2005). However, when we use a measure of domestic violence which aims to represent current exposure to domestic violence, we obtain higher individual costs than other studies. In the end, our results suggest that domestic violence is a major inhibitor of individual and social welfare. It is worth emphasising the sensitivity of our estimates to the gender of the respondent, and the sensitivity of the self-reported satisfaction variable to numerous influences. Evidence suggests men and women use different sets of information to assess their satisfaction with life as a whole, and this is reflected in the fact that domestic violence did not significantly decrease men's life satisfaction. This approach is limited by the possibility of either violence or income not being a substantial part of each respondent's satisfaction. However, it overcomes fundamental limitations of other valuation methods, such as the need to have relevant markets in equilibrium and the incentive to reply strategically. In particular, given that most of the costs of domestic violence are held in private, and are likely to be emotional and human costs for which there are no relevant markets, this approach is, in our view, worth exploring further.

At the same time, there are still reasons to believe that the marginal disutility of violence is underestimated. Self-reported satisfaction will fail to capture the cost of public goods which are unperceived or not valued by the individual or the intergenerational effects of domestic violence, so this measure only captures the costs of domestic violence perceived and understood by the victims. This paper however invites an integrated cost-benefit analysis of domestic violence which takes satisfaction approaches to valuing non-market goods seriously, and shows how urgent this may be for a clearer assessment of the true impact of domestic violence and for a stronger effective support of families where domestic violence occurs.

Appendix A

The variables used in the paper are as follows.

The Measure of Life Satisfaction (Happiness)

[General Satisfaction] How satisfied or dissatisfied are you with your life as a whole? (1 completely satisfied up to 7 completely dissatisfied).

The Measures of Experienced Domestic Violence

The data set contains two main variables on experienced domestic violence.

Have you ever been a victim of domestic violence (yes=1/no=0) (Domestic Violence ever)

and

Please indicate how vulnerable you feel to domestic violence in the future - using a scale of 1 to 7 where 1 means "not at all vulnerable" and 7 means "very vulnerable"?

The latter variable was turned into a binary variable, taking the value 1 when vulnerability was 4 or higher.

Socio-economic and demographic variables

[Age]
   [Gender] (1 male 2 female)
   [Household Income] A continuous measure based on BHPS annual household income variable, calculated by replacing each income band value with the income of the BHPS variable, averaged over the values within the income band.
   [Ethnicity] (1 White British 2 Non-white British)
   [Marital Status] What is your marital status? (1 married or living as married 2 separated or divorced 3 widowed or never married)
   [Education Attained] What is the highest educational or work-related qualification you have? (too many options and regional differences these were later collapsed into 4 comparable categories 1 Other Schooling 2 Vocational Diploma 3 CSE A Level 4 University Degree)

[Employment Status] Which of these best applies to you? (1 working 8 or more hours per week 2 working less than 8 hours per week)

[Dependent Children] How many dependent children do you have that is children dependent on your income? (1 "none" 2 "at least one")

[Log Hourly wage] Potential wage estimated using comparable individuals from BHPS. Individuals were matched on the following observables: Age and Age squared, Gender, Year dummies (from 2000 to 2004), Ethnicity, Marital Status, Education Attained, Employment Status, Dependent Children, Religion, , Life Satisfaction, Regional dummies, Individual and Household income brackets.

[Postcode and Local Crime Rates] Can you tell us the first part of your postcode this can include up to four letters and numbers (e.g. SE23)? Crime rates were then retrieved based on postcode information. Local crime data were collected online from http://www.crimestatistics.org.uk/tool/. This variable measures the number of all reported crime offences per 1000 individuals in the first quarter of 2004. It is collected at the CDRP (Crime and Disorder Reduction Partnerships) level, throughout England and Wales only (we hence lost the 90 observations corresponding to the Scottish sample). It combines police records with the British Crime Survey self-reported questionnaire of individual experiences.

The Measure of Personality

The measure of personality used derives from answers to the ten questions below. Each personality dimension combines two polarised traits, so that the positive one enters positively and the negative one enters negatively towards the final score. The score for each of the five dimensions is then based on the difference between the two relevant traits (the former minus the latter) and can take a value in the range from -6 to 6.

[Extraversion] (-6 up 6)

(+) I see myself as extraverted, enthusiastic (1 agree strongly up to 7 disagree strongly)

(−) I see myself as reserved, quiet (1 agree strongly up to 7 disagree strongly)

[Agreeableness] (-6 up 6)

(+) I see myself as sympathetic, warm (1 agree strongly up to 7 disagree strongly)

(−) I see myself as critical, quarrelsome (1 agree strongly up to 7 disagree strongly)

[Conscientiousness] (-6 up 6)

(+) I see myself as dependable, self-disciplined (1 agree strongly up to 7 disagree strongly)

(−) I see myself as disorganised, careless (1 agree strongly up to 7 disagree strongly)

[Emotional Stability] (-6 up 6)

(+) I see myself as calm, emotionally stable (1 agree strongly up to 7 disagree strongly)

(−) I see myself as anxious, easily upset (1 agree strongly up to 7 disagree strongly)

[Openness] (-6 up 6)

(+) I see myself as open to new experience, complex (1 agree strongly up to 7 disagree strongly)

(−) I see myself as conventional, uncreative (1 agree strongly up to 7 disagree strongly)

The Measure of Distress

The distress index was based on the following questions.

Have you recently lost much sleep over worry? 1. Not at all 2. No more than usual 3. Rather more than usual 4. Much more than usual

Have you recently felt constantly under strain? 1. Not at all 2. No more than usual 3. Rather more than usual 4. Much more than usual

Have you recently been able to enjoy your normal day-to- day activities? 1. More so than usual 2. Same as usual 3. Less so than usual 4. Much less than usual

At work, have you recently felt that you were playing a useful part in things? 1. More so than usual 2. Same as usual 3. Less so than usual 4. Much less than usual

Outside of work, have you recently felt that you were playing a useful part in things? 1. More so than usual 2. Same as usual 3. Less so than usual 4. Much less than usual

Have you recently been enjoying your recreational activities? 1. More so than usual 2. Same as usual 3. Less so than usual 4. Much less than usual

Have you recently been thinking of yourself as a worthless person? 1. Not at all 2. No more than usual 3. Rather more than usual 4. Much more than usual

All variables were turned into binary variables, where the value 1 indicates distress (previous values 3 and 4). All of these values were then added up to create the index.

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