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DETERMINANTS OF HIGHER EDUCATION STUDENTS' WILLINGNESS TO PAY FOR VIOLENT CRIME REDUCTION: A CONTINGENT VALUATION STUDY

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Determinants of higher education students' willingness to pay for violent crime reduction: a contingent valuation study

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Abstract

By eliciting an individual's Willingness to Pay (WTP) for a reduction in crime risks, the contingent valuation method is one of the most solid methodologies in use to estimate the intangible costs of crime. However, very few studies have applied contingent valuation methods to random samples of the population located in high crime rate areas. This study is, to the best of our knowledge, the first attempt to apply the contingent valuation method to estimate how much a specific group of society, which is relatively prone to falling victim to (violent) crime, i.e., students, is willing to pay to reduce the likelihood of being the victim of violent crime. In contrast to the existing literature, our study focuses on a rather unexplored context, Portugal, where criminality and violent crime rates are relatively low by international standards, even though they have been on the rise.

Based on responses from 1122 higher education students in a broad range of degrees (from Economics to Psychology and the Humanities), we found that 33% of our respondents have been victims of crime in the past, although in general they did not result in physical or psychological injuries. A reasonable percentage of the students (almost 40%) is very worried about falling victim to a crime and 52.8% worries moderately. Over 40% of our respondents were willing to pay a certain amount but less than 50€, whereas 20.8% were willing to pay between 50€ and 250€. On average, all other determinants constant, younger and female students revealed that they were more inclined to pay so as to avoid violent crime than their older and male counterparts. Low and high income Portuguese students do not differ in their willingness to pay more to avoid being victims of violent crime. Cautious behaviour, such as locking doors at home, and a strong opinion about policies and payment vehicles with potential to reduce the risk of crime is positively associated with the WTP. Finally, the students' field of study surfaced as a key determinant of WTP – students enrolled in Economics and Management revealed a higher WTP. Such findings are likely to have a critical impact on crime and insurance policies.

Key words: Contingent Valuation Method; Intangible costs; Crime costs

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1. Introduction

Cost-benefit analysis is considered an important tool in analyzing the costs and benefits of criminal justice policies (Cohen, 2000). In a society with limited resources, restricting their allocation to different alternatives, estimating the costs of crime can help policymakers make more informed decisions (Cohen, 2000; Streff et al., 1992). According to Cohen (2000), costs can be classified generally as tangible or intangible costs. Tangible costs are associated with monetary payments such as medical costs, justice system costs, losses in property value and working days (Cohen, 2000). Intangible costs are not valued in the market (Cohen, 2000) and include the costs of pain, suffering, the loss of quality of life inflicted on crime victims (Atkinson et al., 2005), and the costs of fear of crime (Moore et al., 2006). It is more complicated to measure the intangible costs of crime (Dolan et al., 2005) but the costs of the emotional and physical impact of crime may be greater than the financial costs, particularly in the case of violent and sexual offenses (Brand and Price, 2000). In the case of drug abuse programs, Rajkumar and French (1997) argue that including the victims' intangible losses in crime costs may raise considerably the benefits of avoiding criminal activity.

The available literature distinguishes several methodologies to estimate the intangible costs of crime (Cohen, 2000; Rajkumar and French, 1997). One of these methods is the Contingent Valuation Method (Atkinson et al., 2005), based on surveys which ask respondents how much they would be willing to pay for a small reduction in a particular risk or how much they would be willing to accept as a compensation for a small increase in a particular type of risk (Carthy et al., 1999). The surveys present a hypothetical situation with which respondents are confronted, and scenarios can be tailored to the needs of the researcher. The Contingent Valuation (CV) approach elicits willingness to pay – a measure provided by the welfare theory (Mitchell and Carson, 1988) – and when applied to criminality, the researcher can determine the value individuals place on reductions in crime (Atkinson et al., 2005).

Although the Contingent Valuation approach has been widely used in other contexts[1], it has not been generally applied to criminal research (Cohen et al., 2004; Atkinson et al., 2005). Ludwig and Cook's (1999) study, presented in a NBER working paper, is among the few on this matter, and was the first one on eliciting willingness to pay in a crime context. They determined an individual's willingness to pay for a program aimed at reducing gun violence by 30%. Later, Cohen et al. (2004) used the contingent valuation method to estimate people's

[1] See for example Tyrvainen and Vaananen (1998) for an application to an environmental context, Alberini and Chiabi (2007) to a health setting or Gerking et al. (1988) for a study on workplace safety.

willingness to pay for crime control programs, and Atkinson et al. (2005) applied this stated preference approach to value the costs of violent crime. These studies used random samples (Ludwig and Cook, 1999; Cohen et al., 2004) or sampling points (Atkinson et al., 2005) drawn from the entire population of selected regions in two countries where the crime rate is relatively high, the US and the UK.

The research undertaken in this paper is, to the best of our knowledge, the first attempt to apply the contingent valuation method to estimate how much a specific group of society, which is relatively prone to falling victim of (violent) crime, i.e., students, is willing to pay to reduce the likelihood of being victims of a violent crime. In contrast to the existing literature, our study focuses on a rather unexplored context, Portugal, where criminality and violent crime rates are relatively low by international standards, although they have been on the rise.

University students are a relevant population sample as it is possible to assume that a higher level of education enables them to make more informed decisions when estimating the trade-off between costs and safety. Students are also considered at higher risk of falling victim to violent crime (Walker et al., 2009). According to Walker et al., (2009) in the Home Office Statistical Bulletin: Crime in England and Wales 2008/2009, full-time students, single and mixed ethnicity individuals are at higher risk of being victims of violent crime. Risk is also higher for men aged 16 to 24.

This is also, to the best of our knowledge, the first Contingent Valuation study conducted in a relatively low crime rate context, thus adding an empirical contribution to the few studies in the field.[2] As mentioned earlier, the available literature focuses on the US (Ludwig and Cook, 1999; Cohen et al., 2004) or the UK (Atkinson et al., 2005), where the violent crime rate is substantially higher than in Portugal. According to a study by a European Consortium funded by the 6th Framework Programme (2007: 2), the "[r]isks of being assaulted were found to be highest in the UK, Ireland, The Netherlands, Belgium, Sweden and Denmark. Risks were lowest in Italy, Portugal, Hungary, Spain and France. Experiences with sexual violence were reported most often by women in Ireland, Sweden, Germany and Austria and least often in Hungary, Spain, France and Portugal."

[2]"In 2004 levels of crime were most elevated in Ireland, the United Kingdom, Estonia, The Netherlands and Denmark and lowest in Spain, Hungary, Portugal and Finland", The Burden of Crime in the EU, Research Report: a comparative analysis of the European Crime and Safety Survey (EU ICS) 2005.

The FBI Uniform Crime Report (UCR)[3] reported that there were 466.9 and 473.5 violent crimes in the US per 100,000 habitants in 2007 and in 2006, respectively.[4] Our calculations based on absolute values of violent crime (including homicide) and population reported in EUROSTAT, show that the UK has a higher rate of violent crime than the US, whereas Portugal has one of the lowest rates in Europe. The weight of violent crime in total crime recorded is also lower in Portugal. According to the "Relatório Annual de Segurança Interna – Ano de 2008", the weight of violent crime in Portugal in total crime was 5.8%, representing an increase of 10.8% compared to 2007. Despite the rise, this figure is significantly lower than the one for the UK, which is over 20%.

Countries where criminal rates are high (US and UK) have been used to estimate how much people are willing to pay to reduce the risk of assault. It is important therefore to analyze whether such results are consistent with the ones found for a country where both the crime rates and the proportion of violent crime are lower.

Our respondent sample includes 1122 students from the largest Portuguese University (University of Porto), covering individuals from a broad range of (32) degrees and (14) faculties/schools, which allowed us to evaluate the extent to which students enrolled in different courses (e.g., economics vs. engineering vs. arts or medicine), a proxy for an individual's distinct inclinations or psychological traits (Roeser, 2006), reveal differing levels of willingness to pay for a reduction in violent crime. We devised an econometric model aimed at empirically assessing which are the most important determinants of students' willingness to pay for violent crime reduction.

This study is structured as follows. Section 2 presents a review of the available literature on the methods of valuation of the costs of crime that include the valuation of intangible costs. The following section focuses on the methodology used to design the questionnaire. Section 4 elaborates on the model specification and variables that are used for the estimation and provides an outline of the main results of the survey. A comparison of these results with the available literature is also addressed in this section. Finally, in Conclusions, the key findings of this study are summarized, their implications for criminal policy are discussed, and limitations and paths for future research are put forward.

[3] http://www.fbi.gov/ucr/cius2006/offenses/violent_crime/index.html - accessed 19-08-2009.
[4] The FBI considers that violent crime includes 4 offenses: murder and non-negligent manslaughter, forcible rape, robbery and aggravated assault.

2. Valuation of intangible costs of crime and determinants of the willingness to pay: a literature review

In spite of the need to monetize the costs of crime, this is not a consensual approach (Czabanski, 2008). Indeed, it is often defended that life is priceless (Jongejan et al., 2005; Viscusi, 2008) and putting a value on people's suffering is taken as "cold" and "impersonal" (Miller et al., 1996: 1). Measuring correctly the emotional and psychological impacts of violent crime is also considered "impossible" and "artificial" (Brand and Price, 2000).

However, it should be noted that the results presented in the literature do not intend to value the pain and suffering of a particular individual, in the sense that putting a value on the suffering of a crime victim would be considered by most inadmissible. Rather, the studies are an attempt to measure ex-ante the value society places on preventing that suffering (Brand and Price, 2000). It is also worth mentioning that what is being analyzed is not the value of a single crime but the value of crime reduction (Czabanski, 2008). It is the monetary valuation of crime costs that allows policy appraisal and evaluation (Brand and Price, 2000).

In order to make choices, it is necessary to use a common metrics approach to compare costs and benefits. However, certain goods and services are not marketable (e.g., pain and suffering or biodiversity in the environmental context) making economic valuation techniques necessary so as to assign them monetary values (Bateman et al., 2002). Generally, two approaches are used to monetize these goods: the revealed preference approach and the stated preference approach. In the revealed preference approach, economic agents' preferences are inferred by economists by observing their behaviour when making decisions where risk is an important factor: when individuals accept riskier jobs in exchange for higher wages (Viscusi, 1993) or decide the location of the house where they are going to live (Viscusi, 2000). The hedonic price methodology (Thaler, 1978; Cohen, 2000; Tita et al., 2006) and averting behaviour analysis are examples of techniques used as a revealed preference approach.

In the stated preference approach, individuals are directly faced with a hypothetical situation and asked directly to indicate their preferences. A methodology used in stated preference approach is the Contingent Valuation method (CV). The CV method was first applied by Davis (1961) in the context of environmental policy (Marta-Pedroso et al., 2007). It is used to study trade-offs between money and small reductions in risk using surveys to elicit how much individuals would be willing to pay for an improved state of a provision of a public good or how much they would be willing to accept to be compensated for its reduction (Pearce and

Turner, 1990).[5] For instance, Alberni et al. (2007) surveyed the willingness to pay to reduce the risk of dying of cardiovascular and respiratory causes, whereas Persson et al. (2001) surveyed WTP to reduce the risk of dying in a road accident.

The CV method has substantial advantages compared to the techniques of the revealed preference approach (Mitchell and Carson, 1988). One important advantage is the fact that it allows for the direct elicitation of the welfare measure of WTP. Another noticeable advantage refers to the use of hypothetical scenarios that allow researchers to analyze respondents' WTP for goods that may not have been provided yet. These tailored scenarios also enable the study of the transaction of the good in specific contingencies defined by the researcher (Mitchell and Carson, 1988). Respondents may thereafter be informed of the baseline risks and the risk reductions they are requested to value (Alberini and Chiabi, 2007), as well as the payment method or any other information the researcher finds valuable to construct the scenario.

In 1993, a panel of distinguished social scientists chaired by two Nobel Laureates (Kenneth Arrow and Robert Solow) was appointed by the National Oceanic and Atmospheric Administration (NOAA) to assess if the CV method could provide reliable information. This panel concluded that this technique could produce useful information and suggested a number of guidelines to ensure the reliability of CV surveys (Carson, 2000; Arrow et al., 1993; Marta-Pedroso et al., 2007). CV has since then been used as a popular method to evaluate welfare changes in public policies or programs (Atkinson et al., 2005).

The CV method is not without limitations.[6] One of the criticisms associated with this method is that, because the scenario is hypothetical, individuals do not take into consideration their budget constraints resulting in overestimates of the true WTP (Arrow et al., 1993). Some studies have attempted to overcome this disadvantage by reminding respondents of their budget constraint (Alberini and Chiabi, 2007). However, this is not a consensual matter as empirical studies have concluded that the budget constraint bias is not relevant and reminding individuals about their available income might even lead to errors (Ahlheim, 1998). It is also argued that the hypothetical nature of the transaction leads to possible *hypothetical bias* – differences between the amount people claim to be willing to pay in a constructed scenario and the amounts people actually pay for the good. Efforts have been made by researchers to

[5] The WTA approach has not been commonly used in criminal literature except for the case of jury awards, which incorporates this concept as people are compensated in an ex-post situation. For policy analysis it is considered more appropriate to elicit respondents about crime reductions and not infer the amount people would ask for a crime rate increase (Cohen, 2007).

[6] For a more comprehensive debate on the controversies of the CV method, particularly applied to environmental economics, see Carson et al. (2001) and Arrow et al. (1993).

deal with this problem, e.g., Learning Design proposed by Bjornstad et al. (1997) or cheap talk (Cummings and Taylor, 1999).

The validity of the method has also been tested on the sensitivity of scope (Pouta, 2005). This refers to the fact that economic theory predicts that if individuals are willing to pay a certain amount for a good they desire, then they should be willing to pay more if the quantity of the good offered is increased (as long as the individual does not reach the point of satiation). Empirical evidence has shown, in some cases, insensitivity and, in others, sensitivity to scope (Pouta et al., 2005). Carson et al. (2001) consider that the main explanation for CV estimates not to vary systematically with the different characteristics of the good is the poor design and administration of the survey. They argue that the CV studies that demonstrate insensitivity to scope were not designed according to the guidelines of the state of the art surveys. Related to this problem are the possible difficulties respondents might have in understanding very small risks changes. Corso et al. (2000) try to overcome this limitation, once again, by changing the design of the survey adding visual aids. Furthermore, WTP estimates vary depending on the elicitation formats used in the surveys. However Carson et al. (2001) defend that these differences are not as significant as theoretical models predict.

Notwithstanding its limitations, the CV method has been considered by government agencies an acceptable procedure in the context of environmental economics (Mitchell and Carson, 1988). Many of the problems encountered with CV studies "can be resolved by careful study design and implementation" (Carson et al., 2001:173) and the NOAA panel (Arrow et al., 1993) endorsed this method considering it capable of providing reliable estimates.

Ludwig and Cook (1999) presented a first study with the goal of estimating the benefits of reducing crime using the Contingent Valuation Method. In the survey, respondents were asked if they were willing to vote for a program aimed at reducing gun injuries by 30% that requested the payment of a certain amount of money, through an increase in annual taxes. The authors assumed that the respondent's Willingness to Pay (WTP) does not value the risk reduction for the individual but for his/her entire household. On the impact of income on WTP, the results of the survey suggest that there is a positive relationship between these two variables. The amount of WTP is also positively influenced by the number of children that constitute the household. The authors' estimates imply that the value of a gunshot injury is USD 750000 (1998 USD) and societal WTP to reduce gun violence is approximately USD 23.8 thousand million dollars (1998 USD). As a limitation of this survey, the authors

acknowledged that the baseline risks of being a victim of a gunshot injury is not mentioned nor is it part of the population which will benefit from the gun reducing program.

Cohen et al. (2004) used the Contingent Valuation Method to determine people's WTP for programs designed for crime control and provided new estimates of the cost of crime. The authors developed a survey, administered by telephone, in which 2228 respondents were asked if they were willing to vote for a proposal that demanded the payment of a certain amount of money to avoid one in ten crimes in their community. Each of the 1300 respondents that actually completed the interview was then asked if he/she was willing to pay a certain amount of money to continue a successful program in crime control for three types of crime randomly chosen out of five possible ones: burglary, serious assault, armed robbery, rape or sexual assault and murder. In this study, respondents were not given any information regarding crime rates, risk of victimization, average losses or severity of injuries usually related to each type of crime. These details were omitted intentionally so that respondents could answer based on their own perception of these crimes. The authors found that respondents were willing to pay different amounts to avoid each type of crime (Table 1).

Table 1: Individuals' willingness to pay to avoid each type of crime (US, 2000)

Type of Crime	Nº of crimes associated with a 10% crime reduction	WTP for a 10% reduction (USD)	Implicit value of a statistical crime (USD)
Burglary	426 113	104	25 000
Armed Robbery	48 681	110	232 000
Serious Assault	177 836	121	70 000
Rape and Sexual Assault	54 747	126	237 000
Murder	1 553	146	9 700 000

Source: Adapted from Cohen et al. (2004)

A representative household would be willing to pay an average of between USD 104 (for burglary) and USD 146 (for murder) per year for crime reduction programs that diminished specific crimes by 10%. Using an estimate of the number of crimes avoided with a 10% reduction in crime rates and considering the existence of 103 million households in the United States of America, the authors were able to estimate the cost per type of crime (cf. Table 1). Based on a WTP of USD 146 in the case of murder, globally the American people would be willing to spend around 15 billion USD in the program (USD 146 x 103 million). Dividing this amount by the number of murders averted with a reduction of 10% in its number, it is possible to estimate an implicit value of a statistical crime at USD 9 700 000 in the case of murder (Cohen et al., 2004).

Through the analysis of the data the authors were also able to conclude that WTP varies with the income level of the respondents. Low-income respondents are usually willing to pay less to reduce crime victimization than higher-income respondents, even though they have higher victimization rates. It is thus suggested that the ability to pay plays a role in explaining the amount of WTP. Cohen et al. (2004) further argue that WTP is negatively related to age. The amounts of WTP that result from this study using the Contingent Valuation Method are higher than figures estimated using other methods. A possible explanation suggested by the authors refers to the fact that respondents might overestimate the risks and the injuries sustained from violent crime, thus eliciting higher values of WTP. However, it is also possible that these figures are higher because they reflect aspects like the fear of crime and the willingness to live in safer communities making them a relevant contribution to evaluating the cost of crime.

Table 2: Injury Descriptions

	Common Assault	**Other wounding**	**Serious wounding**
Physical injury	No injury profile	Moderate injury profile	Serious injury profile
	None	Cuts and grazes	Concussion
		Extensive bruising to body and face	Cuts (needing stitches)
		No medical attention required	Two broken ribs
		Bruising to body	Immediate medical attention required and two nights in hospital
		Minor physical discomfort for 3 weeks followed by complete recovery	Pain and discomfort for a month followed by complete recovery
Psychological distress	Short-term	Medium-term	Long-term
	Distress profile	Distress profile	Distress profile
	Repeated recollections of assault	Repeated recollections of assault	Repeated recollections of assault
	Feel shaken after a few hours after assault	Difficulty falling asleep or staying asleep (1 or 2 nights each week)	Difficulty falling asleep or staying asleep (1 or 2 nights a week)
	Symptoms last for 1-2 days	Difficulty concentrating on daily tasks	Difficulty concentrating on daily tasks
		Symptoms last for 2 weeks	Feelings of nervousness
			Symptoms last for 6 months

Source: Atkinson et al. (2005)

Atkinson et al. (2005) developed a survey using the CV method in the UK aimed at valuing the benefits of reducing violent crime, especially its intangible impacts. Their study focused on three different categories of offense: “common assault”, “serious wounding” and “other wounding” and included a very detailed description of the probable health effects (physical and psychological) that a victim of each of these offenses might sustain. This comprehensive

description of symptoms was given to respondents as they might have not been completely aware of the consequences of falling victim to a violent crime. Table 2 includes the description of the injury profiles used by the authors. In the scenario used for the elicitation, the respondents were also informed of the probability of being a victim of each type of offense previous to the risk control policy: 1% for other wounding and serious wounding and 4% for common assault.

Corso et al. (2001) argued that one of the limitations of the CV method is the lack of accurate communication of the magnitude of the risk to the respondents taking the survey. If the respondents do not understand the proportion of the risk being reduced they will not evaluate their preferences correctly. They thus suggested the use of visual aids, like tables, pie charts or "risk ladders" as a possible method to overcome this difficulty. Following Corso et al. (2001), Atkinson et al. (2005) opted to inform respondents of the risk change by using visual aids through the inclusion of two grids with shaded and non-shaded squares describing the likelihood of being a victim of the offense before and after the implementation of the risk reduction policy. In the survey, respondents were asked to elicit their WTP to reduce in 50% the probability of becoming victims of one of the three types of assault over the following year. The payment vehicle would be an increase in local taxes for law enforcement (Atkinson et al., 2005). From a sample of 807 interviews, only 523 were used for the estimates - the authors excluded 279 responses classified as "protests" (respondents who were not willing to pay any amount at all to reduce the risk of being crime victims) and 5 responses considered extreme outlying values (responses in which the WTP is more that 10% of the respondent's income and the WTP is higher than £2500). Even though the proportion of protests was 30%, the authors determined that the sample had not been biased as the differences in the demographic characteristics of the protesters and the respondents that did not protest were not statistically significant.

The study of Atkinson et al. (2005) also included variables reflecting the fear of crime, perception of neighbourhood safety, effectiveness of police in reducing crime rates and the respondent's behaviour in avoiding crime. The analysis of the survey's data led to the conclusion that willingness to pay (WTP) is very different across respondents and is higher for the crimes that cause the most serious consequences in the respondent's physical and psychological health. This means that WTP varies positively with the severity of the injuries caused by each type of offense. Aiming to examine the factors that determine the variations of

WTP across respondents, the data was modelled parametrically. Table 3 summarizes the determinants that influenced individuals' WTP and their statistical significance.

Table 3: Determinants of WTP and their statistical significance

Variable	Influence on WTP	Statistically significant (level of significance)
Other wounding	+	5%
Serious wounding	+	10%
Sex		Not significant
Age		Not significant
Low education	-	5%
Income (log)	+	5%
Victim five years		Not significant
Fear of crime	+	10%
Neighbourhood safety		Not significant
Policing	+	10%
Lock door at home	-	5%

Source: Own formulation using information from Table 8 in Atkinson et al. (2005)

One of the most important results is that the severity of the offense influences WTP positively, every other factor remaining constant. Moreover, higher levels of income, education and the lack of crime-averting behaviour also have a positive impact on WTP, ceteris paribus. One characteristic of the respondents that was controlled for referred to their having been victims of a crime in the past. Data analysis suggested that although this had a positive impact on the WTP, it did not have a significant influence on the amounts elicited. This could be explained by the small proportion of respondents in the sample that had already been victims of a crime. Table 8 summarizes the values of WTP and the implied cost of statistical crime per type of offence that resulted from the use of parametric estimates.[7] Based on the WTP amounts, Atkinson et al. (2005) were able to estimate the cost of a statistical crime (cf. Table 4).

Table 4: Summary statistics of WTP and cost of statistical crime

	Willingness to Pay (in £)[8]		Cost of statistical crime (in £)	
	Mean	Median	Mean	Median
Common assault	105.63	18.00	5 282	913
Other wounding	154.54	27.00	30 908	5 342
Serious wounding	178.33	31.00	35 844	6 196

Source: In Atkinson et al. (2005), Tables 6 and 8 combined and shortened

[7] Parametric estimates were used in the table as Atkinson et al. (2005: 578) considered these a "better approximation of true WTP" than non-parametric estimates.

[8] The mean and the median results are quite different as the results show that the mean estimates are skewed and driven by a small number of respondents willing to pay a high amount. Another possible explanation is the difficulty people have in measuring crime impacts.

According to Atkinson et al. (2005) the cost of a statistical crime, in the case of common assault, is £5,282. To reach this figure, the authors used the mean of the WTP, £105.63, assuming that the marginal rate of substitution for a 2% reduction is £52.82.

In line with Atkinson et al.'s (2005) study, the research presented here employed the contingent valuation method (CV) to estimate the willingness to pay (WTP) to reduce violent crime in the case of Portuguese university students enrolled in a wide range of courses and schools. Our contribution to the literature is twofold: firstly, to assess whether different areas of knowledge in which higher education students are enrolled, proxied for their distinct psychological traits, are a determinant factor of the corresponding willingness to pay to reduce the risk of being victims of violent crime. Secondly, to provide some insight as to the consistency of the estimates in previous studies, conducted in countries (US and UK) with relatively high crime rates, in comparison to a context (Portugal) characterized by relatively low crime rates.

3. Willingness to pay for violent crime reduction: methodological considerations

The CV method is used to directly elicit the WTP of higher education students to reduce the risks of being victims of violent crime, following Atkinson et al. (2005) in applying this methodology to the criminal context. As this approach involves the direct elicitation of values using a questionnaire, the design of the survey and its wording are of utmost importance (Mitchell and Carson, 1988).

Our survey started with socio-economic questions that make it possible to characterize students according to age, gender and family income. The monthly family income categories mentioned in the survey were calculated using the minimum wage as the range amount. A question was also included where respondents were asked to state the field of study so as to confirm how WTP varies across respondents with different characteristics. Respondents also had to answer questions related to their personal experience with crime. Following Atkinson et al. (2005), respondents were asked if they had ever been victims of a crime (violent or otherwise), the period in which the crime had occurred and the seriousness of the physical and psychological consequences of the crime. Having been a victim of crime could be a relevant variable, as the WTP to avoid being victim of violent crime is possibly higher for individuals who had previously suffered assault when compared to that of non-victims. It could also be assumed that victims who had suffered more serious injuries would be willing to pay more than individuals who suffered minor or no injuries as a consequence of a crime (Atkinson et

al., 2005). Respondents were requested to assess separately the physical and psychological seriousness of the injuries. The level of seriousness was classified in 5 categories ranging from "no damages" to "very serious damages". Following Atkinson et al., (2005), we included questions to infer the individual's perception of safety, i.e., fear of crime and averting behaviour (whether individuals lock the door at home). Respondents were then elicited to calculate their WTP to reduce the risk of being victims of violent crime:

> Considering the existence of 2,28 violent crimes per 1000 habitants, how much would you be willing to pay to reduce in 10% the probability of being the victim of a violent crime in the next 12 months (regardless of the payment vehicle)?

Information on the baseline risk and the amount of risk reduction was provided to respondents. Available literature regards the inclusion of the baseline risk and the level of risk reduction as crucial because individuals need a reference point and different levels of risk reductions imply different amounts of WTP (Norinder et al., 2001). The figure of 2.28 violent crimes per 1000 habitants is an approximation of the actual risks of falling victim to a violent crime in Portugal.[9] Information on the timing of the risk change was also supplied because it can be of significant importance. Given individual time preferences, goods provided today have a different value than goods provided in the future (Bateman et al., 2002). In our survey, it was considered that the risk reduction would take place in the following 12 months. Following Atkinson et al. (2005), we also chose the payment card as the elicitation format providing respondents with a range of values from which to choose the amount they would be willing to pay to reduce the risks of assault. However other techniques may be used in a CV survey to elicit the amount individuals are willing to pay. Table 5 presents the main elicitation techniques, their advantages and disadvantages. Different variants of these main techniques have also been proposed (Bateman et al., 2002).

The open-ended format has been increasingly abandoned by researchers (Bateman et al. 2002). In contrast, the closed-ended format (or referendum) has been endorsed by the NOAA panel, considering it the choice technique of elicitation (Arrow et al., 1993). Other elicitation techniques are possible, for instance, the bidding game and the payment card. Considering the limitations and the advantages of each technique, Bateman et al. (2002) suggested the use of closed-ended formats or payment cards. Following Atkinson et al. (2005), we used the payment card method to find WTP for risk reduction.

[9] Own calculation using data from Eurostat.

Table 5: Advantages and disadvantages of CV elicitation techniques

Elicitation technique	Description	Advantages	Disadvantages
Open-ended	Individuals are asked their maximum WTP without being given any suggestion as to a value	- No anchoring bias – as no value is given to the respondent he/she is not "anchored" to any amount - Very informative as to what the maximum amount is	- Leads to many non-responses, zero answers or unreliable amounts – it is difficult for respondents to find an amount without any guidance particularly when they are not familiar with the good in question - Individuals are used to thinking in terms of prices of goods and not in maximum amounts
Bidding game	Higher amounts of WTP are consecutively suggested to individuals (like in an auction) until the maximum WTP is found.	- Helps respondents think about their preferences through this process	- Anchoring bias: responses are affected by the starting values presented and the bids used. - Yea-saying: respondents are led to accept paying the amounts included in the bid to avoid the social embarrassment of saying no.
Payment card	Presents respondents with a range of values on a card from which to choose the maximum WTP. It may also indicate the expenditures of a representative household to help respondents with their answer.	- Avoids anchoring bias - Avoids yea-saying - Avoids starting bias	- Range Bias - Vulnerable to the ranges of amounts used
Closed-ended format	Single bounded dichotomous choice – the respondent is asked if he/she is willing to pay a specified amount of money (the amounts usually vary across respondents)	- Easier for respondents to answer as they are already given a specific amount - Lowers the non-response rates - Avoids outliers	- The amounts of WTP are higher than the ones found with other elicitation formats - Nay-saying (protesting) - Less information provided by the respondent
	Double bounded dichotomous choice – after the first question respondents are given a follow-up question where they are asked if they would be willing to pay another amount. This second price is higher if respondents answered "yes" to the first question, and lower if the answer to the first question was "no"	- More information available from the respondent	- Inconsistent responses - Anchoring bias - Yea-saying

Source: own formulation from information taken from Hanley and Spash (1993), Bateman et al. (2002), and Whynes et al. (2004).

It should be noted that, following Cohen et al. (2004), our survey did not include a complete description of the scenario – it did not include the institution responsible for the risk change, the means used to achieve that alteration nor the method of payment (payment vehicle). The decision to omit information on the payment vehicle or the policy used to reduce the risk of victimization is explained by the fact that this study intended to estimate higher education students' willingness to pay to reduce the probability of being victims of a violent crime and not to evaluate a specific crime control policy. However we must bear in mind that the payment vehicle is considered a relevant item of the CV method affecting the answers respondents offer (Morrison et al., 2000).

Even though it was not our goal to evaluate a specific payment vehicle or instrument used to reduce victimization risks, we decided to add a question specifying a payment vehicle (increase in taxes) and a description of a policy instrument (increase in policing) to understand if these elements affect WTP. Considering we were interested in testing if there was a change in WTP, respondents were only asked to state if they would be willing to pay more, less or the same amount compared to the situation where no payment vehicle or instrument was provided.

The method used to apply the survey is also key in preventing errors (Mitchell and Carson, 1988). Surveys may be administered through a variety of instruments. The main survey modes are mail surveys, telephone interviews and face-to-face interviews (Bateman et al., 2002). However, variations of these instruments have been used by combining different modes in an attempt to benefit from the advantages and overcome the difficulties of each instrument when used separately – e.g., combined mail-telephone surveys (Bateman et al., 2002).[10] Table 6 summarizes the main advantages and disadvantages of three basic instruments and includes one more that has emerged with the use of the internet: web-based stated preferences surveys (Marta-Pedroso et al., 2007).

The survey used in our study was disseminated by e-mail with a link to the web-based survey. The primary reason for the choice of this method was the fact that the respondents, as students at the University of Porto (UP), have free access to the internet on campus and are provided with an e-mail account upon enrolment.[11] The technology is thus available without costs to all respondents.

Secondly, the fact that these respondents are higher education students means an absence of problems associated with illiteracy. This was also the reason why no attempt was made to use visual aids as we assumed that high education students have a level of reasoning that allows them to understand the scenario and the risk reduction involved. Moreover, in web-based surveys like Google Docs Form, the data is automatically collected on a spreadsheet that can be downloaded to an Excel spreadsheet. Errors in data collection and transcription are thus avoided.

[10] Other mixed methods have been proposed, such as computer-assisted interviews (Bateman et al., 2002)
[11] The Faculty of Architecture is an exception as students do not have an institutional e-mail account.

The development of the questionnaire involved a pre-test as recommended by the NOAA panel (Arrow et al., 1993). The questionnaire was administered to students enrolled in the Masters in Innovation and Entrepreneurship (MIETE) at the UP's Engineering School. They come from different fields of study and the administration of this survey in the same format as the final survey allowed us to determine if the group understood the questions and to diagnose possible problems with the survey. This group did not report any difficulties in answering the questionnaire.

On the 20th March 2009 an e-mail was sent to students at three UP Faculties (Faculty of Economics, Faculty of Engineering and Faculty of Food Sciences and Nutrition), inviting them to answer the survey. Another e-mail was sent, this time addressed to the contacts listed on UP's website[12] as each Faculty's Communication, Image and Public Relations Office, as well as the university's business school. These contacts were asked to forward the e-mail with the survey link to all students, which also informed respondents of the goal of the questionnaire and the scope of the study. The limited time necessary to answer the questionnaire (approximately 3 minutes) was also mentioned in an attempt to increase the response rates. Other information was included, namely the restricted use of the data. To increase the response rate of some of the Faculties from which no responses were obtained, telephone contacts were established with their Communication, Image and Public Relations Offices to understand the reason behind the lack of responses. We learnt that in some schools students are not used to responding to questionnaires (e.g., Faculty of Medicine where the response rate was 0%) and in other schools, such as the Faculty of Dental Medicine, students are not willing to participate as they are tired of receiving online questionnaires. One last attempt to boost response rates was made in May 2009 by sending an e-mail to the Presidents of all the Faculty Boards requesting the dissemination of the questionnaire.

We considered the questionnaire response phase closed on the 7th July 2009 with a total of 1122 responses. Considering that the total number of students of the University is 29,896,[13] the response rate was approximately 4%.

[12] http://sigarra.up.pt/up/web_base.gera_pagina?P_pagina=122243 – accessed March 2009.
[13] http://sigarra.up.pt/up/web_base.gera_pagina?p_pagina=122350 – accessed September 2009.

Table 6: Advantages and disadvantages of CV survey modes

Survey Mode	Description	Advantages	Disadvantages
Mail Survey	The questionnaires are sent by mail to the respondents, who complete them and send them back to the researchers	- Low cost - Permits the use of visual aids - Respondents can answer the survey in their own time - Easy to answer sensitive questions	- Low response rates - Require the respondents to read and understand the scenario – the level of literacy of the respondent may be a problem - Prevents the use of questionnaires where respondents should answer questions in a fixed sequence because they can read the whole questionnaire before starting to fill it in - Possible self-selection *bias* - the people who answer the questionnaires are more likely the ones that are more interested in the topic. This might lead to unrepresentative samples. - No control over who fills in the questionnaire (head of the household or another individual?)
Face-to-face interviews	The interviewer conducts an interview face-to-face with the respondent	- High response rates - Permits the use of visual aids - Allows the interviewer to explain complex scenarios and assist the respondent if he doesn't understand the questions - Allows the use of questionnaires where the information must unfold sequentially for the respondent.	- High costs - Time consuming - Possible interviewer bias – the interviewer may affect the respondent's answer
Telephone interviews	The interviewer telephones a sample of individuals and interviews them.	- Less expensive than face-to-face interviews - Intermediate level of response rate - Allow the interviewer to explain complex scenarios and assist the respondent if he doesn't understand the questions - Allow the use of questionnaires where the information must unfold sequentially for the respondent	- Do not allow the use of visual aids - Do not allow lengthy questionnaires - respondents may not be willing to answer a questionnaire for more than just a few minutes - Respondents who do not have a telephone will not be represented in the sample
Web-based surveys	Surveys hosted on a web page Surveys accessed following an e-mail message link or a link hosted on another website	-Respondents can answer the survey in their own time -Easy to answer sensitive questions -Low costs -Possibility of designing an interactive survey (the respondent only has access to the next question if he has submitted the previous one - controls for question sequencing) - Answers may be downloaded directly into a database (e.g., Excel spreadsheet)	- Sample representativeness - There is no control over who fills in the questionnaire – The same person can fill it in several times and people who are not supposed to answer may have access - Sample selectivity - Difficult to use visual aids - Require the respondents to read and understand the scenario – level of literacy of the respondent may be a problem - Possible self-selection *bias*

Source: Own formulation from information available in Bateman et al. (2002), Mitchell and Carson (1988) and Marta-Pedroso et al. (2007)

4. Determinants of the WTP for violent crime reduction: results for Portuguese Higher Education students

4.1. Descriptive analysis

A descriptive analysis of our data indicates (cf. Table A1) that most of our respondents were aged 20 to 22 and were female (52.9%). As 52%[14] of UP's students are female, gender overrepresentation did not occur in our sample. The majority of our respondents indicated the highest level of family income mentioned in the questionnaire (over 2250€/month) and was integrated in a family of four members. They were mostly undergraduate students (50.3%), with no family dependents (92.9%), studying Engineering (35.8%), Economics and Management (22.5%), and Health Sciences (17.3%).

The Faculty of Engineering and the Faculty of Economics had the highest number of respondents followed by the Faculty of Arts and the Faculty of Nutrition and Food Science. Our respondent sample is overrepresented (compare columns 3 and 5 of Table 7) in the following courses: Engineering, Economics, and Nutrition. It under-represents Architecture, Sports, Medicine, and Dental Medicine, courses from which we failed to obtain valid answers.

With regard to the crime-related responses, 33% of our respondents had been crime victims in the past and most of these crimes occurred over a year ago. The crimes did not generally result in physical or psychological injuries. The majority of our respondents worry moderately about being victims of a crime (52.8%) and 37.6% worry considerably. This result is consistent with the fact that almost 84% of our respondents usually lock the door when they leave home. When asked how much they were willing to pay to reduce the probability of being victims of a violent crime by 10%, 42.1% of our respondents were willing to pay a certain amount but less than 50€, and 20.8% were willing to pay between 50€ and 250€. It is also worth mentioning that 25.5% of respondents were not willing to pay any money at all. We can speculate several reasons to have obtained such a high number of protesters: respondents may object to the scenario considering it unrealistic or they could have considered that a reduction in 10% in the violent crime rate is negligible when it is so low in Portugal. The high percentage of protesters is a problem that has been previously reported in the literature - Atkinson et al. (2005) encountered more than 30% of protesters in their study and future research should focus more on explaining this phenomena.

[14] http://sigarra.up.pt/up/web_base.gera_pagina?p_pagina=122350 (accessed on 06. 09.2009)

Table 7: Percentage of responses per total number of Faculty students at the University of Porto (UP)

Faculty	Nº of students enrolled at the UP [1]	% students enrolled at the UP by faculty [1]/29896	Nº of responses by faculty [2]	% of responses by faculty [2]/1122	Response rate per faculty [2]/[1]
Faculty of Architecture	1000	3.3%	0	0.0%	0.0%
Faculty of Fine Arts	800	2.7%	14	1.2%	1.8%
Faculty of Sciences	3648	12.2%	18	1.6%	0.5%
Faculty of Nutrition and Food Science	449	1.5%	90	8.0%	20.0%
Faculty of Sport	1494	5.0%	0	0.0%	0.0%
Faculty of Law	998	3.3%	8	0.7%	0.8%
Faculty of Economics	2859	9.6%	259	23.1%	9.1%
Faculty of Engineering	6922	23.2%	431	38.4%	6.2%
Faculty of Pharmacy	1306	4.4%	63	5.6%	4.8%
Faculty of Medicine	2357	7.9%	0	0.0%	0.0%
Faculty of Dental Medicine	506	1.7%	0	0.0%	0.0%
Faculty of Psychology and Education Science	1579	5.3%	74	6.6%	4.7%
Institute of Biomedical Sciences Abel Salazar	2257	7.6%	42	3.7%	2.1%
Faculty of Arts	3721	12.5%	118	10.5%	3.2%
Total	**29896**	**100%**	**1122**	**100.0%**	**3.8%**

Source: Own formulation using data from the report "Ensino_Estudantes Inscritos na U. Porto 2008" (31st December 2008)

Using the Kruskall-Wallis[15] test to assess if there is evidence of statistically significant differences in the mean of WTP between the different categories of the relevant variables (cf. Table 8), we concluded that there are statistically significant differences in mean WTP for the categories in all variables except for 'students' degree', 'having been victim of a crime in the past', 'the date of the previous crime', and 'the injuries caused by that crime'. This means, for instance, that although at first glance the data suggest that different categories of students' degrees imply different amounts of willingness to pay, on average, this difference is not statistically significant. The age variable, although being statistically significant, shows a non-linear relationship with the mean WTP. The respondents aged 23 to 25 years old are willing to pay the highest amount on average and the oldest respondents are the ones willing to pay the lowest amount. Female respondents reveal, on average, a higher propensity to pay than male respondents. Additionally, students with the highest family income category (over 2250€) are willing to pay, on average, a higher amount. Once again, however, the relationship between the two variables is not linear as we cannot sate that the higher (lower) the family income, the higher (lower) the median WTP.[16]

[15] The Kruskall-Wallis tests the null hypothesis of the median of the populations being equal (Sheskin, 2007).
[16] The description of the variables-proxies and the measurement adjustments undertaken on the original questions in order to get these proxies are detailed in Table A2.

The respondents who have family dependents are surprisingly willing to pay less on average than those with no family dependents. Indeed, an opposite result was expected at it was assumed that individuals with family dependents would be more worried about the financial burden on their relatives, not only because of incurring in more costs associated with crime victimization but also because there could be a decrease in family revenue due to possible days lost at work.

Respondents in Psychology and Educational Sciences are inclined to pay the highest amount on average, followed by Economics and Management. Respondents in Arts, Sport or Law present the lowest mean of WTP.

In our sample, respondents who usually lock the door at home are willing to pay, on average, a higher amount. Those who state not to worry about being victims of a violent crime, tend on average to report a lower WTP. These results are in line with what is expected as people who lock their doors reveal a crime-averting behaviour that is consistent with a higher fear of crime.

The difference in the mean of WTP elicited in the question regarding the payment vehicle and policy used to reduce crime is also statistically significant. Respondents who stated they would be willing to pay less than the amount they previously claimed, if the mechanism used to reduce the risk of violent crime victimization was an increase in policing financed by raising taxes, are the ones that present, on average, the highest WTP. In contrast, those who claim they would pay the same amount with the new policy description reveal the lowest WTP.

An analysis of the correlation matrix of the variables presented in Table A3 (in Appendix) reflects a positive and significant correlation between the variable income and the number of household members, without controlling for the other variables. Thus households with the highest income are associated with a higher number of family members and families with a higher number of members are related to the highest income households. Therefore, the variable number of family members was not considered in the estimation of our regressions as it would lead to multicollinearity. A significant and positive correlation was also found between the variable that represented having been the victim of a crime and the time when the crime occurred. Again, a strong correlation was found between the variables having been the victim of a crime and the severity of the injuries suffered. Thus the variables representing the time when the crime occurred and the severity of the injuries were not considered in our estimation.

Table 8: Differences in the mean of WTP for the different categories (in euros)

Variables	Variables' categories							Qui2	p-value and level of significance
Age	[17;19]=190.69	[20;22]=161.76	[23;25]=251.08	[26;30]=251.01	[31;68]=112.50			8.920	0.063*
Gender	Female=246.71	Male=127.03						18.624	0.000***
Income	[0;450[=210.00	[450;900[=169.52	[900;1350[=178.19	[1350;1800[=87.43	[1800;2250[=232.93	[2250;+∞[=236.44		10.362	0.066*
Family members	1=159.01	2=149.41	3=189.63	4=225.83	More than 4 =146.84			8.700	0.069*
Family dependents	Yes=63.13	No=200.05						8.786	0.003***
Degree	Undergraduate=199.47	Integrated Masters=170.79	Postgraduate=35.71	Master Programs=180.83	PhD/Doctoral program=156.82	Other=1012.50		5.734	0.333
Field of study	Exact Sciences = 162.26	Humanities=160.08	Economics and Management Sciences=228.37	Engineering=172.51	Psychology and Educational Sciences=275.00	Health sciences=189.95	Other (Arts. Sport. Law)=95.83	25.729	0.000***
Crime victim	Yes=165.20	No=202.63						2.573	0.109
Crime time	Less than a year=116.77	[1 year;5 years]=148.20	Over 5 years ago=202.89					1.461	0.482
Physical damages	No damage = 164.24	Some damage=165.82	Serious damage=154.17					0.090	0.956
Psychological damages	No damage = 164.24	Some damage=164.38	Serious damage=125.00					1.060	0.588
Lock Door	Yes=199.95	No=141.67						6.723	0.010***
Payment vehicle and Policy	Less=310.00	The same=153.35	More=217.53					30.724	0.000***
Fear	No fear=47.45	Some fear=128.46	Lots of fear=313.60					58.541	0.000***

Legend: ***(**)[*]statistically significant at 1% (5%)[10%] level

4.2. Determinants of higher education students' willingness to pay for violent crime reduction: results from the estimation of the econometric models

Our aim here is to estimate the determinants of the Willingness to Pay (WTP) of higher education students to reduce the risks of falling victim to a violent crime. Our theoretical model assumes that our dependent variable, WTP, is a function of a large set of variables as stated by the existing literature in the field (cf. Section 2): demographic factors (age and gender), family related factors (income, dimension, dependents), degree (undergraduate, master, PhD) and field of study (economics, arts, …), crime related factors (crime victim, crime time, physical injuries, psychological damages, fear of crime), averting behaviour (lock the door), payment vehicle and policy.

The logit model estimated (Table 9) presents a reasonable quality of adjustment (goodness of fit). The Hosmer and Lemeshow test indicates that we can accept the null hypothesis that the estimated model represents reality well. Moreover, more than 75% of the estimated values of the dependent variable are correctly predicted by the model.

Demographic variables – age and gender – are key determinants of the willingness to pay to reduce violent crime among Portuguese higher education students. On average, all other determinants held constant, senior students present a lower WTP, whereas female students are more inclined to pay to avoid being the victim of violent crime than their male counterparts. The first result is in line with findings in the existing literature. Cohen et al. (2004) also found that WTP decreases with age thus in this regard Portuguese higher education students are not different from the general individuals living in more developed, high crime rate countries. This does not seem to be the case for the impact of gender on WTP as this is not a statistically significant factor in the literature on crime costs. However our results are in accordance with psychological literature which suggests that traditional female gender roles are associated with avoidance (Rubinstein, 2005).

No relation was found between students' income level and WTP – low and high income students do not differ, on average, and all else constant, in their willingness to pay more to avoid being a victim of violent crime. The literature on this relationship suggests in contrast that higher incomes positively influence WTP (Atkinson et al., 2005; Ludwig and Cook, 1999). Cohen et al. (2004) further reinforces this evidence claiming that the ability to pay plays a role in explaining the amount in WTP as low income individuals, despite having higher victimization rates, are willing to pay less.

Table 9: Results of the model estimation

Variables	Categories	β estimates
AGE (ln)		-0,811**
GENDER - default: Male		0,520***
INCOME (Ln)		0,236
FAMILY SIZE – default :3	1	0,745**
	2	-0,040
	4	0,131
	More than 4	0,013
STUDY FIELD– default: Health Sciences	Exact Sciences	-0,510
	Humanities	-0,516*
	Economics and Management Sciences	0,202*
	Engineering	-0,475**
	Psychology and Educational Sciences	-0,556
	Other (Arts, Sport, Law)	-1,106**
VCRIME – default: No	Yes	-0,036
FEAR – Default: no fear	Some fear	1,099***
	Lots of fear	1,454***
LOCK DOOR (default: No)	Yes	0,386**
PAYMENT VEHICLE & POLICY (default: the same)	Less	1,290***
	More	0,543***
Constant		1,595
N		1122
WTP>0€		836
WTP=0		286
Goodness of fit		
Hosmer-Lemeshow Test (significance)		6.388 (0.604)
% corrected		75.8

Legend: ***(**)[*]statistically significant at 1% (5%)[10%] level

The relationship between the number of household members and WTP is somewhat surprising – there is statistical support to suggest that a single person is, on average, much more inclined to pay to reduce the probability of being the victim of a violent crime than a student living with a large family (3 members). This contrasts with findings of Ludwig and Cook (1999), who report a positive impact of household size on WTP, which was associated with altruistic reasons as individuals in families with several members would be willing to pay more than individuals who live alone. This apparently contradictory and unexpected result may be

explained by the higher risk a single student faces of falling victim to a crime in comparison of students living with two other relatives.

In comparison to Health Sciences students, those in Humanities, Engineering, and Other courses (incl. Arts, Sport and Law) are willing to pay less, all else equal. In contrast, students in Economics and Management reveal a higher WTP. The literature does not account for the impact of the field of study as a determinant of WTP but our results suggest that this variable has an important role in eliciting WTP. Researchers have found evidence of a relationship between people's personalities and their areas of interest (Tokar et al., 1998). Several authors have found an association between the field of study of university students and personality traits (Rubinstein, 2005; Silver and Malone, 1993; Kline and Lapham, 1992). Silver and Malone (1993), for instance, found that engineers tend to be mostly obsessive, accountants are predominantly paranoid, and medical students are particularly narcissistic[17]. Psychological literature uses the field of study as a proxy for personality traits of individuals. By estimating that distinct fields of study are associated with different amounts of WTP, we suggest that different personality traits might play a determinant role in eliciting WTP to reduce violent crime victimization. After controlling for all other variables likely to impact on the WTP, a higher level of concern about being a possible victim of a violent crime is associated to a higher WTP, on average, which corroborates the findings in the literature (Atkinson et al., 2005).

Another relevant aspect to take into account is an averting behaviour towards crime, reflected in locking the door at home, is positively associated with the WTP. This evidence is not in line with the estimates presented by Atkinson et al. (2005) that suggest that people who do not lock their door are actually willing to pay more. The authors speculate that people whose behaviour puts them more at risk are willing to pay more for a policy that reduces their probability of victimization. Our estimates, on the contrary, might be explained by the fact that people who lock their doors may be more concerned about crime issues and are thus willing to pay more.

[17] Silver and Malone (1993) focus on different personality styles. Among them are the obsessive, the paranoid and the narcissistic. Individuals with an obsessive style usually look for perfection and are never completely satisfied with what they accomplish. They have a rigid mode of thinking, pay great attention to technical details and have a need to control everything around them. Paranoid individuals are good observers characterized by an acute form of attentiveness and a constant sense of anticipation. They have a particular advantage in highly competitive settings like corporations. A narcissistic personality is characterized by a high sense of self, a need for attention and acceptance.

Payment vehicle and policy emerge as a strongly significant variable in explaining Portuguese higher education students' WTP. However, results are not clear-cut, as both groups of students would pay less and more (in relation to those that would pay the same) in the case where payment is made through higher taxes to increase policing reveal a higher willingness to pay to avoid being victims of violent crime. We suggest that students with a strong opinion on the policies and payment vehicles used to reduce crime risks are willing to pay more than students who are neutral to these variables. CV literature emphasizes that payment vehicle and policy are considered relevant variables that should be included in the surveys given their impact on individual's responses (cf. Section 2).

In crime costs literature, Ludwig and Cook (1999) do not address this issue directly in the survey by changing the payment vehicle or policy when eliciting the amounts of WTP. However, they used the answers of individuals that stated "that taxes are too high" as a proxy for respondents who did not agree with the payment vehicle. By removing these responses from the sample, the estimates of WTP were 13% higher (Ludwig and Cook, 1999). With regard to the policy used to reduce risks of victimization, Atkinson et al. (2005) estimate that the belief in the effectiveness of policing has a positive impact on WTP. We provide further evidence supporting the hypothesis that this/these variable(s) is (are) an important determinant in explaining WTP for crime risk reduction.

5. Conclusion

In a society with limited resources that can be allocated to different uses, the need to find instruments to analyze the costs and benefits of different policies will help policymakers make more informed decisions (Cohen, 2000). Crime policy is no exception and estimating the costs of crime is part of the cost-benefit analysis. Tangible costs have been calculated but not including estimates of pain, suffering or changes in lifestyle – particularly important in violent crime – has resulted in biased estimates of the total costs of crime (Czabanski, 2008). Several methodologies have been used to incorporate the intangible costs of crime and the Contingent Valuation method offers a "fresh perspective" (Czabanski, 2008: 122) on this problem. Our study applied the contingent valuation method to estimate the determinants of higher education students' willingness to pay to avoid being victims of violent crime.

The present study contributes with two main elements to the existing literature. Firstly it is, to the best of our knowledge, the first study conducted in a relatively low crime country. Our research indicates that even though crime rates are lower in Portugal, the main elements that

have an impact on WTP in countries like the UK or the US – with high crime rates – are the same for Portuguese university students (cf. Table 10). They have in common the positive influence of characteristics such as higher income and fear of crime on willingness to pay to reduce the risk of violent crime. The negative impact of age is also common to both types of countries. The payment vehicle and the policy used to reduce this risk are also strongly significant in both contexts. However, unlike the results presented for high crime rate countries, our results show that gender is a statistically significant variable, with female individuals willing to pay more to reduce the risk of being victimized, and single students willing to pay more than students that live with a family of 3 members.

Psychology literature supports our results by explaining the different gender roles and confirming that women are more prone to avoidance (Rubinstein, 2005). Locking the door at home was found to have a negative impact on WTP in the UK whereas in Portugal, individuals who lock their doors are willing to pay more to reduce their risks. We explain the opposite findings of our study by suggesting that people who lock doors at home demonstrate a crime avoidance behaviour that is compatible with a higher WTP.

Our study also contributes to the existing literature by being the first study that uses the contingent valuation method to estimate the amount that a particular sector of the population - university students - is willing to pay to reduce the risk of being victims of violent crime. Literature on WTP to avoid crime victimization does not discuss the impact of the individuals' different fields of study on WTP. In this study, we concluded that psychological traits, as indicated by the field of study, play a key role in determining the amount people are willing to pay. We found that Economics and Management students are willing to pay more than Health Sciences students and Arts, Law and Sports students are willing to pay less.

The fact that our results suggest a relationship between the field of study and WTP could have an impact on policy, particularly insurance policy. In light of these results, insurance companies may be interested in designing different insurance packages for individuals depending on their psychological traits as indicated by their field of study. These packages would be tailored to include different benefits and costs depending on the individual's preferences that should include some features based on their field of study.

Table 10: Comparison of the present study with some existing studies in the literature

	Prior studies			Current study
	Ludwig and Cook (1999)	**Cohen et al. (2004)**	**Atkinson et al. (2005)**	
Risk reduction	Gun violence (injuries) by 30%	Several crimes by 10% (burglary, serious assault, armed robbery, rape or sexual assault, murder)	Violent crime by 50% (categorized in three different types of offences – common assault, other wounding, serious wounding)	Violent crime by 10%
Policy	Programme to reduce gun thefts and illegal gun dealers	n.c.	Increase policing	n.c.
Payment vehicle	Tax Increase	n.c.	Rise in local charges	n.c.
Variables				
Age	n.c.	-	0	-
Gender (default: male)	n.c.	0	0	+
Income	+	+	+	0
Family members	+	n.c.	n.c.	-
Field of studies	n.c.	n.c.	n.c.	Significant
Victim of a crime	n.c.	n.c.	0	0
Fear of crime	n.c.	n.c.	+	+
Lock Door	n.c.	n.c.	-	+
Payment vehicle and policy	+	n.c.	+	+
Severity of injuries/crime type	n.c.	+	+	n.c.

Source: Own formulation

Legend: 0 – not statistically significant; n.c - not considered

Government policy can also be affected as crime policies aimed at reducing the risks of assault are perceived differently by people with different educational background. Individuals with a background in Economics and Management are willing to incur in more costs than individuals in other fields. Governments should be aware of this distinction to tailor crime policies depending on the geographical distribution of individuals with different educational backgrounds in the city/country. Different locations with the same crime rates could benefit from different crime reduction policies that should also be tailored in accordance with its population's field of study.

Despite the results obtained in this study, we also acknowledge some limitations. Firstly, it should be mentioned that to tailor our scenario we used official statistics on violent crime in Portugal – EUROSTAT – to present respondents with the baseline risk. However, official statistics underreport the number of criminal offenses, as it is estimated that a high number of crimes are not reported (MacDonald, 2002), particularly sex crimes (Rice et al., 2006). Future research should focus on the impact of different baseline risks and different percentages in the change of risk reduction on WTP, so that reliable and robust estimates can be produced and used in the definition of crime policy. Moreover, as stated by Cohen et al. (2004), different results could have been obtained if a detailed description of the consequences of victimization had been provided. Future research should investigate if different amounts of WTP would be reported in those circumstances.

Our study reported 25.5% of protesters and Atkinson et al. (2005) stated having more than 30% of responses classified as protests. Even though this high percentage of protesters did not bias our results as the logistic regression estimated using the maximum likelihood method produced the same results as the ordinary least squares estimation (not reported in the text), several explanations can be suggested, such as the fact that respondents object to the valuation scenario (e.g., the percentage of risk reduction involved). However, a comprehensive study of the reasons behind the protests should be conducted. Future research should thus focus on trying to explain the high percentage of protesters that are encountered in the CV studies applied to the costs of crime.

Finally, an in-depth analysis of the relationship between individual's educational background (used as a proxy for psychological traits) and WTP to avoid being victims of crime should also be conducted. We have suggested that there is an association between these two variables but given the implications it could have in crime policies, further research is recommended.

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Appendix

Table A1: Descriptive statistics

Variable		Frequency (%)
Age (N=1122)	[17,19]	16.8
	[20,22]	42.1
	[23,25]	20.7
	[26,30]	11.1
	[31,68]	9.4
Gender (N=1122)	Male	47.1
	Female	52.9
Income, in € (N=1122)	[0;450[	4.0
	[450;900[	13.8
	[900;1350[	21.7
	[1350;1800[	15.2
	[1800;2250[	14.9
	More than 2250	30.4
Nº Family elements (N=1122)	1	7.7
	2	11.4
	3	29.2
	4	37.6
	More than 4	14.1
Family Dependents (N=1122)	No	92.9
	Yes	7.1
Level of Study (N=1122)	Undergraduate	50.3
	Integrated Masters	18.0
	Postgraduate	0.6
	Master Programmes	23.7
	PHD/Doctoral programme	6.9
	Other	0.5
Field of study (N=1122)	Exact Sciences	4.7
	Humanities	11.1
	Economics and management sciences	22.5
	Engineering	35.8
	Psychology and Educational Sciences	6.0
	Health Sciences	17.3
	Other (Arts, Sport, Law)	2.7

(…)

School of enrollment (N=1122)	Faculty of Fine Arts	1.2
	Faculty of Sciences	1.6
	Faculty of Nutrition and Food Science	8.0
	Faculty of Law	0.7
	Faculty of Economics	23.1
	Faculty of Engineering	38.4
	Faculty of Pharmacy	5.6
	Faculty of Psychology and Education Science	6.6
	Institute of Biomedical Sciences Abel Salazar	4.2
	Faculty of Arts	10.5
Victim of a previous crime (N=1122)	No	67.0
	Yes	33.0
Date of previous crime (N=376)	Less than 1 year	20.2
	Between 1 to 5 years	40.7
	Over 5 years	39.1
Severity of physical injuries related to the crime (N=374)	No injuries	78.9
	Some injuries	13.1
	Serious injuries	8.0
Severity of psychological damages related to the crime (N=374)	No damages	78.9
	Some damages	19.5
	Serious damages	1.6
Worries about being the victim of a crime (N=1122)	Does not worry	9.6
	Worries moderately	52.8
	Worries a lot	37.6
Locks the door of the residence (N=1122)	No	16.6
	Yes	83.4
Willingness to pay, in € (N=1122)	0	25.5
	[0;50[	42.1
	[50;250[	20.8
	[250;750[	5.5
	[750;1250[	1.9
	[1250;1750[	0.7
	[1750;2250[	0.8
	[2250;2750[	0.2
	More than 2750	2.6
Willingness to pay if there is an increase in policing financed by an increase in taxes – payment vehicle and policy (N=1122)	More	13.4
	The same	58.6
	Less	26.6
	No answer	1.5

Source: Authors calculation based on direct survey, March – July 2009

Table A2: Variables Description

Variable	Description
Age	Age – The questionnaire included an open question that required respondents to state their age. The age of the students that answered the survey varied between 17 and 68 years. For estimation purposes, respondent's ages were grouped into 5 intervals: [17,19]; [20,22]; [23,25] ;[26,30] and [31,68].
Gend	Gender – This variable refers to the gender of the respondent: male or female.
Inc	Income – Represents monthly family income. The questionnaire referred 6 intervals of income, in euros, that were also used in our regressions: [0,450[; [450,900[; [900,1350[; [1350,1800[; [1800,2250[and more than 2250.
Fam	Number of family members – In the questionnaire respondents were asked to state how many individuals lived in their household; 1, 2, 3, 4 or more than 4. These were also the figures used in the estimation of our regressions.
Fam Dep	This variable incorporates the answers respondents gave about having individuals that were financially dependent on them. The possible answers were "yes" or "no". This variable was not included in our estimation as over 90% of the students in the sample do not have family dependents. We thus lack observations for the case where there are family dependents to include in the estimation.
FieldRed	Field of study (reduced) – Respondents were asked the area of their basic training as a proxy for individual's distinct inclinations or psychological traits. A few adjustments were made in this variable. First of all, for the respondents who were aged under 23 years that stated an area of study different from the one provided by the faculty of enrolment, we assumed that the area of study was actually the one available at the faculty of enrolment because the respondent might have interpreted the area of study as the one he followed in high school. In the case of students that were aged more than 23 years we maintained the area of study even if it was different from the areas provided by the Faculty of enrolment as the respondent might be enrolled in a second level of study in a different area. Finally, we grouped the responses from three areas and categorized them under "Other". This category includes the respondents from Arts, Sports and Law. This procedure was necessary to guarantee a minimum number of responses per category. Thus the areas of training considered in the estimation of the regressions were Exact Sciences, Humanities, Economics and Management, Engineering, Psychology and Educational Sciences, Health Sciences and Other (Arts, Sports and Law).
Vcrime	Victim of crime - This variable represents if the respondent has previously been the victim of a crime.
Physical injuries	The severity of the physical injuries and psychological damages suffered in a crime could be stated by the respondent using five levels of severity ranging from "no injuries" to "very serious injuries". For practical purposes we decided to group them in three levels of severity: no injuries, some injuries and serious injuries. As 80% of respondents reported having suffered no damages we created a dummy variable that grouped both physical and psychological consequences of a crime: the variable represented the situation of "no injuries" vs "some injuries".
Psychological damages	
Fear	Fear of crime – This variable illustrates the answers respondents gave when asked if they worried about being victims of a violent crime. Three possible answers were presented: does not worry, worries moderately, worries a lot.
LockDoor	Lock the door -Respondents could answer yes or no to usually locking the door at home
PV	Payment vehicle and policy – Respondents could state paying more, the same or less when confronted with the possibility of risk reduction being achieved by increasing policing financed by higher taxes.

Table A3: Correlation matrix

Variables	lnWTP	Age	Gender	Income	Family elements	Field reduced	Crime victim	Fear of crime	Lock Door	Payment vehicle	Victim past 5 years	Dummy _ injuries
lnWTP	1	-0.069**	0.146***	0.043	0.025	0.051*	-0.050*	0.244***	0.082***	-0.045	-0.065**	-0.007
Age		1	-0.078***	0.056*	-0.287***	-0.135***	0.018	-0.001	0.018	0.006	-0.061**	0.025
Gender			1	-0.144***	-0.006	0.080***	-0.243**	0.149***	0.053*	-0.113***	-0.166***	-0.079***
Income				1	0.316***	0.065**	0.078***	-0.66**	-0.008	0.025	0.035	-0.053*
Family elements					1	0.144***	0.003	-0.006	-0.076**	-0.18	0.026	-0.002
Field reduced						1	-0.028	0.016	0.012	-0.031	0.009	-0.003
Crime victim							1	-0.052*	-0.001	0.031	0.689***	0.387***
Fear of crime								1	0.151***	0.043	-0.058*	0.049
Lock Door									1	0.049	-0.016	0.026
Payment vehicle and policy										1	-0.004	-0.007
Victim past 5 years											1	0.299***
Dummy_injuries												1

Legend: ***(**)[*]statistically significant at 1% (5%) [10%]level

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