Value of work safety: application of CV method to value effects of fatal injuries on wellbeing of economic active population of the Czech Republic[#]

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Introduction

Labor has many direct and indirect impacts on wellbeing of workers, health impacts being the most important among them. Any policy-making decision that has an influence on these impacts (e.g. implementation of work-safety measures) should take into account magnitude of these welfare-related effects. Crucial step in assessment of health impacts of working activity on well-being of workers is monetary valuation of different aspects of work-related health impacts.

One of the important effects of working process is premature death due to work-related fatal injuries. Recently, the value of statistical life (hereinafter VSL) have been used in policy practice in the US and the EU. US EPA has used VSL of $6,3 million (1999 US dollars) as a base in its policy recommendations on groundwater regulations (US EPA, 2000), while the Department of Transportaion and other US governmental agencies have used similar estimates in evaluating regulatory effects (Adler and Posner, 2000; cit. in Jennings and Kinderman, 2003). The European Commission in its CBA guidelines, e.g. for CAFE Programme (EC, 2006) and external costs quantification by ExternE method (EC, 2005), has recommended using a unique value of a statistical life of 1 million Euro with 50% premium for cancer.

The value of mortality can be derived by applying three possible methods:

i) human capital approach,

ii) cost derived from medical expenditures (e.g. QALY),

iii) and methods based on measurement of welfare change.

One of the methods consistent with welfare economics is derivation of value of statistical life (VSL) from stated preferences through contingent valuation (CV) or contingent choice experiments (CE). Based on original CV questionnaire developed by Krupnick et al. (2002), the VSL has been obtained in wide group of countries (see Krupnick et al., 2002, 2006; Alberini et al., 2004, 2005, 2006). Using choice experiments, the VSL has been derived for example by Tsuge et al. (2005) and Itaoke et al (2006). An alternative approach is derivation of VOLY (Chilton et al., 2004; Desaigues et al., 2006).

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Up to now, most studies deriving VSL in the context of labor have used hedonic price model (for recent overview of HPM studies see Viscusi – Aldy 2003). To our knowledge, only 4 studies have used contingent valuation method (CVM) to value mortality risks due to working process (see Gegax et al. 1985, 1991; Gerking et al., 1988, by Lanoie et al., 1995).

As far as we are aware, there has been no CV study of work-related mortality in the Czech Republic or even in Central European countries. The approach used in this paper has derived VSL through CVM by asking respondents whether they were willing to accept certain job with higher risk of fatal injury and higher monthly wages.

The aim of this paper is twofold: (1) to present results for VSL obtained from willingness to accept a compensation for higher occupational risks elicited in the CV survey conducted in the Czech Republic; (2) to compare this VSL with VSL's obtained in other contexts and by other methods (esp. hedonic wage model).

Work-related fatal injuries in the Czech Republic

Working conditions have been improving significantly in the Czech Republic since 1990. While official statistics of SUIP (State Labour Inspection) recorded almost 300 cases of fatal injury and about 100 000 cases of non-fatal occupational injury annually in mid-90's (per total number of 4,7 million employees). Last year (2006), there were only 137 fatal injuries and less than 80 000 cases of non-fatal injuries reported.

To put it in relative numbers, while there were 0,6 cases of fatal and almost 230 non-fatal work-related injuries per 10 000 employees in mid-90's, the relative risks have declined to 0,29 fatal and 170 non-fatal injuries per 10 000 employees in 2006.

Presumably, there have been several factors responsible for this trend. Firstly, a regulatory system of occupational safety has been enforced with more stringency in the period. Secondly, the Czech economy has been strongly restructuring, resulting in higher share of services and firms orientated on products with higher added value. Thirdly, growing unemployment drove out less skilled workers from the labor market.

CVM study of work-related mortality risk

Measure of change in work-related fatal risk

CVM studies valuing mortality risks represent usually in their scenarios risks that are similar in magnitude to those relevant for the particular case (see Krupnick, 2002; Alberini et al., 2006; Leiter, 2006).

In order to make hypothetical CVM situation as realistic as possible for respondents, we have used levels of statistical risk of fatal work-related injuries in the CVM scenario as a baseline risk. The product offered to respondents in the hypothetical situation is then 50% increase in this baseline risk.

The baseline mortality risk has been computed for 9 occupation groups (set as groups by 1-digit Classification of Occupations) combined with 17 industry groups. As a result, we got 153 cells combining different occupations and industries. For each cell we have computed risk of fatal injury using individual data on all work-related fatal and non-fatal injuries reported in 2005 (VÚBP, 2006).

Resulting tables representing statistical risk of work-related fatal injury at 1 to 10 000 levels were used by interviewers in the course of interviewing in order to inform respondents about their "objective" risk of fatal work-related injury.

Pre-survey

Prior to survey itself, an extensive pre-survey had been launched in order to create hypothetical CVM scenario that would be realistic and trustworthy for respondents and that would result in low protesting. The pre-survey consisted of 4 focus groups with manual workers and clerks and some 20 semi-structured interviews with factory workers and their foremen conducted from the Fall 2005 to Spring 2006.

After testing 6 different WTP and WTA scenarios, we have decided to apply a scenario "*Offer of a riskier and better paid job"* in the survey, although WTP format would be generally more preferable. However, all other scenarios except for the one chosen were more likely to be protested against by respondents. In the chosen scenario, respondents were asked whether they would accept new job which would be similar to the one they had except for the work-related fatal injury risk that would be higher by 50%, and wage that would also increase in their new job. Consequently, respondents were asked series of bidding game questions that elicited their minimal WTA (for verbatim of the questions see Appendix 2).

Questionnaire

Above described CVM scenario has been used as one section in larger survey *Quality of professional life 2006* prepared and conducted by CVVM opinion poll agency and coordinated by Occupational Safety Research Institute (VÚBP).

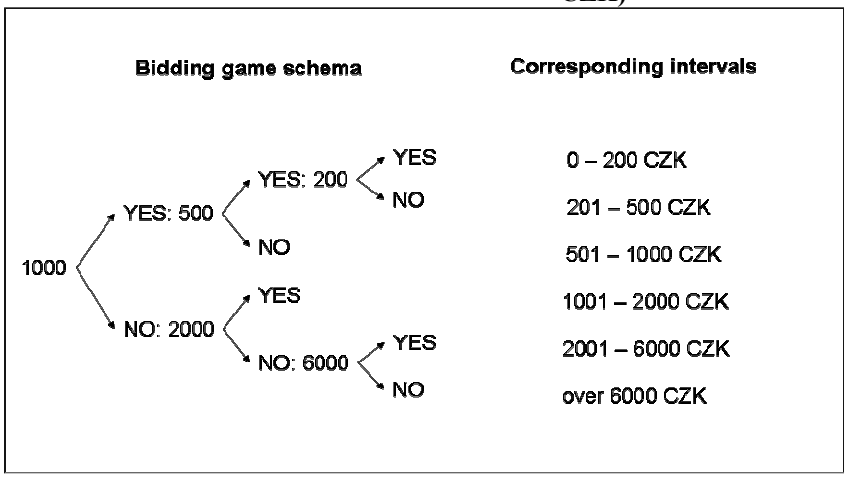
To minimize the rate of protesting, only those respondents who reported to be threatened by other people by machinery or tools, or by means of transportation while at work (most common sources of fatal injury at work), got CVM questions. Therefore the sample of respondents who were asked WTA question was not representative of the general population of workers but rather represented population of workers who were exposed to higher risk of fatal injury.[1] Firstly, these respondents were introduced into hypothetical situation. Next, they were informed about their current fatal injury risk at work and were presented possible 50% increase in the risk in the next 10 years.

After being introduced into hypothetical situation, 3-stage bidding game was used to elicit their minimal willingness to accept (WTA) higher net monthly wage (see the figure bellow) that resulted into 6 intervals of WTA[2].

[1] The differences between this sub-sample and whole sample of respondents interviewed in the survey are displayed in the table 2 in Appendix 2.

[2] We decided arbitrarily to set the upper boundary of the highest interval to 10 000 CZK so that this interval would have the same range as the previous one. However, due to low frequency of this interval, such decision have relatively minimal impact on estimation of regression function of WTA's and on measures of central tendency of WTA's.

Figure 1: Bidding game schema used in WTA question for fatal and non-fatal risk (bidding offers in CZK)



Results

The data collection took place in September 2006. Sampling and data collection were conducted by CVVM opinion poll agency. Quota sampling was used to get a representative sample of the Czech population. Quotas for gender, age, highest level of education achieved, and region were set according to results of 2001 Census. Altogether, 2043 valid standardized interviews were carried out.

Out of these 2043 respondents, 1 373 respondents got the WTA question and from these, 1 267 respondents answered WTA question technically correct[3]. Among these, we found 286 protesters[4] meaning that 981 respondents stated positive and valid WTA for an increase in work-related risk fatal risk.[5] Due to missings in others variables (such as income), some 679 and 739 valid observations entered the models (see bellow).

Scope test

To ensure the validity of CVM study, the NOAA panel proposed so called scope test (Arrow et al. 1993). The scope test has been widely discussed up to now. Although the scope effect is conventionally tested in current CVM studies, there appear to be voices that cast doubts on this proof of validity (for recent overview see Banerjee and Murphy, 2004).

However, we tested scope property in so called external scope test. We run several ordinal logit models and accelerated failure models for censored dependent variable WTA. In all these models the magnitude of fatal risk change (or the product proposed to respondents) did not have any statistically significant effect on WTA. The CVM

[3] Some mistakes were caused by interviewers who mistakenly used wrong information about the proposed product (change in objective fatal risk), or by respondents who failed to answered the question.
[4] For verbatim of the question detecting protesters see Appendix 1.

[5] Most respondents (90%) were offered change of work-related fatal injury equal to 1 in 10 000 in 10 years. [5] Some 6% of respondents got 2 in 10 000 in 10 years and 3% of respondents got 3 in 10 000 in 10 years. Remaining 1% of respondents got 4 or 5 in 10 000 in 10 years.

mechanism that we used to value mortality risk change and which results we present here did not pass external scope test.[6]

Computation of VSL

To compute the value of statistical life (VSL) and its covariates, we apply similar approach as Alberini (2006). Since we have only interval values of stated WTA, we have to compute interval estimates for VSL first. This si showed in formula (1) for lower boundary and in formula (2) for upper boundary of VSL.

$$VSL_{Li} = \frac{WTA_{Li}}{\Delta R_i} \cdot 12 \qquad (1)$$

$$VSL_{Hi} = \frac{WTA_{Hi}}{\Delta R_i} \cdot 12 \qquad (2)$$

Now, if we assume that VSL varies between these given upper and lower intervals randomly with cdf F (y,λ), where λ stands for vector of parameters of the cdf, the respondent's contribution to the likelihood is:

$$F(VSL_{Hi}; \lambda) - F(VSL_{Li}; \lambda) \qquad (3)$$

Where L_i and H_i denote the lower and upper boundary of VSL. Then the log likelihood for every individual respondent *i* takes the form:

$$\sum_{i=1}^{n} \log\left[F\left(VSL_{Hi}; \lambda\right) - F\left(VSL_{Li}; \lambda\right)\right] \qquad (4)$$

We have used normal, lognormal, exponential, and weibull distribution for VSL finding that weibull distribution best fits the data.
Log likelihood of the sample is showed in formula (5) for selected weibull distribution with shape θ and scale σ.

$$\ln(L) = \sum_{i=1}^{n} \log\left[\exp(-(VSL_{Li}/\sigma)^{\theta}) - \exp(-(VSL_{Hi}/\sigma)^{\theta})\right] \qquad (5)$$

Mean and median values of VSL are computed according to formulas (6) and (7), where $\hat{\sigma}$ and $\hat{\theta}$ are maximum likelihood estimates of scale and shape.

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[6] Nonetheless, this result is not surprising and in fact many researches have reported problems with representing and valuing small changes in risks (for review of literature on perception and response of small risks see Camerer et Kunreuther (1989) and Kunreuther and Pauly (2004)). Indeed, as Banerjee et Murphy argue, the scope tests is useful as a proof of validity only when preferences are continuous, strongly monotonic and total. When these assumptions are not possessed by subjects under study, the usefulness of the scope test might be undermined (Banerjee et Murphy, 2004, p. 8–9). Moreover, in the scope test the assumption is that the population is homogeneous in terms of its preferences. However, in our case we assume rather endogenity of the sample's preferences meaning that people that are currently exposed to higher objective risks might have also different preferences for work safety.

$$VSL_{Mean} = \hat{\sigma}_i \cdot \Gamma\left(\frac{1}{\hat{\theta}} + 1\right) \quad (6)$$

$$VSL_{Median} = \hat{\sigma}_i \left[-\ln(0.5)\right]^{1/\hat{\theta}} \quad (7)$$

Regression models for VSL

In order to test the models explaining VSL, we used accelerated failure time model using weibull distribution for error term.

In this paper we present results of testing of two models (see table bellow for results). The model 1 included variables suggested by economic theory and previous empirical research. The model 2 is the best model that we were able to estimate and includes variables that had significant effect on dependent variable (VSL).

Model 1 - basic model

In model 1 we have examine the influence of socioeconomic characteristics of worker (gender, age, education, work experience, net personal monthly wage, "breadwinning" in the household[7]), characteristics of the sector (work in industry, or agriculture), attributes of occupation (having subordinates, working in white collar job), and different attributes of risk (change in fatal risk offered, subjectively perceived baseline risk).

As we can see in the table bellow, only 2 variables in this model have significant effect on VSL. Magnitude of risk change offered to respondents was, ceteris paribus, associated with lower VSL. This result can be interpreted as decreasing marginal dis-utility of risk increase. Also the influence of respondent's net personal wage was highly significant and positive, which seems suggest that people are weighting proposed wage increase by their current wage.

[7] This variable indicated whether the respondent's wage was an important or even main source of income in the household. This indicator is computed as ratio of net personal monthly wage and net household monthly income: breadwin = PWAGE/HINCOME.

Table 1: VSL Model 1 and Model 2 estimates (accelerated failure time model based on Weibull hazard)

	Model 1			Model 2		
Parameter	**Parameter Estimate**	**S.E.**	**Pr > ChiSq**	**Parameter Estimate**	**S.E**	**Pr > ChiSq**
Intercept	10,5685	0,1304	<.0001	10,3244	0,1097	<.0001
RISKCHANGE	-0,4659	0,0595	<.0001	-0,4063	0,073	<.0001
SUBJRISK	0,0342	0,0636	0,5903			
MAN	-0,0309	0,0724	0,6694			
AGE	-0,0004	0,0029	0,8951			
COLLEGE	-0,1635	0,1063	0,1239			
EXPERIENCE	-0,0006	0,004	0,8798			
PWAGE	0,0219	0,0057	0,0001	0,0258	0,0048	<.0001
BREADWINNER	-0,1115	0,1429	0,435			
BOSS	0,0532	0,0772	0,4908			
OFFICE	0,0806	0,0789	0,307			
INDUSTRY	0,012	0,07	0,8635			
AGRICULTURE	-0,0586	0,1514	0,6987			
TRANSPORT				0,1252	0,0604	0,0381
WAGEQUIT				0,2624	0,0881	0,0029
RISKQUIT				0,3607	0,1538	0,019
RISKMALE				-0,1087	0,0526	0,0388
Scale	0,6493	0,0216		0,63	0,0206	
Weibull Shape	1,54	0,0513		1,5872	0,0518	
Log likelihood		-883.975			-946.141	
Number of obs.		679			739	

Model 2 - the best model

Model 2 that we present here is the model with the highest explanatory power. Apart from variables that turned out to be significant predictors in the first model (RISKCHANGE, PWAGE), this model also includes indicator for those who used transportation means at work (TRANSPORTATION),who were contemplating quitting the current job because of low wage (WAGEQUIT), or because of high risk (RISKQUIT). We also included a dummy variable for interaction of change of risk offered (RISKCHANGE) and gender (MALE).

We can see that all variables added to this model were statistically significant predictors of VSL. The impact of variables RISKCHANGE, OBJRISK, and PWAGE on the VSL was the same as in the model 1. Further, we see here that people who had used transportation means at work exhibited significantly higher VSL. Similarly, people who were contemplating leaving their current work either because of low wage or high risk had higher VSL. Interestingly, RISKMALE variable has negative coefficient estimate suggesting that for males their marginal dis-utility associated with higher risks decreased faster than for women.

Using the best model with Weibull distribution of VSL we have computed mean (302 million CZK) and median (239 million CZK) for VSL. The mean value of VSL computed using Weibull distribution is only slightly lower than mean value of VSL computed previously using mid-points: 307 millions CZK.

Concluding remarks

The paper presents VSL derived using data from an original CVM survey on willingness to accept higher net wage in exchange for higher work-related mortality risks. We have concluded that the mean VSL derived by Weibull model is 304 million CZK, or 10,7 million €, while median is 239 million CZK, or 8,4 million €.

Similar results were obtained in another study by Ščasný and Urban (2006) who estimated VSL using hedonic wage method for the Czech labor market ranged from 6 to 9 million € depending on the target population.

Interestingly, these values of VSL obtained in the labor market are by one order higher then similar values obtained outside the labor market. For instance, the value of preventing fatality calculated for the Czech Republic by human capital method by Ščasný (2005) amounted to 0,4 to 0,5 million € for a 40-years-old.

Alberini et al. derived VSL in the context of cardiovascular and respiratory diseases of 1,3 million € (mean), or 0,58 million € (median) (Alberini et al., 2006). VSL obtained in Poland by Giergiczny (2006) amounted to 0,77 million € (mean), but HWM in this study did not pass the scope test.

Higher VSL values estimated in out CV survey are in contrast to findings of Kochi, who found significantly higher VSL generated by the hedonic method than by the CV approach (Kochi et al., 2006).

To conclude, while the hedonic wage studies may be subject to bias resulting from measurement errors (Black 2001), and omitted variables (Hwang et al., 1992; Gunderson – Hyatt, 2001), CV studies may suffer from hypothetical bias. Better understandings of the role of subjective perception of occupational risks in valuation can improve the models tested in this paper. However, this task needs to be left for future research.

References:

[1] Adler, M.D. and E.A. Posner (2000): "Implementing Cost-Benefit Analysis When Preferences Are Distorted," Journal of Legal Studies 29, 1105-1148.

[2] Alberini, A., A. Chiabai, G. Nocella (2006): Valuing the Mortality Effects of Heat-waves. In: Menne, B., Ebi, K.L. (eds.), Climate Change and Adaptation Strategie for Human Health. Springer, Steinhopff Verlag, Darmstadt. ISBN: 3-7985-1591-3. pp. 345-371.

[3] Alberini, A., Ščasný, M., Braun Kohlová, M. (2005): The Value of Statistical Life in the Czech Republic. Poster presented at the 14th Annual Meeting of the European Association of Environmental and Resource Economics EAERE-2005, Bremen, 23-26 June, 2005.

[4] Alberini, Anna, Alistair Hunt, and Anil Markandya (2004): "Willingness to Pay to Reduce Mortality Risks: Evidence from a Three-country Contingent Valuation Study," *FEEM Working paper* 111.04, Milan, July.

[5] Arrow, K., Solow, R., Leamer, E., Portney, P., Radner, R., and Schuman, H. (1993): *Report of the NOAA Panel on Contingent Valuation*, Federal Register, 58, 4601-4614.

[6] Banerjee, S., Murphy, J.H. (2004): "The Scope Test Revisited." *Emory University Department of Economics Working Papers* 4-20 (November). [Online: www.economics.emory.edu/Working_Papers/wp/banerjee_04_20_paper.pdf]

[7] Black, Dan A. (2001): "Some Problems in the Identification of the Price of Risk," Paper presented at USEPA Workshop, *Economic Valuation of Mortality Risk Reduction: Assessing the State of the Art for Policy Applications*, Silver Spring, Maryland, November 6- 7, 2001.

[8] Camerer, C., Kunreuther, H. (1989): "Decision Processes for Low Probability Events: Policy Implications," *Journal of Policy Analysis and Management* 8(4), 565-592.

[9] Chilton, S., J. Covey, M. Jones-Lee, G. Loomes, H. Metcalf (2004): Valuation of Health Benefits associated with Reduction in Air Pollution. Final Report, DEFRA, UK.

[10] Desaigues, B., Ami, D., Hutchison, M., Rabl, A., Chilton, S., Metcalf, H., Hunt, A., Ortiz, R., Navrud, S., Kaderjak, P., Szántó, R., Nielsen, J.S., Jeanrenaud, C., Pellegrini, S., Braun Kohlová, M., Scasny, M., Máca, V., Urban, J., Stoeckel, M.E., Bartczak, A., Markiewicz, O., Riera, P., Farreras, V. (2006): Final Report on the monetary valuation of mortality and morbidity risks from air pollution. Final report. New Energy Externalities Developments for Sustainability, Research Stream 1b, Workpackage 6, New approaches for valuation of mortality and morbidity risks due to pollution. Project funded by the EC within the 6th Framework Programme.

[11] European Commission (2005): Externe - Externalities of Energies: Methodology 2005 Update. Edited by Bickel, P. and Friedrich, R., published by the Directorate-General for Research, Sustainable Energy Systems of European Commission.

[12] European Commission (2006): Thematic Strategy on air pollution, Communication from the Commission to the Council and the European Parliament. COM(2005) 446 final, Brussels.

[13] Gegax, D. Gerking S., Schulze, W. (1991): Perceived Risk and the Marginal Value of Safety. The Review of Economics and Statistics, Vol. 73, No. 4, 589-596.

[14] Gegax, D., Gerking, S., Schulze W. D., Anderson, D. (1985): Experimental Methods for Assesing Environmental Benefits. Vol. IV. Valuing Safety: Two Approaches. USEPA, Washington.

[15] Gerking, Shelby & de Haan, Menno & Schulze, William (1988): "The Marginal Value of Job Safety: A Contingent Valuation Study," Journal of Risk and Uncertainty, Springer, vol. 1(2), pages 185-99, June.

[16] Giergiczny, M. (2006): Value of Statistical Life - Case of Poland. Paper prepared for the the 3rd Annual Congress of Association of Environmental and Resource Economics AERE, Kyoto, 4-7 July, 2006.

[17] Gunderson, M., Douglas, H. (2001): "Workplace risks and wages: Canadian Evidence from Alternative Models," *Canadian Journal of Economics* 34:2 377-395.

[18] Hwang, H.-S., W.R. Reed, and C. Hubbard (1992): "Compensating Wage Differentials and Unobserved Productivity," *Journal of Political Economy* 100(4), 835-858.

[19] Itaoke, K., Saitoi, A., Krupnick, A., Adamowicz, W. and T. Taniguchi (2006): The Effect of Risk Characteristics on the Willingness to Pay for Mortality Risk Reductions from Electric Power Generation. Environmental & Resource Economics (2006) 33: 371-398.

[20] Jennings, P.W., Kinderman, A. (2003): The Value of a Life: New Evidence of the Relationship Between Changes in Occupational Fatalities And wages of Hourly Workers, 1992 to 1999. The Journal of Risk and Insurance, 2003, Vol. 70, No. 3, 549-561.

[21] Kochi, I., B. Hubbell and R. Kramer (2006): An Empirical Bayes Approach to Combining and Comparing Estimates of the Value of a Statistical Life for Environmental Policy Analysis. Environmental and Ressource Economics, Volume 34, Number 3, pp. 385-406.

[22] Krupnick, A., Bhattacharya, S., Alberini, A., Veronesi, M. (2006): Mortality Risk Valuation in Six Countries: Testing Benefit-Transfer Approaches. Prepared for The Third World Congress of Environmental and Resource Economics, Kyoto, Japan, July 3-7, 2006.

[23] Krupnick, Alan, Anna Alberini, Maureen Cropper, Nathalie Simon, Bernie O'Brien, Ron Goeree, and Martin Heintzelman (2002): "Age, Health and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Study of Ontario Residents," Journal of Risk Uncertainty, 24, 161-186.

[24] Kunreuther, H., Pauly, P. (2004): "Why Don't People Insure Against Large Losses?," *Journal of Risk and Uncertainty* 28, 5–21.

[25] Landenfeld, J., S., Seskin, E., P. (1982): The Economic Value of Life: Linking Theory to Practise. American Journal of Public Health, 72(6): 555-566.

[26] Lanoie, Paul & Pedro, Carmen & Latour, Robert (1995): "The Value of a Statistical Life: A Comparison of Two Approaches," Journal of Risk and Uncertainty, Springer, vol. 10(3), pages 235-57, May.

[27] Leiter, A., Pruckner, G.J. (2006): „Dying in an Avalanche: Current Risks and Valuation." Presented at 3rd Annual Congress of Association of Environmental and Resource Economics AERE, Kyoto, July 4 to 7, 2006. Online: http://www.webmeets.com/files/papers/ERE/WC3/173/Leiter_Pruckner_RiskValuation.pdf

[28] Ščasný, M. (2005): *Quantification of Value of a Statistical Life in the Czech republic: a review of method.* Working Paper prepared for the Project VaV/320/1/03 on External cost from electricity and heat production in Czech Republic and the methods of their internalization, Charles University Environment Center, mimeo (in Czech).

[29] Ščasný, M., Urban, J. (2007): Estimation of wage differential for the Czech Republic: Hedonic wage model testing on three datasets. Paper presented at the 15th Annual EAERE Conference, University of Macedonia Thessaloniki, Greece, 27-30 June 2007.

[30] Tsuge, Takahiro, Kishimoto, Atsuo and Kenji Takeuchi (2005): A Choice Experiment Approach to the Valuation of Mortality. The Journal of Risk and Uncertainty, 31:1; 73-95, 2005.

[31] U.S. EPA (U.S. Environmental Protection Agency) (2000): Guidelines for Preparing Economic Analyses. EPA 240-R-00-003. Washington, DC: U.S. EPA.

[32] Viscusi, W.K., Aldy. J.E. (2003): The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World. Journal of Risk and Uncertainty 27(1):5-76.

[33] Viscusi, W.K. (1992): Fatal Tradeoffs: Public and Private Responsibilities for Risk, New York: Oxford University Press, 1992.

[34] VÚBP 2006. *Dataset: Fatal injuries in the Czech Republic in 2005*. Occupational Safety Research Institute (VÚBP, v.v.i.), Prague.

Appendix 1

Verbatim of WTA question for fatal risk increase

"Based on information that you have provided and statistics of work-related fatal injuries, it is possible to find out what your objective risk of work-related fatal injury is. According to statistical data, there are X fatal injuries at your current position per 1000 workers over 10 years.

Now imagine that somebody would offer you the same job you are doing now, in the similar workplace and conditions. In the new job you would be given higher wage but you would be exposed to work-related fatal risk injury higher by 50%. It means that the risk of fatal injury in the new workplace would be Y fatal injuries per 1000 worker per 10 years.

Would you accept this offer if your net monthly wage was increased by 1000 CZK?"

(Other bidding game questions followed.)

Verbatim of the question controlling motives for refusing highest bid offered (valid WTA, protest WTA, WTA reflecting transaction costs)

What was your reason for stating that you were not willing to accept the new riskier job if you were offered higher net income?

(Available obtions:)[8]

a) The increase in wage is too low.
b) The risk is too high..
c) I like my current working group.
d) I cannot imagine any such situation/ I cannot answer such question/ I did not understand the question.
e) Other reasons. (Please, indicate what reasons :_____)

[8] Note: c) and d) were treated as protesters.

Appendix 2

Table 2: Variables used in the regression models (mean and s.d. of the full sample and sub-sample)

Variable	Description of Variables	Full sample mean (s.d.)	WTA sample mean (s.d.)
RISKCHANGE	The change of statistical risk presented to respondents in scenario multiplied by 10 000. RISKCHANGE has been computed for each of combinations of 17 sectors of economic activity and 9 occupational	1,224 (2,106)	1,284 (2,526)
SUBJRISK***	Subjective perception of work-related risk at current job. SUBJRISK is a dummy variable equal to 1 if respondent indicated that his job is very much or very risky on 4-point scale.	0,345 (0,475)	0,454 (0,498)
MAN	Man is dummy variable (1 for males) indicating gender.	0,561 (0,496)	0,662 (0,473)
AGE	Age of respondents minus 18 (minimal age in the sample).	22,377 (11,371)	22,464 (11,317)
COLLEGE	Dummy variable indicating respondents with university degree.	0,143 (0,351)	0,146 (0,354)
EXPERIENCE	Number of years working for the current employee.	7,169 (8,146)	7,199 (8,359)
PWAGE***	Average monthly net personal wage divided by 1000.	15,376 (8,325)	16,416 (9,197)
BOSS***	Dummy variable indicating whether respondent has subordinates at work.	0,246 (0,431)	0,296 (0,457)
BREADWINNER	Variable indicating to what degree is the respondent the main breadwinner in the household (BREADWINNER = personal wage/ household income).	0,616 (0,234)	0,635 (0,228)
OFFICE***	Dummy variable indicating whether respondent works in white-collar job (first 4 occupational groups).	0,431 (0,495)	0,395 (0,489)
INDUSTRY***	Dummy variable indicating whether respondent works in the industry sector.	0,290 (0,454)	0,323 (0,468)
ZEMEDEL***	Dummy variable indicating whether respondent works in the agriculture.	0,046 (0,210)	0,052 (0,222)
TRANSPORT***	Binary variable indicating people who use transportation means at work.	0,435 (0,500)	0,647 (0,478)
WAGEQUIT**	Binary variable indicating people who are contemplating quitting their current job because of low wage.	0,122 (0,328)	0,115 (0,319)
RISKQUIT***	Binary variable indicating people who are contemplating quitting their current job because of high risk.	0,033 (0,178)	0,040 (0,196)

Value of work safety: application of CV method to value effects of fatal injuries on wellbeing of economic active population of the Czech Republic

Jan Urban – Milan Ščasný

ABSTRACT

The paper presents results of a CVM survey conducted recently that focused on valuation of work-related fatal injuries. Willingness to accept an increase in monthly wage in riskier job has been used to derive VSL in the context of labor market. To this end, the authors employed relatively new approach of representing change in fatal risk in the CVM scenario for work-related fatalities. Further, the VSL amounting to median value of 239 million CZK (8.43 million €) is compared with values of VSL obtained in different CVM and HPM studies in context of work-related fatal risk and outside the area of work-related risk.

Keywords: CVM; VSL; WTA; Labor market; Fatal risk; Fatal injury.

Hodnota bezpečí v práci: aplikace metody podmíněného hodnocení na ocenění dopadu pracovních úrazu na blahobyt ekonomicky aktivní populace ČR

ABSTRAKT

V příspěvku jsou prezentovány výsledky CVM šetření realizovaného v v uplynulém roces cílem ocenit dopady smrtelných pracovních úrazů. Ochota akceptovat (WTA) zvýšení čisté měsíční mzdy v rizikovějším zaměstnání je využita k odvození hodnoty statistického života (VSL). Odhad mediánové VSL se pohybuje kolem 239 mil Kč (8.43 mil. €). Tato hodnota je porovnána s hodnotami VSL získanými v rámci jiných CVM a HPM studií v kontextu smrtelného pracovního rizika i v oblastech mimo trh práce.

Klíčová slova: CVM; VSL; WTA; Trh práce; Smrtelné riziko; Smrtelný pracovní úraz.

REVIEW

The paper presents results of a CVM survey that focused on valuation of work-related fatal injuries. The authors also employed relatively new approach of representing change in fatal risk in the CVM scenario for work-related fatalities. I appreciate especially the fact that authors could compare the outcome of this research with the outcome that resulted from a different approach however aiming at similar goals. I recommend the paper to be published.

doc. Ing. Jiří Hnilica, Ph.D.