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Abstract

This study analyzes how the willingness to pay (WTP) for a risk reduction for traffic accidents varies depending on the specific traffic safety measures and whether they are framed as public or private goods. Building on previous studies, we designed and conducted a contingent valuation survey targeting a representative sample of the Swedish population, assessing WTP for eight different measures aimed at increasing the safety of vulnerable road users. Our findings reveal that while keeping the risk reduction constant, WTP is higher for well-established traffic safety measures, such as anti-slip treatments and improved lighting. Conversely, new technologies, like mobile apps and sensors, elicit lower WTP. However, respondents express a higher WTP when these technological measures are provided as a public good. These results suggest that acceptance and perceived reliability of the measures significantly influence WTP. The findings have important implications for cost-benefit analyses and evidence-based policymaking in transportation safety, particularly regarding the implementation of new technology in road safety infrastructure.

Keywords: traffic safety, willingness to pay, public good, private good, infrastructure, bicyclists and pedestrians, interval regression.

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1 Introduction

This study analyzes how the willingness to pay (WTP) for a risk reduction for traffic accidents among unprotected road users varies across different intervention types and their framing as public or private goods. In cost-benefit analysis (CBA) of public interventions in health, transportation, environment, and labor protection, non-market valuations such as the Value of a Statistical Life (VSL) are frequently applied. Policy guidelines often provide ”off-the-shelf” valuations for standardized implementation. Therefore, practical applications typically rely on value transfer, i.e., the use of existing valuation estimates to new contexts that differ from the original estimation setting (Atkinson et al., 2018). US Office of Management and Budget (2023) emphasizes that consistent use of value transfer requires contextual similarity between the original valuation study and the new policy context. However, this requirement is rarely met in practice. For example, many studies estimating the VSL have focused on the WTP for private goods, such as airbags, even though these estimates may be used in CBA of public investments in road infrastructure or fire safety interventions.

Previous literature has mainly focused on how the value of safety depends on whether the risk reduction is framed as a private or public good, typically finding that the valuation of safety is higher in the former framing (Svensson and Vredin Johansson, 2010; Andersson and Lindberg, 2009; Hultkrantz et al., 2006). However, these studies rarely maintain consistency in the safety measures themselves when comparing public and private settings. This inconsistency may affect the differences in the valuation of public versus private goods if respondents consider other attributes of the goods in addition to the safety improvements. For instance, even though the size of the risk reduction is stated to be constant, respondents may perceive that some measures or goods are less effective at reducing risks, or they may not only value the reduction of risk but also how it is achieved. Indeed, when keeping the good constant, Andersson Järnberg et al. (2024) found no evidence that a risk reduction provided by a private good was valued higher than when the reduction in risk was delivered by any framing of the public good. However, they included only one safety measure, which the respondents had little experience with. The present study aims to advance this research by exploring further how the WTP for a risk reduction for traffic accidents varies not only between public and private framings, but also across different types of safety measures, including those with which the respondents have varying levels of experience. Building upon Andersson Järnberg et al. (2024), we evaluate different types of measures, including both those that the respondents have experience with and those that they do not. We conducted a contingent valuation survey to assess WTP for several different measures aimed at increasing the safety of vulnerable road users. The survey was designed to consist of some scenarios where we frame a single measure that reduces the risk of an accident as either private or public, allowing us to compare WTP for the same measure in private versus public settings. In other scenarios, we vary the good while keeping it either as a private or a public good, enabling us to explore whether the valuation varies across different measures.

Several studies have found that the value of safety varies across policy contexts. For example, Johansson-Stenman and Martinsson (2008) found that respondents value pedestrian safety higher than the safety of car drivers, and Carlsson et al. (2010) found a higher willingness to pay for reducing fire and drowning accidents compared to traffic accidents. Furthermore, within the health economics literature, a common finding is that respondents are willing to pay more to reduce the risk of dying from cancer than from other causes of death (Jones-Lee et al., 1985; McDonald et al., 2016; Viscusi et al., 2014; Olofsson et al., 2016).

While previous literature has mainly focused on the differences in valuation across policy contexts, the present study advances the research field by analyzing the extent to which the value of a risk reduction varies within a given policy context. If respondents place value on how safety is improved, we expect to find differences in valuation not only between public and private goods but also across different types of goods within both public and private settings.

Our study addresses two key research questions: First, does WTP for a risk reduction depend on the specific good or measure used to deliver the safety improvement, and second, does WTP also differ between private and public measures? Our findings confirm both hypotheses: WTP for risk reduction varies across different measures, even when they are all private or all public measures. Furthermore, for measures with which respondents have limited experience and that depend on new technologies, such as a mobile phone app, the WTP is higher when framed as a public good, contrary to earlier findings. However, for conventional safety measures, specifically, anti-slip treatment and better lights, our results show higher WTP for a risk reduction in the private setting. These results may imply that people have varying confidence in whether different measures reduce risk to the extent that was stated.

This paper is organized as follows: Section 2 presents the study design and survey methodology, Section 3 discusses the econometric framework, Section 4 presents some descriptive statistics, Section 5 presents the empirical findings, including main hypothesis tests and robustness tests, and Section 6 concludes and discusses policy implications.

2 Study Design

The data used in this paper were collected through a contingent valuation web survey administrated to a sample of the Swedish population aged 18-80. The complete survey is presented in Appendix B, and the sampling procedure aligns with previous studies (Olofsson et al., 2019a,b; Andersson Järnberg et al., 2024). The sample was drawn to be representative of the population regarding gender, age, and geographic distribution across northern, middle, and southern Sweden; see Table A1 in Appendix A. The survey was distributed in December 2021 to 20,067 individuals from the Userneeds web panel.[1] In total, we received 2,667 complete answers. While low response rates are common in web panel surveys and necessitate caution in drawing inference outside of the sample, quality control measures were implemented. To

[1] Userneeds web panel is since 2022 part of Norstat web panel https://norstat.co/company/ Our sampling was managed by the survey company Attityd Karlstad AB.

ensure that it was a real individual and not a bot answering, the respondents had to answer some questions to test their logical thinking before the real survey started.

The survey began with demographic questions regarding age, gender, and residential region, followed by questions about their habit of traveling by bicycle, traffic conditions, worriedness about being in an accident, and what traffic safety precautions they use when walking or bicycling. In addition, there was a text explaining the baseline accident risks for pedestrians and cyclists.

To examine whether the WTP for risk reduction not only differs between the private and public setting but also whether it depends on the specific measure, we identified eight different measures for reducing accident risks among unprotected road users, three private and five public. The selection of different safety measures was based on statistics about traffic accidents involving cyclists in Sweden (Niska and Eriksson, 2013). To enable meaningful comparisons, we designed the study to compare the difference in WTP for risk reduction between private and public measures where the risk situation itself is as similar as possible. Therefore, the safety measures were chosen to ensure that the type of risk (e.g., slip hazard) remained the same across both the private and public measures (see Table 1). For two public measures and one private measure, we selected measures that the respondents have limited experience with and involve new technologies. Specifically, we included a mobile phone app, both as a public and private safety measure, and sensors at intersections that detect when cyclists or pedestrians are approaching and warn motorists to reduce the risk of collision (see Table 1).

Before answering the WTP questions, the respondents were asked about their attitudes toward all eight measures, rating each of them on a 1-5 scale going from "very bad" to "very good". The respondents were then asked to state their WTP for four different traffic safety measures, two of which were public measures and two were private. We varied the order in which the respondents received the questions, first in terms of a block of either public or private measures and second in terms of measures within each block. This means

Table 1: Measures reducing risk of traffic accidents for pedestrians and bicyclists

Safety measure	Description of safety measure
Public safety measure	
Slip_Pu	Better anti-slip treatments during wintertime on walking and cycling paths.
Light_Pu	Improved lighting on walking and cycling paths.
Lane_Pu	Separate lanes for pedestrians and cyclists.
App_Pu	An app in the mobile phone that everyone can download without charge and that sends signals to cars to reduce the risk of collisions with pedestrians and bicyclists.
Sensor_Pu	Sensors at intersections and exits that detect when cyclists or pedestrians are approaching and warn motorists to reduce the risk of collision.
Private safety measure	
Slip_Pr	Studded tires on bicycles and/or studded shoes that are easy to remove and put on.
App_Pr	An app in the mobile phone that sends signals to cars to reduce the risk of collision with pedestrians and bicyclists.
Light_Pr	Better lights on the bicycle, helmet, or clothes.

that half of the sample started with questions about two public measures that appeared in random order, and half of the sample started with questions about two private measures in random order. Each respondent received two randomly assigned private measures, one randomly assigned public measure, in addition to the public measure Sensor_Pu, which all respondents received. Theory predicts that WTP should increase with the size of the risk reduction (r) but at a decreasing rate (Jones-Lee, 1974). To assess internal validity through scale (scope) sensitivity, we employ a split-sample design in our survey, and half of the respondents received scenarios for a 50% risk reduction and the other half received scenarios for a 10% risk reduction. The sample structure is illustrated in Figure 1.

Since respondents often struggle to interpret a change in small probabilities (Hammitt and Graham, 1999), we included a text explaining how many actual accidents the measure would prevent if implemented in a city with 10,000 inhabitants: "Suppose that by improving lighting on pedestrian and cycling paths, one can halve the risk of pedestrians and cyclists being involved in a serious accident. This means that in a city of 10,000 inhabitants, the

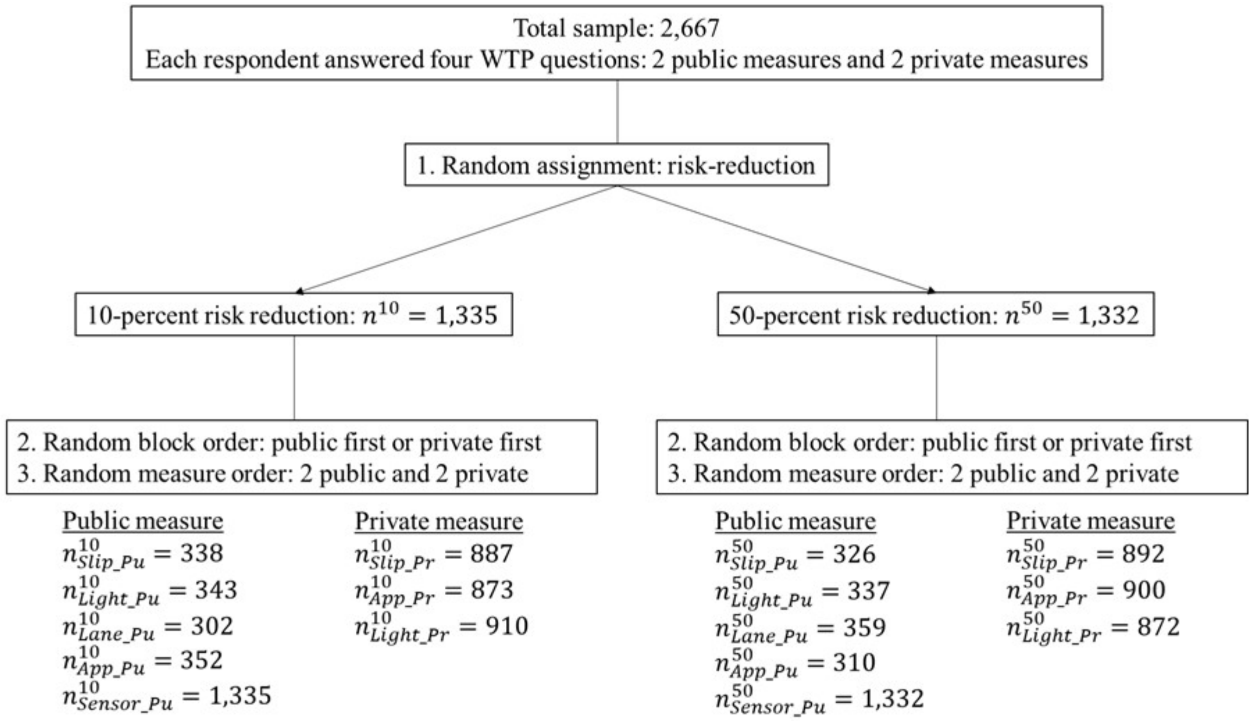

Figure 1: Survey and sample structure

number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

The payment vehicles differ across the private and the public measures with a uniform tax, evenly distributed among all taxpayers for the public measures. For each measure the respondents were asked to choose the highest tax increase (for the public safety measure) or maximum cost (for the private safety measure) they would be willing to pay from a payment card that showed eight different alternatives (see Figure 2).[2] To reduce the risk of hypothetical bias we reminded the respondents that it is common to overestimate the WTP in these kinds of situations and asked them to think about what they could afford and really would like to pay. This kind of "cheap talk" is commonly used and has been shown to reduce the hypothetical bias (Penn and Hu, 2019). Individuals who stated 0 SEK as their highest WTP for the safety improvement received follow-up questions about the reason for this.

After the WTP questions, the respondents were asked some standard background ques-

[2]The pilot based on an open-ended format of the WTP question, and a previous similar survey by Andersson Järnberg et al. (2024), informed us about the range of probable payment.

☐ 0 SEK per month (0 SEK per year)
☐ 5 SEK per month (60 SEK per year)
☐ 10 SEK per month (120 SEK per year)
☐ 25 SEK per month (300 SEK per year)
☐ 50 SEK per month (600 SEK per year)
☐ 75 SEK per month (900 SEK per year)

Figure 2: Payment card

tions, including household size, education, occupation, country of birth, and income; their experience with traffic accidents, either personally or involving a family member or near friend; their subjective well-being and their attitudes about several dimensions of publicly provided goods. To control for consequentiality (Zawojska et al., 2019; Andersson Järnberg et al., 2024), we asked the respondents if they thought that the results from this survey would influence which traffic safety measures would be implemented in Sweden.

3 Econometric Framework

Our model design is intricately motivated by the challenge of understanding and quantifying individual i's willingness to pay for distinct traffic safety measures s, associated with risk reduction r. The complexity arises from the unobservable nature of the individual's expected utility from the traffic safety improvements included in the scenarios, making it difficult to directly measure preferences and valuations. To address these issues, we employ a latent variable model, which can handle the inherent challenge of observing individual utility when assessing preferences and monetary valuations for different traffic safety measures. The latent outcome variable, $WTP_i^{*s,r}$, represents the individual's willingness to pay for safety, which is not directly measurable but influences the observed responses. The structural model describes how variations in latent willingness to pay affect the observed responses to different safety measures, incorporating a diverse set of factors:

$$WTP_i^{*s,r} = X_i\beta + \epsilon_i^{s,r}, \tag{1}$$

where X_i is a vector of explanatory variables that includes socio-demographic characteristics, attitudes toward safety measures, worriedness about traffic risks, past accident experiences, perceived consequentiality, and dummy variables for each but one safety measure. The error term $\epsilon_i^{s,r}$ accounts for unobserved factors affecting an individual's response to a safety measure. Since attitude variables and variables reflecting worriedness and accident experiences may be endogenous, we estimate the model excluding these explanatory variables in a sensitivity analysis.

Given that our data are interval-censored, the outcome variable is not precisely observed, but rather lies within certain intervals: i) a closed interval with two fixed endpoints (interval-censored data), ii) an interval with a fixed upper endpoint and an open (possibly infinite) lower endpoint (left-censored data), iii) an interval with a fixed lower endpoint and an unknown upper endpoint (right-censored data). With this data design, we use an interval regression model. Table 2 shows the payment card, the relevant interval for each bid and what this implies for the outcome variable which in the interval regression consists of two variables, i.e., the lower and upper bounds of the interval utilized to account for the discretized nature of the WTP variable.

Table 2: The outcome variable

Payment card	Interval	Lower bound	Upper bound
0 SEK per month (0 SEK per year)	$-\infty \leq x < 5$	.	4
5 SEK per month (60 SEK per year)	$5 \leq x < 10$	5	9
10 SEK per month (120 SEK per year)	$10 \leq x < 25$	10	24
25 SEK per month (300 SEK per year)	$25 \leq x < 50$	25	49
50 SEK per month (600 SEK per year)	$50 \leq x < 75$	50	74
75 SEK per month (900 SEK per year)	$75 \leq x < 100$	75	99
100 SEK per month (1200 SEK per year)	$100 \leq x < 101$	100	100
More than 100 SEK per month (1200 SEK per year)	$101 \leq x \leq \infty$	101	.

To estimate the model, we employ an interval regression framework, which uses a likelihood function formulated based on the probability that the true unobserved WTP falls within the given intervals. Let WTP_{il}, represent the lower bound and WTP_{iu}, represent the upper bound of the interval for observation i, and x_i be the vector of explanatory variables. The likelihood function for the interval-censored data is given

$$L(\beta \mid WTP_{il}, WTP_{iu}, x_i) = \prod_{i=1}^{n} \big[F(WTP_{iu} \mid X_i, \beta) - F(WTP_{il} \mid x_i, \beta)\big], \tag{2}$$

where $F(\cdot)$ is the cumulative distribution function of the error term $\epsilon_i^{s,r}$. This specification allows for the estimation of $WTP_i^{*s,r}$ while accounting for the censored nature of the data.

4 Descriptive Statistics

Description and summary statistics of the explanatory variables used in the analysis are reported in Table A2 in Appendix A. There are no significant sub-sample differences in the socioeconomic variables gender, age, household income, and size. Prior to the valuation questions, all respondents were asked about their attitudes toward the eight different measures that could be used to increase the safety for cyclists and pedestrians. The overwhelming majority of respondents stated that the suggested safety improvements were fairly good or very good (see Table 3). The exception is the measure that requires the use of a mobile phone app, both when it is framed as a public good and as a private good. In the two app measures, approximately one third of the respondents were indifferent toward the app measures, one third perceived it as bad (very bad or fairly bad), and one third perceived it as good (fairly good or very good). The attitudes toward the other measures are similar, and most respondents perceived them as good (fairly good or very good), ranging from 67% for Sensor_Pu to 87% for Light_Pr.

Table 4 presents the descriptive statistics of the WTP for a 50% risk reduction, with all responses shown in columns 1-4, and only non-zero responses in columns 5-7. The descriptive results for the WTP align with the attitudes presented in Table 3. Though there appears to be significant differences in mean WTP between measures, the median values remain rela-

Table 3: Proportion of attitude responses across the eight measures, in percent

Measure	Very bad	Fairly bad	Indifferent	Fairly good	Very good
Slip_Pu	2	4	14	34	46
Light_Pu	2	3	15	33	47
Lanes_Pu	2	4	19	29	46
App_Pu	17	15	33	19	16
Sensor_Pu	6	6	21	34	33
Slip_Pr	1	3	15	37	43
App_Pr	16	15	34	21	14
Light_Pr	1	2	10	34	53

tively stable, suggesting that differences are driven by extreme values rather than the central tendency. This indicates that differences across measures are driven by valuations toward the end of the distributions. Table 5 reports pairwise Wilcoxon rank-sum (or alternatively, sign-rank) tests for equality of the full sample distribution of WTP across the different measures.[3]

Table 4: WTP in SEK for a 50% reduced risk of accident by measure

	Full sample			WTP=0 (%)	WTP 0		
	Mean	SD	Median		Mean	SD	Median
Measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slip_Pu	11.81	17.18	5	95 (29.14)	16.67	18.32	10
Light_Pu	12.92	18.91	5	76 (22.55)	16.69	19.98	10
Lane_Pu	13.03	21.32	5	116 (32.39)	19.26	23.49	10
App_Pu	10.77	19.42	5	119 (38.39)	17.49	22.25	10
Sensor_Pu	12.34	19.69	5	408 (30.63)	17.68	21.48	10
Slip_Pr	18.41	26.20	5	228 (25.56)	27.52	27.84	10
App_Pr	7.86	16.02	0	485 (53.89)	17.04	20.02	10
Light_Pr	18.82	23.80	10	175 (20.07)	23.55	24.44	10

Note: SD stands for standard deviation. The proportion of WTP=0 is reported as share of the number of respondents for the measure. The complete sample number of observations for the measure with a 50% risk reduction are: $n^{50}_{(\text{Slip\_Pu})} = 326; n^{50}_{(\text{Light\_Pu})} = 337; n^{50}_{(\text{Lane\_Pu})} = 359; n^{50}_{(\text{App\_Pu})} = 310; n^{50}_{(\text{Sensor\_Pu})} = 1{,}332; n^{50}_{(\text{Slip\_Pr})} = 892; n^{50}_{(\text{App\_Pr})} = 900; n^{50}_{(\text{Light\_Pr})} = 872$.

Focusing first on the five public measures: the WTP for a reduced risk of accidents is fairly consistent across the five public measures. Anti-slip treatment, improved lights, and

[3] Both a Shapiro-Wilk test and a joint test of skewness and kurtosis indicate that valuations for the different measures are not consistent with normal distribution, and hence motivates using Wilcoxon ranksum tests.

Table 5: Unconditional tests of equality of distributions for WTP in the different scenarios, complete sample

	Slip_Pu (1)	Light_Pu (2)	Lane_Pu (3)	App_Pu (4)	Sensor_Pu (5)	Slip_Pr (6)	App_Pr (7)
(1)				-3.68 (0.00)			
(2)	0.72 (0.47)				-3.65 (0.00)		
(3)	1.48 (0.14)	0.82 (0.41)			-1.35 (0.18)		
(4)	5.66 (0.00)	5.13 (0.00)	4.15 (0.00)		8.67 (0.00)		
(5)	-4.88 (0.00)	-5.74 (0.00)	-6.28 (0.00)	-10.56 (0.00)	-11.40 (0.00)		
(6)	11.86 (0.00)	11.36 (0.00)	9.98 (0.00)	5.02 (0.00)	15.33 (0.00)	20.19 (0.00)	
(7)	-6.17 (0.00)	-7.10 (0.00)	-7.58 (0.00)	-11.92 (0.00)	-13.62 (0.00)	-1.34 (0.18)	-21.98 (0.00)

Note: z-value (p-value) reported. Comparisons are conducted using the Wilcoxon rank-sum test with unmatched samples (also known as the Mann–Whitney two-sample statistic), while comparisons with Sensor_Pu are conducted using the Wilcoxon matched-pairs signed-ranks test.

separate lanes do not show statistically significant differences in the WTP for risk reduction, while the sensor measure yields a lower WTP, and the app results in a much lower WTP. Among the private measures, the differences are more pronounced. The anti-slip measure and better lights yield much higher WTP for risk reduction compared to the mobile phone app, which ranks lowest among both private and public measures. Hence, the two measures based on new technologies, which respondents have less experience with, receive lower WTP values.

Column 4 of Table 4 shows the proportion of zero responses. Looking at non-zero bids, we observe a similar pattern for both public and private measures, with the main difference being that the increase in WTP for the mobile phone app is larger than the increase for the other measures, due to a higher proportion of zero bids. This is especially notable for the private app. This may suggest that many respondents do not trust the app's ability to reduce risk.

Next, we compare public and private measures, ensuring the risk context is as similar as possible between the public and private setting and find the usual pattern: the WTP is higher for private measures. However, for the app, the opposite is true. Examining only non-zero bids, we again find a similar pattern.

5 Results

5.1 Main Hypotheses Tests

Table 6 presents two model specifications for panel data random effects interval regressions, with column (1) showing a short model that includes only dummies for the different safety measures and column (3) displaying the full model presented in Equation (1).[4] Due to few observations in the highest bid levels, collapsing the three upper bid levels is necessary for some of the robustness tests, especially when we conduct analysis with observations where $WTP_i > 0$. The benefit of this approach is that it uncovers the full WTP distribution, which is essential for an unbiased estimate of the mean (Fosgerau, 2007). For consistency, all results are based on the same collapsing of the upper bid levels, and the point estimates of the dummy variables for the different measures are therefore expected to be lower than if the upper bid levels were not collapsed.

The public safety measure Sensor_Pu, which was assigned to all respondents, is used as the reference measure. The coefficients are similar in columns (1) and (3), which is reassuring and suggests that potential endogeneity of the attitudinal variables is limited.

The willingness to pay for a reduced risk of accidents varies across the five public measures, similarly to the unconditional tests in Section 4. Among the public measures, a Wald test shows that the WTP for anti-slip treatment, better lights, and separate lanes is not significantly different from one another ($\chi^2 = 1.50$, p-value = 0.47), consistent with the unconditional tests. Additionally, in line with the unconditional tests, the app tends to yield a much lower WTP, while the sensors yield a somewhat lower WTP. Among the private measures, the differences again align with results in Table 5, where the app produces a much lower WTP for a risk reduction compared to both anti-slip treatment ($\chi^2 = 784.38$, p-value = 0.00) and the better lights measure ($\chi^2 = 885.54$, p-value = 0.00). The mobile app ranks lowest in both private and public good valuations. Therefore, a tentative conclusion is again

[4]Table C1 in Appendix C presents estimations where we stepwise introduce blocks of controls.

that the WTP for an increase in traffic safety is higher for goods that respondents have experience with and therefore trust more, which is not the case for sensors or mobile apps.

The last three rows of Table 6 compare the public and private measures, keeping them as similar as possible across contexts, specifically comparing Slip_Pu with Slip_Pr, Light_Pu with Light_Pr, and App_Pu with App_Pr. These results allow us to reject the hypothesis that the WTP for risk reduction is the same when the measure is framed as a public good versus a private good, confirming that framing influences WTP. In the first two cases, we observe the familiar pattern of a higher WTP for the private measure, which aligns with findings in many previous studies (Svensson and Vredin Johansson, 2010; Andersson and Lindberg, 2009; Hultkrantz et al., 2006). However, for the mobile phone app, we see the opposite. A tentative conclusion is that whether the WTP for an increase in traffic safety is higher for a public or private good may be influenced by the good itself. It may reflect differences in the respondents' belief about how effectively the good functions depending on whether it is a private or public good. For example, the respondents may place higher trust in a public mobile app compared to a private one.

The long model (column 2) reports how the various characteristics of the respondents affect valuations directly. First, we look at the attitudinal variables. We find that respondents who do not think that taxes are too high (Tax attitude) and those who think that the public sector should prioritize lowering the gap between rich and poor in society (Distribution) state a higher WTP. Second, our results show that respondents who believe that the results of our survey will have an impact on actual traffic safety policy (Projectcons) have a higher WTP. A high self-rated degree of worry about being in a traffic accident (Ownworry) is also related to a higher WTP. Among the demographics we find that the middle-aged group has a lower WTP than both the younger (Age1829) and the older (Age6580) groups, but female and male respondents do not express differences in WTP.

Third, theory predicts that WTP should increase with the size of risk reduction, at a decreasing rate (Jones-Lee, 1974). As an internal validity test of scale (scope) sensitivity,

Table 6: Panel interval regression with dummy variables for the different measures and covariates

	Short model		Long model	
	Coef.	S.E.	Coef.	S.E.
	(1)	(2)	(3)	(4)
Slip_Pu	2.708***	(0.84)	2.718***	(0.84)
Light_Pu	3.069***	(0.84)	3.034***	(0.84)
Lane_Pu	1.675*	(0.86)	1.714**	(0.86)
App_Pu	-6.673***	(0.88)	-6.698***	(0.88)
Slip_Pr	8.647***	(0.57)	8.670***	(0.57)
App_Pr	-10.26***	(0.61)	-10.31***	(0.61)
Light_Pr	9.815***	(0.57)	9.848***	(0.57)
Risk	-0.262	(0.92)	-0.343	(0.89)
Order2	-5.392***	(0.50)	-5.385***	(0.50)
Order3	-7.759***	(0.50)	-7.749***	(0.50)
Order4	-9.931***	(0.50)	-9.929***	(0.50)
Age1829			4.303***	(1.48)
Age6580			2.882***	(1.06)
Female			-0.535	(0.93)
IncLow			-3.164**	(1.28)
IncHigh			2.631**	(1.05)
lnHHsize			-2.238	(1.43)
Children			3.447**	(1.54)
Urban			0.820	(0.95)
Ownworry			3.177***	(0.92)
Expcar			2.441*	(1.38)
Expbike			2.082	(1.53)
Expped			3.780*	(1.97)
Expfamilycar			0.498	(1.01)
Expfamilybike			2.541**	(1.13)
Expfamilyped			0.875	(1.39)
Projectcons			7.901***	(1.31)
Effectiveness			1.268	(1.08)
Privatization			2.212*	(1.33)
Tax attitude			7.678***	(1.10)
Distribution			4.132***	(0.93)
Public regulation			1.035	(0.96)
Constant	16.93***	(0.78)	5.777***	(1.84)
sigma_u	21.65***	(0.40)	20.62***	(0.38)
sigma_e	16.11***	(0.09)	16.12***	(0.09)
No. of observations	10668		10668	
Log lik.	-17517.9		-17408.2	
rho	0.644		0.621	
LR-test panel	4051.8		3685.2	
Difference and Wald tests				
$WTP_{\text{Slip\_Pu}} = WTP_{\text{Slip\_Pr}}$	-5.94	45.53***	-5.95	45.76***
$WTP_{\text{Light\_Pu}} = WTP_{\text{Light\_Pr}}$	-6.75	58.88***	-6.81	60.13***
$WTP_{\text{App\_Pu}} = WTP_{\text{App\_Pr}}$	3.59	14.44***	3.61	14.63***

Notes: Standard errors (S.E.) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The Wald test reports the chi2 value of a two-sided test.

we make use of the split sample design of our survey to test whether WTP is sensitive to a risk reduction of 10% versus 50%. The coefficient for the dummy variable Risk (= 1 if 50% risk reduction, zero otherwise) is not statistically significant in Table 6, indicating scale insensitivity. One reason for this could be that the respondents do not value the risk reduction, but the good itself.

Finally, we see that the order of the valuation questions matters and valuations decline across questions (Order). For that reason, we will include a robustness test in sub-section 5.3 only including responses from the valuation questions that were presented first.

To further explore heterogeneity in WTP we run the estimations including a dummy variable indicating cycling habit as well as its interactions with the measure dummies; see Table C2 (column 1) in the Appendix. We do not find any significant coefficients on these interactions, although the coefficient on the variable Bicyclist, which indicates respondents who bicycle often rather than just sometimes, seldom or not at all is positive and significant. For most cases we see no difference between cyclists and non-cyclists in terms of our hypotheses, except for when both the public and private safety measure are based on a mobile phone app. In this latter case the Wald test shows that we cannot reject the hypothesis of equality in WTP between the public and private measures for cyclists at the 1-% significance level; see Table C2.1 in Appendix. We also interact age with the measures for the mobile app, but neither of the coefficients are significant. According to a Wald test the valuation difference between the public and private app is driven by individuals older than 30; see Table C2 (column 2) and Table C2.1 in the Appendix.

5.2 Robustness Tests

Results on several robustness tests are reported in Tables C3 to C7 in Appendix C and discussed here.

Estimations using first answers only

In sub-section 5.2 we reported that all three dummy variables for order have a significant negative direct effect on WTP and may indicate that respondents do not behave consistently throughout the survey. To check the robustness of the results we therefore run the models using the first answer only; see Table C3. The results on the hypothesis tests remain unchanged; see Table C3.1. The private app is still the least preferred and the other two private solutions are the most preferred. Most of the results on the characteristics variables are qualitatively similar to when we include all four scenarios answered by the respondent, except that now there is a significant income effect: high-income earners have a higher WTP, and in the long model (column 6) low-income earners have a lower WTP.

Zero-bids

A large proportion of the respondents stated that they were not willing to pay anything for the risk reduction (see Table 4). A zero-bid is not problematic per se if it is an expression from respondents who truly think that the risk reduction isn't worth anything. However, a zero-bid is of concern if the respondents do value the measure positively but for some reason, e.g., as a protest, state an untrue zero WTP. A common procedure to address this issue is to exclude so-called protest bids based on the answer to follow-up questions to the zero-bid (Bateman et al., 2002).[5] Following the literature we therefore restrict the sample by excluding respondents who stated a zero WTP with the reason being: "I think taxes already are high enough", "I don't believe the measure has any effect for me personally", "I don't believe the measure has any effect for anyone", "The question doesn't feel real to me".[6] The results based on this sample are reported in Table C4 with corresponding Wald tests in Table C4.1. With this sample restriction we no longer find any statistical support for a difference in WTP between a public and a private safety measure when the good used

[5] A protest-bid is an expression from a respondent who does not agree to "play the game" and is not necessarily confined to zero bids, but could also manifest e.g., as a non-response to the valuation question or an extremely high WTP.

[6] We include respondents who give the reason for a zero WTP as "I cannot afford to pay more in tax" (public measures), "I cannot afford" (private measures) and/or "I believe the safety is already high enough".

is a mobile phone app. Our previous results on the other hypotheses are robust. Also, this sample shows a significant income effect, a gender effect (females have a lower WTP) and age effect (individuals aged 65-80 have a higher WTP).

An alternative to analyzing the importance of the zero-bids and that allows us to report all the data is to estimate two models: one for the zero WTP responses and one for the non-zero WTP responses. The results of these two models are reported in Table S5 with corresponding Wald tests in Table C5.1. The results on our hypotheses tests based on the second model (including non-zero WTP responses only) are similar to those reported in Table C4 when excluding zero bids classified as protest-bids.

Certainty calibration

Another robustness test is with respect to how certain respondents are of their stated WTP. We create a dummy variable Certain which takes the value 1 for a reported certainty with a value of at least 8 on the 10-point scale, and zero otherwise (Champ et al., 1997; Champ and Bishop, 2001). We run the models including Certain as a separate variable and find that respondents who express certainty have a lower WTP; see Table C6. The empirical evidence for our hypotheses remains robust to the main results reported in Table 6; see Wald tests in Table C6.1. As an alternative, we drop uncertain answers; see Table C7 and corresponding Wald tests in Table C7.1. The evidence for our hypotheses remains unchanged with this sample.

6 Discussion and Conclusion

This study has explored two key questions regarding the valuation of a risk reduction in the context of traffic safety: (1) whether the willingness to pay (WTP) for a constant risk reduction depends on the specific safety measure used to deliver the safety improvement, and (2) whether WTP differs between public and private measures, and depends on the specific measure. For this purpose, we identified eight different safety measures for vulnerable road users, five public and three private measures. To facilitate meaningful public-private comparisons of WTP, the study was designed to keep the risk situation itself as similar as possible between the public and private measures. Data was collected from a contingent valuation web survey in Sweden.

The first question is to what extent the willingness to pay (WTP) for a constant risk reduction differs among private measures and among public measures. Among public measures, we find that the WTP for a risk reduction is not significantly different for traditional, non-high-tech measures, such as anti-slip treatments, separate lanes, and improved lighting on walking and biking paths. However, the WTP is significantly lower for sensors at intersections and exits that detect when cyclists or pedestrians are approaching and warn motorists to reduce the risk of collisions. It is also much lower for a mobile app that everyone can download for free, which sends signals to cars to reduce the risk of collisions with pedestrians and cyclists. This indicates that the WTP for a public risk reduction decreases if respondents are not familiar with the measure and possibly do not trust that it will achieve the stated risk reduction.

Among private measures, we observe a similar effect: the WTP for a risk reduction is comparable for studded tires on bicycles and/or studded shoes, and for better lights on bicycles, helmets, or clothing. However, WTP is much lower for a mobile app that sends signals to cars to reduce the risk of collisions with pedestrians and cyclists. Hence, a key conclusion is that acceptance and perceived reliability of the measures significantly influence WTP.

The second question we investigated is whether the difference in WTP for risk reduction between private and public measures, as found in previous literature, depends on the specific measure. Again, we find this to be true. For the measures with which respondents are familiar, we arrive at the common result that the WTP for the private measure is higher than for the public measure. The differences in WTP between the private and public measures are consistent across the two measures familiar to respondents (anti-slip treatments and better lights). However, for measures that respondents are not familiar with and that are based on technology, we observe the opposite trend. A tentative conclusion is that respondents place more trust in a mobile phone app supplied by the authorities than one provided by a private company, in line with findings by Andersson Järnberg et al. (2024). The fact that the app and sensors are unfamiliar to the respondents may also introduce uncertainties in the responses, explaining why we find slightly different results from Andersson Järnberg et al. (2024), who found no statistically significant difference in WTP for risk reduction based on a mobile phone app framed as a public good versus a private good when controlling for public vs. private provider. This reinforces the conclusion that for a fair and meaningful comparison of the WTP for similar private and public measures, analysts should ensure that respondents believe the measures can reduce the risk of accidents as stated.

Our findings highlight the necessity of considering not only whether a safety measure is public or private but also the specific characteristics and familiarity of the measure when estimating WTP for risk reduction. Policymakers should exercise caution when transferring valuations from one context to another, especially if the measures differ in familiarity or technological complexity. Future research could further explore the underlying reasons for these preferences, perhaps by examining the role of perceived effectiveness, ease of use, or privacy concerns associated with technology-based measures.

In conclusion, our findings suggest that the specific safety measure indeed matters in determining WTP. To effectively utilize value transfer in cost-benefit analyses, as emphasized by the US Office of Management and Budget (2023), policymakers must ensure that the safety measures considered are comparable not just in their public or private framing but also in their characteristics and the public's perception of them. Understanding these nuances can lead to more accurate valuations and better-informed decisions that enhance public safety and welfare.

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Appendix A1

Table A1: Survey representativeness in terms of gender, age, and residential region compared to the Swedish population, in percent

	Survey			Sweden		
	East	South	North	East	South	North
Female						
18-34	4.13	4.95	1.40	5.93	6.11	2.20
35-49	4.68	4.64	1.83	5.21	5.31	1.93
50-80	10.48	12.47	4.72	8.55	9.88	4.29
Male						
18-34	4.44	4.95	1.56	6.23	6.53	2.50
35-49	4.68	5.57	1.91	5.41	5.52	2.01
50-80	10.02	12.55	5.03	8.33	9.75	4.31

Note: Information obtained from Attityd Karlstad AB.

Table A2: Description and summary statistics of explanatory variables

Variable	Description	Mean (S.D.)
Socio-economic variables		
Age1829	=1 if respondent is aged 18 to 29	0.117 (0.321)
Age6580	=1 if respondent is aged 65 to 80	0.387 (0.487)
Female	=1 if respondent is female or identifies as other	0.493 (0.500)
IncLow	=1 if respondent's household monthly pre-tax income is <30,000 SEK	0.212 (0.409)
IncHigh	=1 if respondent's household monthly pre-tax income is >50,000 SEK	0.387 (0.487)
lnHHSize	Natural logarithm of number of household members (1, 2, 3, 4, 5, >5)	0.651 (0.472)
Children	=1 if respondent's household includes children under the age of 18	0.228 (0.420)
Urban	=1 if respondent lives in urban area	0.662 (0.473)
Attitude variables		
PC=participation coercion, TC=tax coercion, Priv=Private companies, FA=financial altruism		
Publ. reg. (PC)	=1 if strongly disagree or disagree to "The Swedish Alcohol Retailing Monopoly should be abolished."	0.529 (0.499)
Tax attitude (TC, FA)	=1 if strongly disagree or disagree to "Taxes in Sweden are too high."	0.256 (0.436)
Effectiveness (Priv)	=1 if strongly agree or agree to "Private agents are in general more effective than public."	0.346 (0.476)
Privatization (Priv, PC)	=1 if strongly agree or agree to "More government agencies (activities) should be privatized."	0.187 (0.390)
Distribution (FA)	=1 if strongly agree or agree to "The central government and municipality should prioritize to reduce the difference between rich and poor in society."	0.514 (0.500)
Risk assessment and accident experience		
Ownworry	=1 if respondent rates own worry of being injured in a traffic accident as pedestrian or bicyclist ¿5 on a scale 1 (not worried at all) to 10 (very worried)	0.424 (0.494)
Expcar	=1 if respondent has experience of serious injury due to traffic accident in car, irrespective of how many times	0.132 (0.338)
Expbike	=1 if respondent has experience of serious injury due to traffic accident as bicyclist, irrespective of how many times	0.100 (0.300)
Expped	=1 if respondent has experience of serious injury due to traffic accident as pedestrian, irrespective of how many times	0.059 (0.235)
Expfamilycar	=1 if a family member or close friend of respondent has been involved in a traffic accident in car with either fatal outcome or serious injury	0.349 (0.477)
Expfamilybike	=1 if a family member or close friend of respondent has been involved in a traffic accident as a bicyclist with either fatal outcome or serious injury	0.248 (0.432)
Expfamilyped	=1 if a family member or close friend of respondent has been involved in a traffic accident as a bicyclist or pedestrian with either fatal outcome or serious injury	0.151 (0.358)
Consequentiality		
Projectcons	=1 if respondent rates the likelihood >3 (on a scale 1 to 5) that the results of the survey will have any effect on whether any of the suggested interventions will be implemented	0.135 (0.341)

Appendix B: The survey

Background and aim of the study
The aim of this study is to survey how you value interventions for increased road safety for pedestrians and cyclists. The study is part of a research project financed by the Swedish Transport Administration and University X.

Handling of responses
Your answers will be processed so that unauthorized persons cannot access them. We as researchers can never connect the answers to you as a person. The answers are analyzed only at the group level, so that no single individual can be distinguished. If you have questions about anonymity, you are welcome to contact the company administrating the survey.

Principal of Research
This study is done by researchers at University X and Institute Y. Principal of research is University X.

Responsible for the study
Responsible for the study is Z.

○ I have taken part of the information above and agree to participate in the study.

What is your gender?

- O Man
- O Women
- O Other

How old are you?

____

In what community to you reside?

Mark your answer ▼

How often do you ride a bicycle?

- O Often
- O Sometimes
- O Seldom
- O Never

When cycling or walking, indicate how often the following apply:

	Never	Seldom	Sometimes	Often	Always
Cyclists share a road with cars	O	O	O	O	O
There is no or poor lighting on the bicycle or pedestrian paths	O	O	O	O	O
The bicycle or pedestrian paths are unplowed, unsalted, unsanded, and unheated in the winter	O	O	O	O	O
The bicycle or pedestrian paths are bumpy and uneven	O	O	O	O	O
The bicycle or pedestrian paths are crowded	O	O	O	O	O

How worried are you that you will be hurt in an accident while walking or riding a bicycle?

Not worried at all Very worried

1	2	3	4	5	6	7	8	9	10

- O Don’t know

When cycling or walking, indicate how often the following apply:

	Never	Seldom	Sometimes	Often	Always
Do you wear a bicycle helmet when cycling?	O	O	O	O	O
Do you wear a reflective jacket or reflective harness when cycling or walking in the dark?	O	O	O	O	O
Do you have front and rear lights on your bicycle when riding in the dark?	O	O	O	O	O
Do you have studded tires on your bicycle when cycling in the winter?	O	O	O	O	O
Do you have stingers on your shoes when walking in the winter?	O	O	O	O	O

Publicly funded actions to increase road safety

There are several things your municipality can do to reduce your risk of being involved in a serious accident as a pedestrian or bicyclist. These efforts are financed through the tax. In this part, we want to explore how you approach these.

During one year on average 20 individuals who are walking or riding a bicycle in a town with 10 000 inhabitants will be in a road accident which leads to a visit to the emergency. Thus, the risk for an average individual is 0.2%.

We would now like to know what you think about various proposals that the municipality could implement to increase safety for pedestrians and bicyclists. All proposed measures would be paid for through the tax.

	Very bad	Fairly bad	Neither bad nor good	Fairly good	Very good
Better anti-slip control during the winter. For example, more plowing and sanding or heated pedestrian and bicycle paths.	O	O	O	O	O
Improved lighting of pedestrian and bicycle paths.	O	O	O	O	O
Separate lanes for pedestrians and bicyclists.	O	O	O	O	O
An app in the mobile that everyone can download without charge and that sends signals to cars to reduce the risk of collision at intersections.	O	O	O	O	O
Sensors at intersections and exits that detect when cyclists or pedestrians are approaching and warn motorists to reduce the risk of collision.	O	O	O	O	O

Each respondent was asked about her willingness to pay for two different public safety improvements (stated below). Everyone was asked about her WTP for sensors at intersections (last scenario below). The order in which respondents answered the two questions was varied so that 50% started with the question about the sensors and 50% started with the other question.

Half of the respondents were asked about a risk reduction of 50% and the other half of the sample was asked about a risk reduction of 10%. The risk reduction was constant between the public and private alternatives for the same respondent.

Suppose that through better anti-slip measures in winter, one can halve the risk for pedestrians and cyclists to be involved in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

or

Suppose that improving lighting on pedestrian and cycle paths, one can halve the risk of pedestrians and cyclists being involved in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

or

Suppose that by separating the lanes of pedestrians and cyclists, one can halve the risk of pedestrians and cyclists being in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

or

Suppose that through an app on the mobile phone that sends signals to cars, one can halve the risk of pedestrians and cyclists being in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

or

Suppose that by installing sensors at intersections and exits that detect cyclists and pedestrians, one can halve the risk of pedestrians and cyclists being involved in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists will decrease from 20 to 10 per year.

Imagine there being a local referendum on raising taxes to fund this proposal. The tax is distributed equally among all taxpayers.

Which tax increase that will be charged depends on several factors that are yet unknown. Currently, we assume that all the below levels are equally likely. Suppose the proposal will be implemented if enough individuals say yes to the tax increase that ultimately applies.

Mark the highest tax increase you would vote yes to fund this proposal.

It is easy to exaggerate when answering these kinds of questions, therefore, think about what you really want to pay and can afford.

- O 0 SEK per month (0 SEK per year)
- O 5 SEK per month (60 SEK per year)
- O 10 SEK per month (120 SEK per year)
- O 25 SEK per month (300 SEK per year)
- O 50 SEK per month (600 SEK per year)
- O 75 SEK per month (900 SEK per year)
- O 100 SEK per month (0 SEK per year)
- O More than 100 SEK per month (1200 SEK per year)

How certain are you that you would indeed vote yes to a proposal to raise the tax by X SEK (the indicated amount) to fund the proposal?

- O 1 – Not at all
- O 2
- O 3
- O 4
- O 5
- O 6
- O 7
- O 8
- O 9
- O 10 - Completely certain

For respondents who stated that they were not willing to pay anything:

How certain are you that you would indeed not vote yes to a proposal to raise the tax to fund the proposal?

- ○ 1 – Not at all
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10 - Completely sure

You have indicated that you are not willing to pay anything to implement the proposed safety improvement. Please state your main reason(s):

- ❑ I cannot afford to pay more taxes.
- ❑ I think the tax is already too high.
- ❑ I think the safety is already high enough.
- ❑ I don't think the measure has any effect for me personally.
- ❑ I don't think the measure has any effect for anyone.
- ❑ The question doesn't feel real to me.
- ❑ Other reason:

Private goods for increased road safety

There are various goods you can buy yourself to reduce the risk of being involved in an accident as a pedestrian or cyclist. In this part, we want to explore how you approach these.

During one year on average 20 individuals who are walking or riding a bicycle in a town with 10 000 inhabitants will be in a road accident which leads to a visit to the emergency. Thus, the risk for an average individual is 0.2%.

We would now like to know what you think about different types of equipment that you and other pedestrians and cyclists could buy to reduce the risk of accidents.

	Very bad	Fairly bad	Neither bad nor good	Fairly good	Very good
Studded tires on bicycle and/or stingers on shoes that are easy to take off and put on.	O	O	O	O	O
An app in the mobile phone that sends signals to cars to reduce the risk of collision at intersections.	O	O	O	O	O
Better lighting on the bicycle, helmet, or clothes.	O	O	O	O	O

Each respondent was asked about her willingness to pay for two different private goods (stated below). The order in which respondents answered the two questions was varied so that 50% started with one of the three questions randomly selected, and 50% started with one of the remaining two questions randomly selected. Half of the respondents were asked about a risk reduction of 50% and the other half of the sample was asked about a risk reduction of 10%. The risk reduction was constant between the public and private alternatives for the same respondent.

Suppose that with studded tires on a bicycle and/or stingers on shoes that are easy to use and change between different surfaces, you can halve your risk of being in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists would decrease from 20 to 10 if everyone used studded tires and/or stingers.

or

Suppose that with an app on your mobile phone that sends signals to cars to reduce the risk of being hit, you can halve your risk of being in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists would decrease from 20 to 10 if everyone used the app.

or

Suppose that with better lighting on your bicycle, helmet, or clothes, you can halve your risk of being in a serious accident. This means that in a city of 10,000 inhabitants, the number of serious accidents among pedestrians and cyclists would decrease from 20 to 10 if everyone used better lighting.

Mark the maximum cost you are willing to pay for this.

It is easy to exaggerate when answering these kinds of questions, therefore, think about what you really want to pay and can afford.

- 0 SEK per month (0 SEK per year)
- 5 SEK per month (60 SEK per year)
- 10 SEK per month (120 SEK per year)
- 25 SEK per month (300 SEK per year)
- 50 SEK per month (600 SEK per year)
- 75 SEK per month (900 SEK per year)
- 100 SEK per month (0 SEK per year)
- More than 100 SEK per month (1200 SEK per year)

How certain are you that you would really pay for this if it cost X SEK (the indicated amount)?

- 1 – Not at all
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 - Completely certain

For respondents who stated that they were not willing to pay anything:

How certain are you that you would not want to pay for this?

- 1 – Not at all
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 - Completely certain

You have indicated that you are not willing to pay anything for the safety improvement. Please state your main reason(s):

- ❑ I cannot afford it.
- ❑ I don't think the item improves my safety.
- ❑ I think the safety is already high enough.
- ❑ The question doesn't feel real to me.
- ❑ Other reason:

Have you ever been involved in a serious traffic accident that meant you needed to visit the emergency room?

	Yes	No
In car	○	○
As a cyclist	○	○
As a pedestrian	○	○

Do you know if a friend or close relative of yours has been seriously injured or died because of a traffic accident?

	Yes	No
In car	○	○
As a cyclist	○	○
As a pedestrian	○	○

Mark on a scale [1-5] how much you agree with the following statements:

In general, private actors are more effective than public actors.

Do not agree at all | Agree completely

1	2	3	4	5

More businesses should be privatized.

Do not agree at all | Agree completely

1	2	3	4	5

Taxes in Sweden are too high.

Do not agree at all | Agree completely

1	2	3	4	5

The state and municipality should prioritize reducing the differences between poor and rich in society.

Do not agree at all | Agree completely

1	2	3	4	5

Systembolaget's monopoly on alcohol sales should be abolished.

Do not agree at all | Agree completely

1	2	3	4	5

How many people are included in your household? Include yourself.

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ More than 4

If more than 1 in the previous question: Of the members of your household, how many of these are under 18 years of age?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ More than 4

I live

- ○ in urban area with urban traffic
- ○ in rural area
- ○ Don't know

What is your highest completed level of education?

- ○ Nine-year compulsory school for children aged 7-16 (Grundskola in Swedish)
- ○ Seven (eight)-year compulsory school for children aged 7-11 (Folkskola in Swedish)
- ○ Secondary education that existed 1905-1972 (Realskola in Swedish) or similar
- ○ 2-year upper secondary education or vocational school
- ○ 3-year or 4-year upper secondary education
- ○ University or college education shorter than 3 years
- ○ University or college education 3 years or longer
- ○ Other

What is your current main occupation?

- ○ Employee
- ○ Self-employed
- ○ Pensioner
- ○ Student
- ○ Jobseeker
- ○ Sick leave
- ○ Other, state what:

Country of birth

- ○ Sweden
- ○ Other European country
- ○ Other country outside Europe
- ○ Do not want to answer

What is the household's approximate total monthly income before tax?

- ○ Less than 10,000 SEK.
- ○ 10,000 - 29,999 SEK.
- ○ 30,000 - 49,999 SEK.
- ○ 50,000 - 69,999 SEK.
- ○ 70,000 - 89,999 SEK.
- ○ 90,000 - 149,999 SEK.
- ○ 150,000 - 300,000 SEK.
- ○ Over SEK 300,000.
- ○ Don’t know
- ○ I wish not to answer

Do you think that the results of this survey will affect what measures will be implemented to reduce the risk for pedestrians and cyclists in Sweden?

- ○ 1 = Not at all
- ○ 2
- ○ 3
- ○ 4
- ○ 5 = Very likely

How satisfied have you been with your life in the past twelve months?

Extremely dissatisfied — Very satisfied

0	1	2	3	4	5	6	7	8	9	10

Thank you for taking the time to answer the survey!

Appendix C: Additional tables

Table C1 Panel interval regression with scenario dummies and stepwise adding covariates, corresponding to Table 6 in the main text

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slip_Pu	2.708***	2.708***	2.693***	2.691***	2.709***	2.731***	2.718***
	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)
Light_Pu	3.069***	3.069***	3.073***	3.075***	3.070***	3.060***	3.034***
	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)
Lane_Pu	1.675*	1.675*	1.668*	1.691**	1.682**	1.693**	1.714**
	(0.86)	(0.86)	(0.86)	(0.86)	(0.86)	(0.86)	(0.86)
App_Pu	-6.673***	-6.673***	-6.651***	-6.677***	-6.685***	-6.721***	-6.698***
	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)
Slip_Pr	8.647***	8.647***	8.651***	8.644***	8.644***	8.651***	8.670***
	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)
App_Pr	-10.262***	-10.262***	-10.261***	-10.263***	-10.264***	-10.281***	-10.310***
	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)
Light_Pr	9.815***	9.815***	9.807***	9.810***	9.816***	9.821***	9.848***
	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)
Risk	-0.262	-0.262	-0.333	-0.355	-0.194	-0.461	-0.343
	(0.92)	(0.92)	(0.91)	(0.91)	(0.91)	(0.90)	(0.89)
Order2	-5.392***	-5.392***	-5.386***	-5.389***	-5.390***	-5.388***	-5.385***
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Order3	-7.759***	-7.759***	-7.753***	-7.752***	-7.753***	-7.751***	-7.749***
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Order4	-9.931***	-9.931***	-9.926***	-9.928***	-9.925***	-9.924***	-9.929***
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Age1829			6.130***	6.004***	5.627***	4.729***	4.303***
			(1.51)	(1.51)	(1.50)	(1.50)	(1.48)
Age6580			2.570**	2.657**	2.855***	2.846***	2.882***
			(1.09)	(1.08)	(1.08)	(1.07)	(1.06)
Female			0.161	-0.448	-0.002	0.214	-0.535
			(0.93)	(0.94)	(0.94)	(0.94)	(0.93)
IncLow			-2.110	-2.101	-2.291*	-2.395*	-3.164**
			(1.31)	(1.31)	(1.30)	(1.29)	(1.28)
IncHigh			3.367***	3.327***	3.159***	3.234***	2.631**
			(1.07)	(1.07)	(1.07)	(1.06)	(1.05)
lnHHsize			-1.961	-1.935	-1.846	-2.073	-2.238
			(1.47)	(1.46)	(1.46)	(1.45)	(1.43)
Children			3.597**	3.561**	3.193**	3.085**	3.447**
			(1.58)	(1.58)	(1.57)	(1.56)	(1.54)
Urban			1.368	1.127	1.001	0.879	0.820
			(0.98)	(0.97)	(0.97)	(0.97)	(0.95)
Ownworry				4.085***	3.363***	2.973***	3.177***
				(0.93)	(0.94)	(0.93)	(0.92)
Expcar					1.772	1.688	2.441*
					(1.41)	(1.40)	(1.38)
Expbike					2.511	2.281	2.082
					(1.57)	(1.56)	(1.53)
Expped					4.064**	3.756*	3.780*
					(2.01)	(1.99)	(1.97)
Expfamilycar					0.297	0.431	0.498
					(1.04)	(1.03)	(1.01)
Expfamilybike					3.118***	2.972***	2.541**
					(1.16)	(1.15)	(1.13)
Expfamilyped					0.999	0.803	0.875
					(1.42)	(1.41)	(1.39)
Projectcons						8.591***	7.901***

						(1.32)	(1.31)
Effectiveness							1.268
							(1.08)
Privatization							2.212*
							(1.33)
Tax attitude							7.678***
							(1.10)
Distribution							4.132***
							(0.93)
Public regulation							1.035
							(0.96)
Constant	16.932***	16.932***	13.869***	12.597***	11.033***	10.494***	5.777***
	(0.78)	(0.78)	(1.65)	(1.67)	(1.72)	(1.71)	(1.84)
sigma_u	21.647***	21.647***	21.469***	21.372***	21.236***	21.030***	20.617***
	(0.40)	(0.40)	(0.39)	(0.39)	(0.39)	(0.39)	(0.38)
sigma_e	16.108***	16.108***	16.106***	16.108***	16.109***	16.112***	16.121***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
N	10668	10668	10668	10668	10668	10668	10668
Log lik.	-17517.9	-17517.9	-17499.3	-17489.7	-17475.7	-17454.7	-17408.2
rho	0.644	0.644	0.640	0.638	0.635	0.630	0.621
LR-test panel	4051.8	4051.8	3991.4	3954.9	3905.9	3830.7	3685.2

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C2 Heterogeneity: Panel interval regression with scenario dummies, other covariates, with group dummies for bicyclist and scenario interactions (column 1), and age interactions with app scenarios (column 2)

	(1)	(2)
Slip_Pu	2.959***	2.715***
	(0.95)	(0.84)
Light_Pu	3.354***	3.046***
	(0.94)	(0.84)
Lane_Pu	2.425	1.706**
	(1.94)	(0.86)
App_Pu	-6.369***	-6.717***
	(1.02)	(0.93)
Slip_Pr	8.429***	8.669***
	(0.64)	(0.57)
App_Pr	-9.984***	-10.563***
	(0.69)	(0.64)
Light_Pr	9.802***	9.848***
	(0.64)	(0.57)
Risk	-0.396	-0.337
	(0.89)	(0.89)
Order2	-5.378***	-5.389***
	(0.50)	(0.50)
Order3	-7.744***	-7.751***
	(0.50)	(0.50)
Order4	-9.933***	-9.932***
	(0.50)	(0.50)
Age1829	4.172***	4.006***
	(1.47)	(1.50)
Age6580	3.023***	2.880***
	(1.06)	(1.06)
Female	-0.520	-0.534
	(0.93)	(0.93)
IncLow	-3.261**	-3.166**
	(1.28)	(1.28)
IncHigh	2.623**	2.625**

	(1.05)	(1.05)
lnHHsize	-2.339	-2.235
	(1.42)	(1.43)
Children	3.598**	3.445**
	(1.53)	(1.54)
Urban	0.544	0.818
	(0.96)	(0.95)
Ownworry	3.065***	3.176***
	(0.92)	(0.92)
Expcar	2.517*	2.434*
	(1.38)	(1.38)
Expbike	1.565	2.085
	(1.54)	(1.53)
Exped	3.835*	3.777*
	(1.96)	(1.97)
Expfamilycar	0.569	0.496
	(1.01)	(1.01)
Expfamilybike	2.290**	2.548**
	(1.13)	(1.13)
Expfamilyped	0.903	0.869
	(1.38)	(1.39)
Projectcons	7.811***	7.895***
	(1.31)	(1.31)
Effectiveness	1.264	1.262
	(1.08)	(1.08)
Privatization	2.246*	2.207*
	(1.32)	(1.33)
Tax attitude	7.620***	7.675***
	(1.10)	(1.10)
Distribution	4.057***	4.128***
	(0.93)	(0.93)
Public regulation	1.026	1.037
	(0.95)	(0.96)
Bicyclist	3.273***	
	(1.27)	
Bicyclist*Slip_Pu	-1.098	
	(2.03)	
Bicyclist*Light_Pu	-1.498	
	(2.08)	
Bicyclist*Lane_Pu	-0.865	
	(2.11)	
Bicyclist*App_Pu	-1.329	
	(1.99)	
Bicyclist*Slip_Pr	1.124	
	(1.32)	
Bicyclist*App_Pr	-1.435	
	(1.42)	
Bicyclist*Light_Pr	0.161	
	(1.29)	
Age1829*App_Pu		0.138
		(2.71)
Age1829*App_Pr		2.098
		(1.66)
Constant	5.465***	5.822***
	(1.85)	(1.84)
sigma_u	20.577***	20.616***
	(0.38)	(0.38)
sigma_e	16.116***	16.120***
	(0.09)	(0.09)
N	10668	10668

Log lik.	-17402.3	-17407.4
rho	0.620	0.621
LR-test panel	3673.6	3683.9

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dummy variable *Bicyclist* takes the value one for respondents who state they ride a bike often, and the value zero if they never, seldom, or sometimes ride a bike.

Table C2.1 Wald tests for some valuation comparisons for results reported in Table C2

Hypotheses	Bicyclist (column 1)		Age (column 2)	
	Non-cyclists	Cyclists	Age 30+	Age18-29
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	30.39 (0.00)	16.40 (0.00)		
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	42.77 (0.00)	17.55 (0.00)		
$WTP_{App\_Pu} = WTP_{App\_Pr}$	10.96 (0.00)	3.92 (0.05)	14.77 (0.00)	0.44 (0.51)

Note: Chi2-value and corresponding p-value of two-sided test within parentheses.

Table C3 Interval regressions based on first answer only

	(1)	(2)	(3)	(4)	(5)	(6)
Slip_Pu	2.696	2.709	2.757	2.987	3.281	3.885*
	(2.42)	(2.40)	(2.40)	(2.39)	(2.38)	(2.36)
Light_Pu	1.609	1.841	1.869	2.015	2.193	2.609
	(2.56)	(2.55)	(2.55)	(2.54)	(2.53)	(2.50)
Lane_Pu	-0.255	-0.455	-0.280	-0.254	-0.098	0.815
	(2.35)	(2.33)	(2.33)	(2.32)	(2.31)	(2.29)
App_Pu	-0.559	-0.342	-0.502	-0.554	-0.840	-0.477
	(2.36)	(2.35)	(2.35)	(2.34)	(2.33)	(2.30)
Slip_Pr	16.977***	17.214***	17.107***	17.023***	17.043***	17.209***
	(1.69)	(1.68)	(1.68)	(1.67)	(1.67)	(1.65)
App_Pr	-11.413***	-11.301***	-11.250***	-11.209***	-11.124***	-11.111***
	(1.80)	(1.79)	(1.78)	(1.78)	(1.77)	(1.75)
Light_Pr	17.674***	17.556***	17.456***	17.535***	17.815***	18.559***
	(1.70)	(1.69)	(1.69)	(1.68)	(1.68)	(1.66)
Risk	0.638	0.566	0.526	0.718	0.496	0.713
	(1.11)	(1.10)	(1.10)	(1.10)	(1.09)	(1.08)
Age1829		3.847**	3.761**	3.437*	2.607	2.097
		(1.78)	(1.78)	(1.78)	(1.78)	(1.76)
Age6580		4.649***	4.713***	4.871***	4.851***	4.864***
		(1.28)	(1.28)	(1.28)	(1.28)	(1.26)
Female		0.229	-0.168	0.313	0.522	-0.381
		(1.10)	(1.11)	(1.12)	(1.11)	(1.11)
IncLow		-3.029*	-3.031**	-3.217**	-3.328**	-4.217***
		(1.55)	(1.54)	(1.54)	(1.53)	(1.52)
IncHigh		4.013***	3.973***	3.925***	4.001***	3.383***
		(1.27)	(1.26)	(1.26)	(1.26)	(1.25)
lnHHsize		-3.122*	-3.099*	-3.024*	-3.228*	-3.410**
		(1.73)	(1.73)	(1.72)	(1.72)	(1.70)
Children		3.090*	3.063	2.697	2.563	3.043*
		(1.87)	(1.87)	(1.86)	(1.85)	(1.83)
Urban		1.540	1.381	1.380	1.244	1.158
		(1.15)	(1.15)	(1.16)	(1.15)	(1.14)
Ownworry			2.737**	1.982*	1.612	1.890*
			(1.10)	(1.11)	(1.11)	(1.10)
Expcar				2.743*	2.670	3.558**
				(1.67)	(1.66)	(1.64)
Expbike				1.515	1.298	1.101
				(1.86)	(1.86)	(1.83)
Expped				4.845**	4.590*	4.654**
				(2.37)	(2.36)	(2.33)

Expfamilycar				0.153	0.273	0.300
				(1.23)	(1.22)	(1.21)
Expfamilybike				1.381	1.261	0.831
				(1.38)	(1.37)	(1.35)
Expfamilyped				2.346	2.152	2.185
				(1.68)	(1.67)	(1.65)
Projectcons					8.111***	7.485***
					(1.57)	(1.55)
Effectiveness						0.614
						(1.29)
Privatization						2.330
						(1.58)
Tax attitude						8.565***
						(1.31)
Distribution						4.466***
						(1.11)
Public regulation						0.961
						(1.14)
Constant	13.621***	10.637***	9.809***	8.296***	7.689***	2.541
	(1.25)	(2.12)	(2.15)	(2.20)	(2.20)	(2.36)
lnsigma _cons	3.277***	3.270***	3.269***	3.265***	3.260***	3.245***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	2667	2667	2667	2667	2667	2667
Log lik.	-4956.4	-4939.6	-4936.5	-4927.0	-4913.6	-4873.8

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C3.1 Wald tests for some valuation comparisons for results reported in Table C3

Hypotheses	Short model (column 1)		Full model (column 6)	
	Difference	Chi2 (p-value)	Difference	Chi2 (p-value)
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	-14.28	32.25 (0.00)	-13.32	29.53 (0.00)
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	-16.07	36.60 (0.00)	-15.95	38.00 (0.00)
$WTP_{App\_Pu} = WTP_{App\_Pr}$	10.85	18.13 (0.00)	10.63	18.26 (0.00)

Note: Difference between estimates of similar public-private measures. Chi2-value and corresponding p-value of two-sided test within parentheses.

Table C4 Without protest zeros: Panel interval regression with scenario dummies and other covariates, testing for sample restrictions with respect to bid levels including "true" $WTP = 0$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slip_Pu	1.282	1.171	1.099	1.100	1.112	1.127	1.107
	(0.80)	(0.78)	(0.78)	(0.78)	(0.78)	(0.78)	(0.78)
Light_Pu	0.060	0.371	0.377	0.384	0.384	0.389	0.377
	(0.80)	(0.78)	(0.78)	(0.78)	(0.78)	(0.78)	(0.78)
Lane_Pu	0.797	0.832	0.837	0.852	0.851	0.855	0.849
	(0.82)	(0.80)	(0.80)	(0.80)	(0.80)	(0.80)	(0.80)
App_Pu	-1.599*	-2.023**	-1.985**	-2.015**	-2.026**	-2.073**	-2.048**
	(0.87)	(0.85)	(0.85)	(0.85)	(0.85)	(0.85)	(0.85)
Slip_Pr	7.495***	7.360***	7.337***	7.334***	7.336***	7.346***	7.368***
	(0.54)	(0.53)	(0.53)	(0.53)	(0.53)	(0.53)	(0.53)
App_Pr	-3.190***	-3.386***	-3.389***	-3.402***	-3.406***	-3.435***	-3.445***
	(0.63)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)
Light_Pr	6.876***	6.805***	6.771***	6.783***	6.797***	6.813***	6.847***
	(0.54)	(0.52)	(0.52)	(0.52)	(0.52)	(0.52)	(0.52)
Risk	-0.413	-0.377	-0.397	-0.423	-0.296	-0.464	-0.400
	(0.83)	(0.84)	(0.83)	(0.83)	(0.82)	(0.82)	(0.82)
Order2		-3.510***	-3.488***	-3.496***	-3.505***	-3.510***	-3.512***
		(0.47)	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)

Order3		-6.003***	-5.974***	-5.975***	-5.981***	-5.986***	-5.991***
		(0.47)	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)
Order4		-7.868***	-7.842***	-7.848***	-7.850***	-7.856***	-7.863***
		(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)
Age1829			2.990**	2.926**	2.705**	2.175	1.913
			(1.35)	(1.35)	(1.35)	(1.35)	(1.34)
Age6580			2.653***	2.725***	2.848***	2.833***	2.915***
			(0.99)	(0.99)	(0.99)	(0.98)	(0.98)
Female			-2.414***	-2.827***	-2.491***	-2.353***	-2.625***
			(0.84)	(0.85)	(0.86)	(0.85)	(0.86)
IncLow			-4.398***	-4.401***	-4.516***	-4.543***	-4.829***
			(1.18)	(1.18)	(1.18)	(1.17)	(1.17)
IncHigh			3.132***	3.095***	3.026***	3.075***	2.604***
			(0.98)	(0.97)	(0.97)	(0.97)	(0.97)
lnHHsize			-2.360*	-2.362*	-2.267*	-2.385*	-2.475*
			(1.33)	(1.33)	(1.33)	(1.32)	(1.31)
Children			2.339	2.345*	2.067	2.009	2.245
			(1.43)	(1.42)	(1.42)	(1.42)	(1.41)
Urban			0.414	0.245	0.194	0.132	0.095
			(0.89)	(0.89)	(0.89)	(0.88)	(0.88)
Ownworry				2.696***	2.203***	1.979**	2.114**
				(0.84)	(0.85)	(0.85)	(0.85)
Expcar					0.873	0.836	1.345
					(1.27)	(1.27)	(1.26)
Expbike					1.999	1.869	1.690
					(1.42)	(1.42)	(1.41)
Expped					2.184	1.961	1.968
					(1.81)	(1.81)	(1.80)
Expfamilycar					0.222	0.325	0.383
					(0.94)	(0.94)	(0.93)
Expfamilybike					1.675	1.591	1.354
					(1.04)	(1.04)	(1.03)
Expfamilyped					1.167	1.045	1.065
					(1.29)	(1.28)	(1.27)
Projectcons						5.119***	4.688***
						(1.19)	(1.19)
Effectiveness							1.506
							(0.99)
Privatization							1.777
							(1.22)
Tax attitude							4.964***
							(1.00)
Distribution							1.858**
							(0.86)
Public regulation							0.818
							(0.88)
Constant	18.735***	22.905***	23.216***	22.385***	21.296***	20.912***	17.651***
	(0.66)	(0.71)	(1.50)	(1.52)	(1.57)	(1.57)	(1.71)
sigma_u	18.836***	18.997***	18.723***	18.679***	18.614***	18.530***	18.362***
	(0.35)	(0.35)	(0.34)	(0.34)	(0.34)	(0.34)	(0.34)
sigma_e	14.070***	13.627***	13.629***	13.628***	13.629***	13.630***	13.629***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
N	8153	8153	8153	8153	8153	8153	8153
Log lik.	-15213.7	-15063.5	-15035.4	-15030.3	-15023.4	-15014.2	-14993.6
rho	0.642	0.660	0.654	0.653	0.651	0.649	0.645
LR-test panel	3247.1	3445.2	3344.1	3333.0	3307.9	3277.4	3229.2

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The sample contains respondents who have stated a zero WTP with the reason being that “I cannot afford to pay more in tax” (public scenarios), “I cannot afford” (private scenarios) and/or “I believe the safety is already high enough”. The results in this table can be compared with Table 6 in the main text which contains all bid levels including all zeros, and Table C5 (Column 2) which contains only $WTP > 0$ answers.

Table C4.1 Wald tests for some valuation comparisons for results reported in Table C4

Hypotheses	Short model (column 1)		Full model (column 6)	
	Difference	Chi2 (p-value)	Difference	Chi2 (p-value)
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	-6.21	55.46 (0.00)	-6.26	59.48 (0.00)
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	-6.82	67.24 (0.00)	-6.47	64.00 (0.00)
$WTP_{App\_Pu} = WTP_{App\_Pr}$	1.59	2.78 (0.10)	1.40	2.27 (0.13)

Note: Difference between estimates of similar public-private measures. Chi2-value and corresponding p-value of two-sided test within parentheses.

Table C5 Column (1) is a panel probit model (RE) for prob ($WTP > 0$), and column (2) is a panel interval regression of the full model including only $WTP > 0$ answers

	(1)	(2)
Slip_Pu	0.264***	0.997
	(0.09)	(0.77)
Light_Pu	0.444***	-0.106
	(0.09)	(0.77)
Lane_Pu	0.085	0.991
	(0.08)	(0.80)
App_Pu	-0.744***	-1.553*
	(0.08)	(0.85)
Slip_Pr	0.353***	7.391***
	(0.06)	(0.53)
App_Pr	-1.137***	-2.216***
	(0.06)	(0.62)
Light_Pr	0.655***	6.569***
	(0.06)	(0.52)
Risk	-0.076	0.283
	(0.07)	(0.76)
Order2	-0.475***	-3.061***
	(0.05)	(0.47)
Order3	-0.561***	-5.470***
	(0.05)	(0.47)
Order4	-0.688***	-7.353***
	(0.05)	(0.48)
Age1829	0.291**	2.179*
	(0.12)	(1.25)
Age6580	0.261***	0.944
	(0.09)	(0.91)
Female	0.252***	-4.060***
	(0.08)	(0.80)
IncLow	-0.002	-3.848***
	(0.11)	(1.10)
IncHigh	0.144*	1.728*
	(0.09)	(0.90)
lnHHsize	-0.010	-3.213***
	(0.12)	(1.23)
Children	0.265**	1.979
	(0.13)	(1.30)
Urban	0.180**	-0.256
	(0.08)	(0.82)
Ownworry	0.276***	1.832**
	(0.08)	(0.79)
Expcar	0.219*	1.412

	(0.12)	(1.17)
Expbike	0.248*	0.942
	(0.13)	(1.30)
Expped	0.397**	1.933
	(0.17)	(1.66)
Expfamilycar	0.009	0.089
	(0.08)	(0.86)
Expfamilybike	0.191**	0.547
	(0.09)	(0.95)
Expfamilyped	0.071	0.990
	(0.12)	(1.17)
Projectcons	0.792***	3.077***
	(0.12)	(1.09)
Effectiveness	0.152*	-0.095
	(0.09)	(0.92)
Privatization	0.113	2.263**
	(0.11)	(1.13)
Taxation	0.677***	3.124***
	(0.09)	(0.92)
Distribution	0.423***	1.125
	(0.08)	(0.79)
Public regulation	0.087	-0.257
	(0.08)	(0.82)
Constant	0.102	25.303***
	(0.15)	(1.62)
lnsig2u	0.860***	
	(0.06)	
sigma_u		16.269***
		(0.31)
sigma_e		13.155***
		(0.12)
N	10668	7318
Log lik.	-4950.6	-14049.1
rho	0.703	0.605
LR-test panel	2049.3	2523.0

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C5.1 Wald tests for some valuation comparisons for results reported in Table C5

Hypotheses	Probit model (column 1)	Full model (column 2)
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	0.97 (0.33)	62.17 (0.00)
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	5.28 (0.02)	69.00 (0.00)
$WTP_{App\_Pu} = WTP_{App\_Pr}$	21.06 (0.00)	0.51 (0.48)

Note: Chi2-value and corresponding p-value of two-sided test within parentheses.

Table C6 Certainty calibration: Panel interval regression with scenario dummies and other covariates, including a dummy variable for certainty

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slip_Pu	2.828***	2.735***	2.719***	2.716***	2.736***	2.759***	2.747***
	(0.87)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)
Light_Pu	2.652***	3.058***	3.062***	3.064***	3.058***	3.047***	3.021***
	(0.86)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)	(0.84)
Lane_Pu	1.780**	1.727**	1.722**	1.745**	1.737**	1.752**	1.776**
	(0.88)	(0.86)	(0.86)	(0.86)	(0.86)	(0.86)	(0.86)
App_Pu	-6.381***	-6.654***	-6.633***	-6.658***	-6.667***	-6.703***	-6.679***
	(0.90)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)
Slip_Pr	8.720***	8.664***	8.668***	8.661***	8.661***	8.669***	8.690***

	(0.58)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)	(0.57)
App_Pr	-10.177***	-10.210***	-10.210***	-10.211***	-10.211***	-10.227***	-10.255***
	(0.63)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)
Light_Pr	9.929***	9.868***	9.861***	9.863***	9.870***	9.879***	9.909***
	(0.58)	(0.57)	(0.56)	(0.56)	(0.56)	(0.57)	(0.57)
Risk	-0.214	-0.198	-0.266	-0.289	-0.123	-0.402	-0.275
	(0.92)	(0.92)	(0.92)	(0.92)	(0.91)	(0.90)	(0.89)
Certain	-4.067***	-3.398***	-3.404***	-3.424***	-3.447***	-3.633***	-3.783***
	(0.56)	(0.55)	(0.55)	(0.55)	(0.55)	(0.55)	(0.55)
Order2		-5.303***	-5.297***	-5.299***	-5.300***	-5.293***	-5.287***
		(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Order3		-7.597***	-7.591***	-7.589***	-7.589***	-7.578***	-7.569***
		(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Order4		-9.794***	-9.789***	-9.790***	-9.786***	-9.777***	-9.777***
		(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.51)
Age1829			5.926***	5.797***	5.419***	4.458***	3.998***
			(1.52)	(1.52)	(1.51)	(1.50)	(1.48)
Age6580			2.898***	2.989***	3.194***	3.203***	3.248***
			(1.09)	(1.09)	(1.09)	(1.08)	(1.07)
Female			0.045	-0.576	-0.122	0.099	-0.654
			(0.94)	(0.94)	(0.95)	(0.94)	(0.94)
IncLow			-2.148	-2.139	-2.329*	-2.442*	-3.219**
			(1.32)	(1.31)	(1.31)	(1.30)	(1.28)
IncHigh			3.431***	3.390***	3.225***	3.308***	2.692**
			(1.08)	(1.07)	(1.07)	(1.06)	(1.05)
lnHHsize			-2.001	-1.976	-1.890	-2.133	-2.315
			(1.48)	(1.47)	(1.46)	(1.45)	(1.43)
Children			3.669**	3.633**	3.255**	3.144**	3.512**
			(1.59)	(1.59)	(1.58)	(1.57)	(1.54)
Urban			1.362	1.117	0.999	0.870	0.817
			(0.98)	(0.98)	(0.98)	(0.97)	(0.96)
Ownworry				4.160***	3.424***	3.014***	3.211***
				(0.94)	(0.94)	(0.94)	(0.93)
Expcar					1.920	1.838	2.603*
					(1.42)	(1.40)	(1.39)
Expbike					2.434	2.187	1.980
					(1.58)	(1.56)	(1.54)
Expped					3.931*	3.598*	3.625*
					(2.02)	(2.00)	(1.97)
Expfamilycar					0.349	0.493	0.565
					(1.04)	(1.03)	(1.02)
Expfamilybike					3.180***	3.029***	2.590**
					(1.16)	(1.15)	(1.14)
Expfamilyped					1.071	0.869	0.943
					(1.43)	(1.41)	(1.39)
Projectcons						9.083***	8.373***
						(1.33)	(1.31)
Effectiveness							1.449
							(1.08)
Privatization							2.361*
							(1.33)
Taxation							7.760***
							(1.11)
Distribution							4.312***
							(0.93)
Public regulation							1.157
							(0.96)
Constant	13.522***	18.805***	15.696***	14.410***	12.806***	12.333***	7.446***
	(0.79)	(0.84)	(1.68)	(1.70)	(1.75)	(1.74)	(1.86)
sigma_u	21.650***	21.766***	21.587***	21.488***	21.350***	21.128***	20.702***

	(0.40)	(0.40)	(0.40)	(0.39)	(0.39)	(0.39)	(0.38)
sigma_e	16.638***	16.087***	16.085***	16.087***	16.088***	16.092***	16.103***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
N	10668	10668	10668	10668	10668	10668	10668
Log lik.	-17703.9	-17498.7	-17480.1	-17470.3	-17456.0	-17432.8	-17384.3
rho	0.629	0.647	0.643	0.641	0.638	0.633	0.623
LR-test panel	3844.4	4085.8	4025.3	3988.6	3939.6	3863.0	3715.0

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Certain* is a dummy variable that takes the value 1 for a reported certainty with a value of at least 8 on the 10-point scale, and zero otherwise.

Table C6.1 Wald tests for some valuation comparisons for results reported in Table C6

Hypotheses	Short model (column 1)	Full model (column 7)
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	42.41 (0.00)	45.58 (0.00)
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	64.93 (0.00)	61.45 (0.00)
$WTP_{App\_Pu} = WTP_{App\_Pr}$	15.33 (0.00)	14.32 (0.00)

Note: Chi2-value and corresponding p-value of two-sided test within parentheses.

Table C7 Certainty calibration: Panel interval regression with scenario dummies and other covariates, dropping uncertain answers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slip_Pu	1.387	1.536	1.521	1.517	1.512	1.580	1.552
	(1.23)	(1.21)	(1.20)	(1.20)	(1.20)	(1.20)	(1.21)
Light_Pu	2.924**	3.377***	3.440***	3.437***	3.434***	3.457***	3.448***
	(1.23)	(1.20)	(1.20)	(1.20)	(1.20)	(1.20)	(1.20)
Lane_Pu	1.626	1.718	1.680	1.685	1.703	1.698	1.723
	(1.21)	(1.19)	(1.19)	(1.19)	(1.19)	(1.19)	(1.19)
App_Pu	-5.750***	-6.156***	-6.134***	-6.166***	-6.168***	-6.205***	-6.195***
	(1.27)	(1.25)	(1.25)	(1.25)	(1.25)	(1.25)	(1.25)
Slip_Pr	8.987***	8.973***	8.993***	8.975***	8.987***	9.015***	9.079***
	(0.83)	(0.81)	(0.81)	(0.81)	(0.81)	(0.81)	(0.81)
App_Pr	-12.402***	-12.444***	-12.436***	-12.446***	-12.462***	-12.437***	-12.509***
	(0.89)	(0.87)	(0.87)	(0.87)	(0.87)	(0.87)	(0.87)
Light_Pr	9.965***	9.923***	9.903***	9.905***	9.900***	9.894***	9.908***
	(0.82)	(0.80)	(0.80)	(0.80)	(0.80)	(0.80)	(0.80)
Risk	-0.094	-0.126	-0.200	-0.342	-0.238	-0.642	-0.487
	(1.27)	(1.26)	(1.26)	(1.25)	(1.25)	(1.24)	(1.21)
Order2		-5.133***	-5.135***	-5.141***	-5.142***	-5.128***	-5.082***
		(0.72)	(0.72)	(0.72)	(0.72)	(0.72)	(0.72)
Order3		-7.165***	-7.178***	-7.181***	-7.171***	-7.153***	-7.163***
		(0.72)	(0.72)	(0.72)	(0.72)	(0.72)	(0.72)
Order4		-9.110***	-9.116***	-9.114***	-9.116***	-9.108***	-9.116***
		(0.73)	(0.73)	(0.73)	(0.73)	(0.73)	(0.73)
Age1829			8.136***	7.784***	7.391***	6.029***	5.674***
			(2.16)	(2.15)	(2.14)	(2.13)	(2.10)
Age6580			4.838***	4.863***	5.141***	5.222***	5.276***
			(1.50)	(1.49)	(1.49)	(1.48)	(1.45)
Female			1.871	0.912	1.343	1.603	0.084
			(1.28)	(1.29)	(1.29)	(1.28)	(1.28)
IncLow			-2.264	-2.270	-2.384	-2.570	-3.973**
			(1.83)	(1.82)	(1.81)	(1.80)	(1.78)
IncHigh			4.489***	4.401***	4.197***	4.200***	3.582**
			(1.47)	(1.47)	(1.46)	(1.45)	(1.43)
lnHHsize			-2.263	-2.106	-1.954	-2.325	-2.604
			(2.06)	(2.05)	(2.04)	(2.02)	(1.99)
Children			3.991*	3.730*	3.375	3.398	3.873*
			(2.22)	(2.21)	(2.20)	(2.18)	(2.13)

Urban			1.482	1.269	1.055	0.973	0.692
			(1.34)	(1.33)	(1.33)	(1.32)	(1.30)
Ownworry				5.931***	4.937***	4.424***	4.704***
				(1.28)	(1.29)	(1.28)	(1.26)
Expcar					0.868	0.556	1.678
					(1.90)	(1.88)	(1.85)
Expbike					2.963	2.948	2.640
					(2.19)	(2.17)	(2.13)
Expped					6.301**	5.385*	5.023*
					(2.84)	(2.82)	(2.77)
Expfamilycar					1.062	1.322	1.257
					(1.41)	(1.40)	(1.37)
Expfamilybike					3.644**	3.435**	3.193**
					(1.56)	(1.55)	(1.52)
Expfamilyped					1.773	1.447	1.615
					(1.91)	(1.89)	(1.86)
Projectcons						10.863***	10.194***
						(1.72)	(1.69)
Effectiveness							0.863
							(1.48)
Privatization							2.018
							(1.79)
Tax attitude							9.866***
							(1.50)
Distribution							5.544***
							(1.29)
Public regulation							2.235*
							(1.32)
Constant	8.795***	14.306***	8.854***	7.033***	5.039**	4.221*	-1.876
	(1.02)	(1.10)	(2.28)	(2.31)	(2.38)	(2.36)	(2.55)
sigma_u	25.801***	25.782***	25.554***	25.416***	25.227***	24.925***	24.282***
	(0.59)	(0.58)	(0.58)	(0.58)	(0.57)	(0.57)	(0.56)
sigma_e	17.118***	16.689***	16.691***	16.694***	16.697***	16.703***	16.721***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
N	6573	6573	6573	6573	6573	6573	6573
Log lik.	-10238.4	-10153.1	-10136.9	-10126.2	-10114.0	-10094.2	-10048.4
rho	0.694	0.705	0.701	0.699	0.695	0.690	0.678
LR-test panel	2586.0	2678.6	2633.8	2612.6	2570.1	2504.8	2377.1

Note: Standard errors within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Certain* is a dummy variable that takes the value 1 for a reported certainty with a value of at least 8 on the 10-point scale, and zero otherwise. The table contains results of a sample when we drop *Certain* = 0.

Table C7.1 Wald tests for some valuation comparisons for results reported in Table C7

Hypotheses	Short model (column 1)	Full model (column 7)
$WTP_{Slip\_Pu} = WTP_{Slip\_Pr}$	34.74 (0.00)	35.47 (0.00)
$WTP_{Light\_Pu} = WTP_{Light\_Pr}$	30.65 (0.00)	26.87 (0.00)
$WTP_{App\_Pu} = WTP_{App\_Pr}$	23.55 (0.00)	21.97 (0.00)

Note: Chi2-value and corresponding p-value of two-sided test within parentheses.