Estimation of wage differential for the Czech Republic: Hedonic wage model testing on three datasets

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Abstract

The aim of the paper is to test hedonic wage model on data from the Czech labour market in order to obtain the Value of a Statistical Life from wage differential. In order to support an empirical basis for using the willingness-to-accept concept as a reliable method, we also examine the statistical relationship between changes in occupational rate of fatal risks and yearly average wages for economic sectors. We confirm statistically significant effect of objective fatal risk rate on employee's wage for the Czech Republic. Using individual data from the national representative survey conducted in October 2006, we estimate the VSL about 6 million €, while we display higher VSL for the employees exposed to higher occupational risks, particularly for exposed males. We do not confirm significant effect of either objective fatal risks or subjective perception of occupational risk on wage for individual data coming from the 2000 survey. Wage differential is obtained from statistical averages for economic sectors during 2003-2005 that also gives us empirical basis for using the willingness-to-pay concept as a reliable method for valuing a life. The VSL derived from macro data, i.e. statistical averages, then ranges between 3.2 to 3.6 million €. The VSL's derived from hedonic wage models are pretty much comparable with the VSL obtained from a CV study on willingness to accept compensation paid through higher wage for increased risk rate by 50% as well as they are in line with empirical evidence provided by the literature. The VSL's derived from the Czech labor market are, however, proved to be larger than the VSL's obtained outside of labor market that are about 0.2 to 1.0 million €.

KEYWORDS: hedonic wage model; health risks; fatality; value of a statistical life; Czech Republic

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Introduction

Policy intervention involves – directly or indirectly – many health impacts. Except the effects on morbidity and human impairment, there are the effects on mortality and related risks that need to be considered in cost-benefit analysis. Welfare measures of such changes might therefore emerge for relevant economic analysis.

Despite the very specific character of the product, i.e. a premature death, an attempt to put monetary value on mortality has a long tradition in public policy analysis. For instance, Landefeld et Seskin (1982) trace this idea more than 300 years back in impact assessment of public programmes combating airborne pollution in Great Britain. More recently, the value of statistical life (hereinafter VSL) is used in current policy practise as in the US as in EU. US EPA uses as a base VSL of $6.3 million (1999 dollars) in its policy recommendations on groundwater regulations (US EPA, 2000), The Department of Transportation and other US governmental agencies use 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) or for the external costs quantification by the ExternE method (EC, 2005), recommends to use a unique value of a statistical life as high as 1 million Euro, with 50% premium for cancer.

Such value of mortality can be derived by applying three possible methods. The oldest approach uses observed economic values and bases on a macroeconomic vision of the role of the individual as an agent contributing to the activity of the system (OECD, 2002). The value of preventing a fatality, at a given time, is equal to the future productive loss evaluated as the discounted sum of the earnings that the individual would have otherwise earned. This is known as the loss of production method or more familiar as 'human capital approach'. Alternatively, one can consider that any individual is a consumer and premature death results in the loss of these consumption possibilities. Then, households' final consumption is used to value life. Both of these methods display many disadvantages as summarized in e.g. OECD (2002); by considering market production, the value of life is zero for people outside the labour market such as pensioners and disabled people, due to discounting, the value of child's life is smaller then of economic active person. Moreover, the values vary with age and are very sensitive on magnitude of discount rate being chosen. The biggest problem, however, lies in inconsistency with the fundamental principles of welfare economics by not taking into account agents' preferences[2].

The second approach to derive monetary value of life - mostly used in medical practise -- might be based on medical treatment costs per Quality Adjusted Life Year (QALY). The QALY is kind of quality of life measure and presents a weight expressed over the range (0,1), with 1 indicating 'full health' or health in normal expected quality, and 0 indicating a state in that a person is indifferent to death and life (the negatives can even indicate a preference to die rather than to live). The weights are mostly stated by medical experts and physicians. The costs of relevant medical treatment or intervention are identified. Then, the costs per QALY are used in costs-effectiveness analysis or even as an arbitrary threshold of cost-effectiveness set out by social planner. For instance, the costs per QALY of 20,000£ is identified as a threshold (Towse et Pritchard, 2002; Devlin et Parkin, 2003), while 30,000£ needs a special reasoning (Rawlins et Culyer 2004) for NICE in the UK. The costs of 60,000€ was found as a threshold for Sweden in the studies by Kolbet et al. (2004). Similarly, as the first approach, the QALY approach is not consistent with the fundaments of welfare economics.

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[2] By only considering the productive aspect of the individual, this method used to underestimate the value of life compared with estimates derived from WTP approaches (Le Net, 1994).

Only the methods that are consistent with welfare economics focus on welfare change due to change in undesirable health outcome. These methods focus specifically on trade-offs between risk and money (or income). Then, in policy assessment, the Value of Statistical Life is a reference point for any mortality benefits.

The VSL can be experimentally derived using several methods. The researcher might use evidence on market choices that involve implicit tradeoffs between risk and money. Particularly, one can observe the compensating wage differentials that workers must be paid to take riskier jobs (see Viscusi and Aldy, 2003, for a recent literature review). In order to estimate the VSL, one can even extend the hedonic wage model by relating housing prices and wages to climate (Moore, 1998; Maddison and Bigano, 2003) or air quality (Portney, 1981). Most of the empirical estimates of VSL have relied just on the hedonic wage approach.

Next group of approaches – using averting behaviour method – might examine behaviours where people weigh costs against risks (Blomquist, 2004; review of US studies in Viscusi and Aldy, 2003). Costs for safer car equipment such as seat-belts, child-seat or airbags or expenditures on sport- or motorbike-helmets or smoke-detectors might be the examples.

The VSL can also be obtained from stated preference through contingent valuation or contingent choice experiments. Based on original CV questionnaire developed by Krupnick et al. (2002), the VSL is obtained from willingness-to-pay for risk reduction of dying in wide group of countries; the VSL is estimated in such way for the US and Canada (Krupnick et al., 2002), for Italy, France and UK (in NewExt project; see Alberini et al., 2005), while Krupnick et al. (2006) compare these results with VSL derived for Japan. Alberini et al. (2005) and Alberini et al. (2006) obtained the VSL from WTP for avoiding risk of dying from respiratory and cardiovascular diseases for Italy and for the Czech Republic, while Giergiczny (2006) tests this approach in Poland. Alternatively, the Value of Life Year Lost was obtained from WTP for prolongation of life expectancy by DEFRA study (Chilton et al. 2004), and more recently the values for 8 European countries are provided by NEEDS project (Desaigues et al. 2006).

Using stated preference approach in choice experiments, the VSL was derived by e.g. Tsuge et al. (2005) who experiment with various characteristics such as risk type (cancer, heart attack, accident) and latency or Itaoke et al (2006) who treat labelling effect for mortality risk reduction from electric power sector.

Most recent and comprehensive review of the VSL estimates provides Kochi, Hubbell, and Kamer (2006). They compare data coming from 40 selected studies published between 1974 and 2002, containing overall 197 VSL estimates (although there are increasing numbers of CV or HW studies in countries with lower income such as Taiwan, Korea, India or CEEC countries, they exclude these from their analysis). Their estimate of composite distribution of empirical Bayes adjusted VSL yields a mean of $5.4 million and a standard deviation of $2.4 million.

Despite the real policy demand for having such values, according to our best knowledge, there are only few empirical studies that estimate the VSL or VOLY performed in transition countries in Central and Eastern Europe. Regarding the implementation of hedonic wage model, there is only one such study conducted in Poland (Giergiczny, 2006) who found a sample mean of VSL as high as 2.26 million €, with a 95 percent CI from 2.05 to 2.44 million € (2005).

Our aim is fulfil partially this gap by testing hedonic wage model for the Czech Republic during huge restructuralisation of its economy and labour market included. The aim of our paper is then twofold: (1) to obtain the VSL from wage differential by applying hedonic wage model on the Czech employees, (2) to examine the statistical relationship

between changes in occupational mortality rate and in yearly average wages for economic sectors in order to support an empirical basis for using the willingness-to-pay concept as a reliable method for valuing a life from individual data, and (3) compare our estimates with VSL values obtained by using other methods, particularly CV method in the Czech Republic and at abroad.

II. Valuation of occupational risks

Empirical evidence

The idea that higher risk of occupational mortality may result in higher wage payment to worker is quite plausible. Adam Smith in his well-known book 'The Wealth of Nations' (1776; Chapter X, part I) has already noted that "*The wages of labour vary with the ease or hardship, the cleanliness or dirtiness, the honourable or dishonourableness of the employment… A journeyman blacksmith, though an artificer, seldom earns so much in twelve hours as a [labourer] does in eight. His work is not quite so dirty, is less dangerous…*". The economists therefore have been focusing their effort to find an evidence for such measurable impact of occupational mortality on wages in order to derive compensating wage differential. Such wage differential has been the most often used approach to reveal trade-off between money and fatality risk in order to obtain so called value of statistical life.

This is documented in the great review by Viscusi and Aldy (2003) who found more than 50 labour market studies that bring the value of statistical life. Most of these studies are dominated geographically by US labour market; 30 out of 51 studies. Only six hedonic wage studies were conducted in developing Asian countries (Hong Kong, India, Taiwan), and six in Europe, however five of them were conducted in the UK (last one in Austria). So far, there is no such study conducted in CEEC region except a pioneering Giergiczny's 2006 study. The VSL ranges between $0.5 to $21 million (2000 dollars) in US, $4 to $74 million in the UK, or $0.2 to $4.1 million in Asia (excluding Japan). Central estimate of the VSL value provided from meta-analysis by Mrozeck-Taylor (2002) yields $1.6 to $2.7 million, by CSERGE (1999) as high as 6.5 million € and Viscusi and Aldy (2003) provide mean VSL of 5 million €.

Viscusi and Aldy also documented overall 39 studies of the value of statistical (nonfatal) injury. Again, these studies are mostly (31) coming from US labour market. They identify only one being conducted in the UK. Implicit value of a statistical injury used to range about tens of thousands US 2000 dollars.

Most of hedonic wage studies estimate wage differential on individual data of workers. There is also a group of empirical studies that examine relationship between statistical rate of occupational injuries and wage for industries or branches. For instance, Jennings and Kinderman (2003) use data from the Bureau of Labour Statistics for the period 1992 to 1999 on industry injury and illness rates and fatality rates to examine the statistical relationship between changes in occupational mortality rate and in hourly wages in the USA. Their analysis did not support any statistically significant evidence, and thus conclude that there is no empirical basis for using the willingness-to-pay concept as a reliable method for valuing a life.

Econometric model

Econometric estimation of wage compensating differential from hedonic wage function is well documented exercise. The wage-risk relationship in labour markets is mostly estimated from following equation:

$$w_i = \beta_0 + \beta_1 WORKER_i + \beta_2 JOB_i + \beta_3 RISK_i + \beta_4 RISK \cdot COMP_i + \beta_5 X_i + \varepsilon_i \qquad (1)$$

while **WORKER** is a vector of personal characteristic variables including human capital measures such as education, experience and skills for worker i, **JOB** is a vector of job characteristic variables for worker i, **RISK** might be a vector of variables describing risks of fatal and non-fatal injuries and occupational illnesses, **COMP** describes compensations (pecuniary or in-kind) provided to worker i, and **X** might include other variables including interactions of fatality risk and personal characteristics (gender, age, trade-union status) to capture heterogeneity in risk perception and aversion. ε_i is the random error capturing unmeasured factors affecting worker's wage rate.

The model and estimation of hedonic price equation is well documented regular event. Most hedonic wage studies have estimated the wage equation using linear and semi-logarithmic specifications. Although, as argued by Rosen (1974), choosing a preferred functional form from these specifications cannot be determined on theoretic grounds, one can employ a flexible functional form given by the Box-Cox transformation to identify the specification with greatest explanatory power (Moore and Viscusi, 1988a).

A more general functional form of hedonic price function proposed by Halvorsen and Polakowski (1981) follows:

$$p_i(\lambda) = \sum_{c=1}^{C} \beta_c \cdot z_{ic}(\phi) + 0.5 \sum_{c=1}^{C} \sum_{g=1}^{C} \alpha_{cg} \cdot z_{ic}(\gamma) \cdot z_{ig}(\gamma) + \varepsilon_i$$

where α's, and β's are linear parameters on the transformed variables, and the transformation of any variable x is the typical form for Box-Cox models:

$$x(\lambda) = \begin{cases} \dfrac{x^\lambda - 1}{\lambda} & \text{for } \lambda \neq 0 \\ \ln(x) & \text{for } \lambda = 0. \end{cases}$$

Then, the marginal effect of a change in characteristic c for individual i is given by

$$\frac{\partial p_i}{\partial z_{ic}} = p_i^{1-\lambda} \cdot (\beta_c z_{ic}^{\phi-1} + z_{ic}^{\gamma-1} \sum_{g=1}^{C} \alpha_{cg} z_{ig}(\gamma)).$$

The hedonic wage function as in eq. 1 used to be only estimated by semi-logarithmic specifications, or with the dependent variable, i.e. wage w_i, transformed by the best lambda, i.e. $\phi=1$ and $\gamma=1$.

Then, the marginal effect of fatal risks obtained from the hedonic wage function (1) is given as

$$\frac{\partial w_i}{\partial RISK_i} = w_i^{1-\lambda} \cdot \beta_3 \qquad \text{or}$$

$$= w_i^{1-\lambda} \cdot (\beta_3 + 2\beta_{3q}) \qquad \text{for a quadratic form of fatal risks.}$$

The Value of Statistical Life is then derived as

$$VSL = \frac{w^{1-\lambda} \cdot (\beta_3 + 2\beta_{3q})}{R}$$

where β's are coefficients estimated for fatal risk variable(s), w is average wage and R is risk rate, e.g. 1/1,000 or 1/10,000.

Risk data

There is a huge literature on choice of the risk variable and its measurement. Variable reflecting both worker's and firm's (subjective) perception of the risk would be an ideal measure of on-the-job fatality and injury risk (Viscusi and Aldy, 2003). In the literature, measures of risk used to include self-reported risks based on worker surveys and objective risks derived from actuarial tables, compensation records, surveys and censuses of death certificates (then compiled by official statistical bodies).

Particularly early papers – as note by Viscusi and Aldy (2003) – included several qualitative measures of on-the-job risk. Hamermesh (1978), Viscusi (1979, 1980), or Fairris (1989) estimated the hedonic wage equation with a dichotomous measure of injury risk based on a worker's perception of whether his or her job is „dangerous" by asking if their job exposed them to physical dangers or unhealthy conditions. Duncan and Holmlund (1983) use "danger" variable in their hedonic study of male workers in Sweden. Similarly to this approach, we also control the "danger" by variables indicating subjective perception of physical and psychological risks and personal aggression at work in our hedonic wage models.

Empirical studies use, however, dominantly the measures of objective risk either occupation-specific (e.g. Thaler and Rosen, 1975; Brown, 1980; or Polish study by Giergiczny, 2006), or - most recent ones – industry-specific ones. An average of at least several years of observations is used for fatalities which tend to be relatively rare events.

The magnitude of risk premium, and consequently of the VSL, estimated by regression strongly depends on the choice of the risk measure. Moreover, it is just accuracy in perception of differences in occupational risks between professions and branches rather than absolute magnitude of risks that plays a role for validity of hedonic wage model. Therefore the choice of risk measure used in econometric model and its perception by worker requires a special attention of modeller.

How the objective risks are perceived and whether they are considered in real decision making by worker has remained crucial question for researcher that needs to be discussed. For instance, Viscusi (1979) confirms a correlation between subjective perception of the risks – indicated by the answer on question "Is your job dangerous?" - and objective (statistical) accident data. Viscusi et O'Connor (1984) or Gerking et al. (1988) report that accident rate data used to be perceived more than they are (about 50% in chemical industry). Slovic et al. (1979) found that people overestimate the likelihood of infrequent causes of death such as death due to botulism, floods or tornadoes and on the other hand underestimate the probability of death with higher frequencies, e.g. due to heart attacks and cancer (cit. in Freeman, 2003, p. 404). McDaniels, Kamlet, and Fischer (1992) examined the relationship between perceived risk and WTP for increased safety from ten technological hazards, five of which are well-known and five are less well-known. They found that the WTP for well-defined risks is most influenced by perceived personal exposure, while WTP for less-known risks is most influenced by levels of dread and severity.

Very important note was remarked by Fischhoff et al. (1981) that one must distinguish between an individual's perception of the relative perception frequency of death in some population and the individual's estimate of his or her own risk of death. As confirmed by them or by Hamermesh (1985), the later is often underestimated. We also do confirm this evidence has been found in our two focus groups conducted with blue-collar workers in the Czech Republic. It was indeed personal experience with injury at work and skills that result in underestimation (or perception) of objective risks given by statistical accident rate data.

III. Data and estimation results

Working conditions have been significantly improving since 1990 in the Czech Republic. While the official statistics of SUIP (State Labour Inspection Office, Prague) recorded almost 300 cases of fatal injuries and about 100,000 cases of non-fatal occupational injuries yearly in the middle nineties (from about 4.7 million of employees), there have been only 137, respectively less than 80,000 cases of fatal and non-fatal injuries recorded recently.

In relative terms, while the statistics recorded 0.6 cases of fatal and almost 230 non-fatal injuries per 10,000 employees in the middle nineties, the relative risks have declined at 0.3 of fatal or 180 non-fatal injuries per 10,000 in the year 2005 (SUIP).

We can document several trends: firstly, a regulatory system of occupational safety has been enforced with larger stringency, secondly, the Czech economy has been strongly restructuring what's resulted in higher share of services and firms being orientated on products with higher value added; thirdly, growing unemployment has lowered the number of employees what likely excludes less skilled and more "troublesome" workers from the labour market. Each of these factors might lower the absolute and relative occupational risks.

We follow an econometric model with transformed net wage by Box-Cox and report the estimation results for best lambda. Econometric model is estimated in maximum likelihood by SAS programme.

We use three datasets for hedonic wage model tests in the Czech Republic:

1. Individual data of Czech employees from a survey **"Quality of Occupational Life – 2006"**;

2. **Yearly averages for economic sectors** provided by the Czech Statistical Office for the period 2003 to 2005;

3. Individual data of the survey **"Working Conditions - 2000"**;

III.1 Individual data from "Quality of Occupational Life – 2006" survey

This data come from the same dataset as the data we used to obtain the VSL from willingness-to-accept a compensation, i.e. higher real wage (Urban and Ščasný; submitted to EAERE-2007). The survey was conducted jointly by Sociological Institute of Academy of Sciences – Public Opinion Research Centre, Occupational Safety Research Institute and Charles University Environment Center in October 2006. The survey and sampling strategy are described in more detail in our other paper. There are 2,043 observations in full sample (see Appendix for the descriptive statistics).

We use statistical data by SUIP on objective risks, i.e. reported number of fatal and non-fatal injuries per 10,000 employees. After identifying the respondent's occupation (nine

profession categories used by statistical bodies was used) and branch (17 industries followed NACE classification), we tell the respondent the risk of fatal and non-fatal injuries he or she used to be exposed to.

Besides socio-demographics, the respondent reported his/her net monthly wage. Mean net monthly wage or salary is then about 15,380 CZK or about 520 €.

We use three dichotomous variables on detecting whether i) she/he is in contact with machineries while working, ii) she/he travels by car during business travel (as a driver or a passenger), or iii) she/he used to be in contact with persons who can physically attack her/him, i.e. situations dominating causes of fatal injuries reported in the official Czech statistics. We then use these variables as a filter indicating the respondent exposed to risks. Only 1,373 (67%) of the respondents pass the filter.

Average net monthly wage is larger for the sample of workers exposed to risks (16,400CZK, or 550 €), net wage gets even higher if we create a sub-sample consisting only of the males exposed to risks (17,900 CZK, or about 600€). Descriptive statistics for both sub-samples are reported in Appendix.

We regress net wage on fatal and non-fatal occupational risks for the full sample and two sub-samples consisting only of those exposed to risks, either all or only male.

Estimation results

In all models, non-fatal risks are not significant, while fatal risk and fatal risk square are significant at almost 99.9% level for full sample, and at the 98% level for sub-samples of the exposed respondents. All coefficients of covariates have right signs and are significant at 99% level. Net wage is higher if the respondent is managing people (BOSS), does business trips by car (CARTRAVELLING), is male, has university degree or A-level, has more children or brings higher share of money to family (BREADWIN). Variables described by KZAM denote type of profession (following none categories of Classification of Occupations) and by OKEC denote classes of economic branches (NACE digit-1 level).

The VSL is then calculated from net monthly average wage as high as **5.9 million €** (full sample), or **6.6** and **8.9 million €** for the sample of exposed to risks and for the exposed males. Semi-logarithmic specifications with λ=0 yield similar estimates of the VSL.

III.2 Yearly averages for industries for 2003-2005

The aim of this analysis is to support our previous estimates by examining the relationship between branch-specific occupational mortality rates and other measures of "dangerousness" of the job on one side and an average yearly wage for a relevant branch of the Czech economy. We follow similar logic as Jennings and Kinderman (2003) who examine the relationship between the changes in occupational mortality rates and in hourly wages in order to provide an empirical basis for reliability of using WTP/WTA concept for valuing a life.

We assume that statistically significant evidence for relationship between risks and wages being found in individual employee's behaviour could be, in average, also found for the economic sectors.

Performing this test, we gather statistical data compiled by the Czech Statistical Office for following measures:

- fatal injuries, non-fatal injuries with working-disability longer than 3 days, non-fatal injuries with any working-disability, new cases of job-related illness, days of sickness due to job-related illnesses,
- financial compensations provided by the firm to employees and expenditures averting the occupational risks expended by the firm,
- economic variables such as the added value, paid wages and salaries and the number of employees.

We create variables describing the **relative risks** and **average wage** by dividing all risks and paid wages and salaries. Using information on tax regime, we obtain an average of the **net yearly wage** per employee in a given sector and year.

All financial data are recalculated in 2005 price level by CPI. We control the effect of sectors/branches by composing **sector dummies**. The effect of productivity and technological change is controlled by sector-specific **labour productivity** variables and **Year** variable. Descriptive statistics see in Appendix.

We collect yearly data for the period 2003 to 2005 for sectors according to the NACE 2-digit level having in total 3*57 observations.

We then experiment with several sub-samples: i) only sectors with positive fatal occupational accidents (N=86), and ii) sectors with positive fatal occupational accidents without services, i.e. NACE 65+ is dropped out (N=68).

Estimation results

For macro data, i.e. statistical averages for sectors, we conclude that statistical significance of fatal risk rates on wage at 90% level for all sectors. If we consider only those sectors with positive fatal risk rates, its significance rises at 95% level. We report stronger statistical relationship for net yearly wage indicating the workers who considered real wages in their choices at labour market rather than gross wages and salaries.

The VSL derived from wage compensating differential for all sectors of the Czech economy amounts **3.6 million €**, however, statistically significant estimate is found only for net yearly wages (90% level). If only the economic sectors with positive fatal rates were considered, the VSL obtained from the gross yearly wage gets higher, almost **4 million €**, while the VSL derived from the net wage is as high as **3.2 million €**. We estimate then the highest VSL from the data after dropping out services (NACE 65+). The VSL from the gross wage is **4.5 million €**, and from the net wage amounts about **3.6 million €**.

We do not find an evidence for quadratic relationship of fatal risks as we report for "Quality of Occupational Life" 2006 data. Moreover only some of the models confirm statistical significance of other non-fatal risks. We find that the non-fatal injuries without any following working-disabilities increase employee's wage, while the non-fatal injuries followed by working-disabilities at least for 3 days contribute negatively to wage. The effect of „job-related illness" is not proved to be statistical significant, similarly as compensation paid by firm to employees for suffering due to an injury.

In line with one's intuition, labour productivity is the strongest predictor of the wage in the sector with positive and significant coefficient. Trend variable is significant only in some of our models with intuitively right sign (+). Some of our models support our hypothesis that the sectors with higher wages and salaries likely invest more sources for prevention of occupational risks (kcprevent). Sector dummies increase robustness of our models.

III.3 Working Conditions – 2000 survey

A survey on "working conditions" was conducted by STEM/MARK in the Czech Republic within the European Survey on Working Conditions regularly conducted in 1991, 1996, and 2000.

The questionnaire contains the questions on physical factors affecting the quality of working conditions, working time, work organisation, social workplace environment and other measures describing subjective perception and objective factors of the workplace. All questions are related to a full-time job of the respondent ignoring working conditions of a part-time job.

The questionnaire also includes question whether respondent thinks that his/her job brings him/her a danger for safety and health (Q34). If positively answered, i.e. he/she is exposed to occupational risks, then he/she is asked on 23 kinds of effects that might be related with this exposure. Using this information we create two variables on exposure to physical factors and "psychological" risks. Dichotomous variable on occupational risk due to physical factors (*risk_fyz*) considers respondent's suffering from health problems related with hearing, eyes, skin, respiration or cardiovascular system, or his/her pain in back, head, stomach, muscles, legs or hands, or allergies caused by working. Psychic causes such as stresses, tiredness, sleep-deficit, anxiety, being on edge or having trauma from the job creates dichotomous variable *risk_psy*.

Awareness of physical aggression stemming from other people or his/her colleagues in the job creates our third variable *risk_aggres*.

On the top, we use statistical data on fatal and non-fatal risk rates for each profession (9 categories) and for each of the five economic sectors aggregated in agriculture, industry, construction, transport and services.

We use other variables describing exposure to variety of physical factors (7-level Lickert scale) such as vibrations from handy-equipment and machineries, noise, high temperature, low temperature, breathing exhalation, vapours from toxic substances and dust, manipulation with dangerous products or radiation from roentgen or so.

Measures of subjective perception of occupational risks (risk_fyz, risk_psy, or risk_aggres) as measure of objective fatality risk rate and measures of exposure are not correlated (Pearson coeff. is the highest for risk_fyz and risk_psy as 0.54).

We use reported average net monthly wage/salary from the full-time job and normalise them on full-time, i.e. 42 hours per week. We may only create dichotomous variables for wage compensation for risk exposure (priplatek) and extra payments for working during weekend (vikend) and night (noc). We control the effect of experience (praxe) and if the respondent is a boss (vedouci). We use five binary variables for economic sectors and 9 for profession (KZAM following standardised Classification of Occupations). Descriptive statistics is displayed in Appendix.

In our econometric model, we use only data for such respondents who are employees dropping out the respondent running his/her own business (assuming different behaviour and thus referring the modeller rather to the averting behaviour model). We also dropped out those respondents with more than one job. In order to make our sample more homogenous we also dropped out employees working with less than 40 hours and more than 70 per week.

Estimation results

Firstly, we examine the relationship between subjective perception of risks (risk_fyz, risk_psy, and risk_aggres) and reported wage. Our strong model that explains net wage (adjusted R^2=0.68), however, does not contain any variable on subjective perception of risks. Wage is thus left to be explained by type of profession, economic sector and years of experience. Hedonic wage model that consists of our three variables is very weak (adjusted R^2<0.1) and subjective risk perception explains the wage variance by 1 to 3%. Only the effect of risk_fyz is weakly significant, while the effect of the other two is not statistical significant at all. Moreover, in some cases, our hedonic wage models yield wrong signs. This could be due to the fact that the respondents do not consider these factors in their choice or due to the unobserved heterogeneity labour in productivity we have not been able to reveal so far (see e.g. Hwang et al. 1992; or Dorsey 1983 a Dickens 1984 who report wrong signs for risk coefficients).

We also do not confirm positive relationship of an interaction of perceived risk and paid compensation with wage; p-value is 0.16 for the relationship. Using these data, we do not confirm any statistical significant effect of fatal rate on wage; p-value of a square of fatal rate is about 0.18.

IV Conclusions

We confirm statistical significant effect of objective fatal risk rate on employee's wage. Based on estimation of hedonic wage function we derive the wage differential from that the VSL from the Czech labour market was obtained. The VSL is estimated about 6 million € and the VSL is higher for those employees that are exposed to higher occupational risks, particularly for exposed males.

The VSL obtained from statistical averages for economic sectors ranges about 3.2 to 3.6 million €, if gross wages and salaries were used, the VSL would be about 4 million €. Proved statistical significance of risk rates on wages gives us empirical basis for using the willingness-to-pay concept as a reliable method for valuing a life from individual data.

More attention is required to analyse the hedonic wage function; particularly a modeller may pay attention for the role of subjective perception of occupational risks and perception of objective (statistical) risk rate. Measures indicating subjective perception of occupational risks, either the variables describing fatal risk rate did not explain wage in data coming from the 2000 survey.

Our results -- we get from hedonic wage models -- are in line with estimates derived by other studies. Older review by Viscusi (1992) brough the range of VSL between 0.8 to 17.7 million $, more recent estimates of VSL reported in the literature range between 0.2 million $ (Loomis and du Vair, 1993) to 87.6 million $ (Arabsheibani and Marin, 2000). A comprehensive review of hedonic wage studies by Viscusi and Aldy (2003) show the range between 0.5 to 21 million $ in the US, 4 to 74 million % in the UK, or 0.2 to 4.1 million of 2000$ in Asia. On the top, Kochi et al. (2006) display a mean of the composite distribution of empirical Bayes adjusted VSL as high as 5.4 million $ and a standard deviation of 5.4 million $ (based on 197 VSL estimates).

The VSL's derived from hedonic wage models are pretty much comparable with the VSL being just obtained from our contingent valuation study on willingness to accept a compensation paid through higher wage for increased risk rate by 50%. Urban and Ščasný (2006) found a mean VSL derived from WTA as high as 10.7 million €, while median is 8.4 million €.

The VSL's derived from the Czech labor market are proved to be much more higher than the VSL's obtained outside of labor market.

For instance, the value of preventing fatality calculated for the Czech Republic by human capital method (Ščasný, 2005) and considering average macroeconomic labour productivity in 2004 is as high as 0.4 to 0.5 milllion € for 40 years old man (d.r.=4%, or d.r.=3% respectively).

Máca (2005) reviewed the costs per QALY for CEEC countries and brings the range between 370 € to 16,000 €. If we considered 2,900 € per QALY for acute myocardial infarction as found by Máca for the Czech Republic, we get VSL as high as 0.2 million € for average life expectancy; the VSL obtained by such a way for QALY for Statins following pericutaneous coronary intervention (Fluvastatin) in Hungary gets 1.2 million €.

The VSL derived by CV method from WTP for mortality risk reduction from cardiovascular and respiratory diseases in the Czech Republic is 1.3 million € (mean), or 0.58 million € (median) (Alberini et al., 2006). The VSL can be obtained also for Poland from WTP for mortality risk reduction by 1 in 10,000 (Giergiczny, 2006); the VSL is 0.77 million € (mean), or 0.44 million € (median), however, Giergiczny's study did not pass an external scope test and no VSL value was originally reported in the paper.

Median VOLY derived from WTP from life expectancy prolongation by 3 months estimated by the team led by Desaigues (2006) amounts about 8,000 € for NMS pooled data, or almost 10,000 for the Czech Republic, 8,000 € for Poland and 3,000 € for Hungary (country samples are, however, too small – about 150 each - yielding hardly statistical significant estimates). Very rough estimate can be then derived for average life expectancy of 75 years by neglecting factor of time; this value would be about 0.75 million € for the Czech republic, or about 0.22 million € for Poland.

We can conclude that this comparison displays the VSL about 0.2 to 1.0 million €, while the VSL derived from labour market is one order of magnitude higher, i.e. about 3 to 9 million €.

This is contradictory to the empirical findings given by economic literature that shows significantly larger estimates generated by the hedonic method than by the CV approach (Kochi et al., 2006). The fact that two valuation methods do not necessarily provide the same outcome is supported on theoretical ground: while the hedonic wage approach is estimating a local trade-off, the CV approach approximates a movement along a constant expected utility locus (Viscusi and Evans 1990). In the other words, marginal utility of changing risks from its optimal level (analysed by hedonic model) can be expected to be the highest because marginal utility declines with marginal risk 'located' more far from the optimal risk, i.e. probably described in the contingent (hypothetical) scenario.

One caveat should be point out: values based on willingness to accept approach used to yield higher values than those derived from willingness to pay. Hanemann (1991) for instance argues that the differences between the compensating surplus, i.e. minimum WTA to consent higher occupational risks in our case and the equivalent surplus, i.e. maximum WTP to prevent increase of the risks, need not be insignificant as counter-argued by Randall and Stoll (1980). Empirical evidence suggests that the minimum WTA can exceed the maximum WTP several times over. Carson (1991) argues that when individuals are asked to state their minimum WTA, they tend to state their expectation of the maximum they could hope to extract as compensation rather than their true minimum WTA (cited in Markandya et al., 2002; p. 425).

Therefore, while the hedonic wage studies may be subject to bias resulting from measurement errors (Black 2001), and omitted variables (Hwang et al. 1992; Gunderson and 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. This task needs to be however left for our next research.

Acknowledgment

References:

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

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.

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.

Alberini, A., Ščasný, M., Braun Kohlova, M., Melichar, J. (2006): The Value of Statistical Life in the Czech Republic: Evidence from Contingent Valuation Study. 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. 373-393.

Arabsheibani, R. G., and A. Marin (2000): Stability of Estimates of the Compensation for Damage, Journal of Risk and Uncertainty 20:3, 247-269.

Black, Dan A. "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.

Blomquist GC (2004): Self-protection and Averting Behavior, Values of Statistical Lives and Benefit Cost Analysis of Environmental Policy. Review of Economics of the Household 2:69-110.

Braun Kohlová, M., Ščasný, M., Máca, V., Melichar, J. (2005): Environmentální vlivy na zdraví dětí (Environmental effects on children's health) - Final report from Project IC/5/6/04 granted by Ministry of Environment of the Czech Republic.

Brown, C. (1980): "Equalizing Differences in the Labor Market," Quarterly Journal of Economics 94(1), 113-134.

Carson, R.T. (1991): Constructed markets; in: Braden, J., C. Koldstad (eds.), Measuring the Demand for Environmental Quality, Amsterdam, Elsevier, pp. 121-62.

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.

CSERGE, IOS-NLH, IVM, CAS, DAE-UoV. Benefits Transfer and the Economic Valuation of Environmental Damage in the European Union: With Special Reference to Health. CSERGE, IOS-NLH, IVM, CAS and DAE-UoV, 1999.

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.

Devlin, N. and D. Parkin (2003): "Does NICE have a cost effectiveness threshold and what other factors influence its decisions? A discrete choice analysis", Health Economics, 13(5).

Dickens, W.T. (1984): "Differences Between Risk Premiums in Union and Nonunion Wages and the Case for Occupational Safety Regulation," American Economic Review 74(2), 320-323.

Dorsey S. and N. Walzer (1983): "Workers' Compensation, Job Hazards, and Wages," Industrial and Labor Relations Review 36(4), 642-654.

Duncan, G.J. and B. Holmlund. (1983): "Was Adam Smith Right After All? Another Test of the Theory of Compensating Wage Differentials," Journal of Labor Economics 1(4), 366-379.

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.

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

Fischhoff, B., S. Lichtenstein, P. Slovic, S.L. Derby, and R.L. Keeney (1981): Acceptable Risk. New York: Cambridge University Press.

Freeman III, A.M. (2003): The Measurement of Environmental and Ressource Values. Theory and Methods. 2nd edition (1st edition 1993). Resource for the Future, Washington, DC.

Gerking, S., M. de Haan, and W. Schulze (1988): "The Marginal Value of Job Safety: A Contingent Valuation Study," Journal of Risk and Uncertainty 1(2), 185-199.

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.

Gunderson, Morley and Douglas Hyatt, "Workplace risks and wages: Canadian Evidence from Alternative Models," Canadian Journal of Economics 34:2 (2001), 377-395.

Hanemann, M. (1991): Willingness to pay and willingness to accept: how much can they differ? American Economic Review, 81 (3), 635-47.

Halvorsen, R. and H. O. Pollakowski (1981): Choice of Functional Form for Hedonic Price Equations, Journal of Urban Economics, 10, 37-49.

Halvorsen, R., H.O.Polakowski (1981): Choice of Functional Form for Hedonic Price Equations. Journal of Urban Economics, 10, 37-49.

Hamermesh, D.S. (1978): "Economic Aspects of Job Satisfaction." In O. Ashenfelter and W. Oates (eds.), Essays in Labor Market Analysis. New York: John Wiley and Sons, pp. 53-72.

Hamermesh, Daniel S. (1985): Expectations, Life Expectancy, and Economic Behavior. Quarterly Journal of Economics 100 (2): 389-408.

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

Jennings, P.W., A. Kinderman (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.

Itaoke, K., A. Saitoi, A. Krupnick, W. Adamowicz, 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.

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 Resource Economics, Volume 34, Number 3, pp. 385-406.

Kolbet, G., K. Eberhardt and P. Geborek (2004): "TNF inhibitors in the treatment of rheumatoid arthritis in clinical practice: costs and outcomes in a follow up study of patients with RA treated with etanercept or infliximab in southern Sweden", Annals of Rheumatic Disease, 63. Available at http://ard.bmjjournals.com/cgi/reprint/63/1/4

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.

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.

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.

Le Net (1994): "Le Prix de la Vie Humaine", Rapport pour le Commissariat Général du Plan, Paris.

Loomis, John B. and Pierre H. duVair (1993): Evaluating the Effect of Alternative Risk Communication Devices on Willingness to Pay: Results from a Dichotomous Choice Contingent Valuation Experience, Land Economics 69:3, 87-98.

Maddison, David and Andrea Bigano (2003): "The Amenity Value of the Italian Climate", Journal of Environmental Economics and Management, 45: 319-332.

Markandya, A., Harou, P., BellÙ L. G., Cistulli, V. (2002): Environmental Economis for Sustainable Growth: A Handbook for Practitioners. Chelthenam, UK: Edward Elgar.

McDaniels, Timothy L., Mark S. Kamlet, GregoryW. Fischer. (1992). "Risk Perception and the Value of Safety," Risk Analysis 12, 495–503.

Moore, M.J. and W.K. Viscusi. (1988a): "Doubling the Estimated Value of Life: Results Using New Occupational Fatality Data," Journal of Policy Analysis and Management 7(3), 476-490.

Moore, Thomas Gale (1998): "Health and Amenity Effects of Global Warming", Economic Inquiry, 471-488.

Mrozek, J.R. and L.O. Taylor (2002): "What Determines the Value of Life? A Meta-Analysis," Journal of Policy Analysis and Management 21(2), 253-270.

OECD (2002): Valuing Children's Environmental Risks. Working Party on National Environmental Policy. Workshop held 20/21 November 2002, Paris. ENV/EPOC/WPNEP(2002)31

Portney, P.R. (1981): "Housing Prices, Health Effects, and Valuing Reductions in Risk of Death," Journal of Environmental Economics and Management 8, 72- 78.

Randall, A., J.R.Stoll (1980): Consumer Surplus in commodity space, American Economic Review, 70 (3), 449-55.

Rawlins, M.D. and A.J. Culyer (2004): "National Institute for Clinical Excellence and its value judgements", British Medicine Journal (BMJ), 329.

Rosen, S. (1974): "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," Journal of Political Economy 82, 34-55.

Slovic, Paul, Baruch Fischhoff, and Satan Liechtenstein (1979): Rating the Risks. Environment 21 (3): 14-20, 36-39.

Smith, A., 1776 (reprinted 1937): The wealth of Nations (New York: Modern Press).

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).

Tsuge, T., A. Kishimoto, K. Takeuchi (2005): A Choice Experiment Approach to the Valuation of Mortality. The Journal of Risk and Uncertainty, 31:1; 73-95, 2005.

Thaler, R. and S. Rosen (1975): "The Value of Saving a Life: Evidence from the Labor Market." In N.E. Terleckyj (ed.), Household Production and Consumption. New York: Columbia University Press, pp. 265-300.

Towse, A. and C. Pritchard (2002): "Does NICE have a threshold? An external view", in A. Towse, C. Pritchard and N. Devlin (eds) Cost-Effectiveness Thresholds: economic and ethical issues. London: King's Fund/Office for Health Economics.

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

Viscusi, W.K. (1978): "Labor Market Valuations of Life and Limb: Empirical Evidence and Policy Implications," Public Policy 26(3), 359-386.

Viscusi, W.K. (1979): Employment Hazards: An Investigation of Market Performance. Cambridge, MA: Harvard University Press.

Viscusi, W.K. (1980): "Union, Labor Market Structure, and the Welfare Implications of the Quality of Work," Journal of Labor Research 1(1), 175-192.

Viscusi, W.K. and C.J. O'Connor. (1984): "Adaptive Responses to Chemical Labeling: Are Workers Bayesian Decision Makers?" American Economic Review 74(5), 942-956.

Viscusi, W. Kip and William N. Evans (1990): Utility Functions That Depend on Health Status: Estimates and Economic Implications, American Economic Review 80:3 (1990) 353-374.

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

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.

Figure 1: Absolute number of occupational injuries, Czech Republic, 1993-2005

Absolute number of occupational injuries
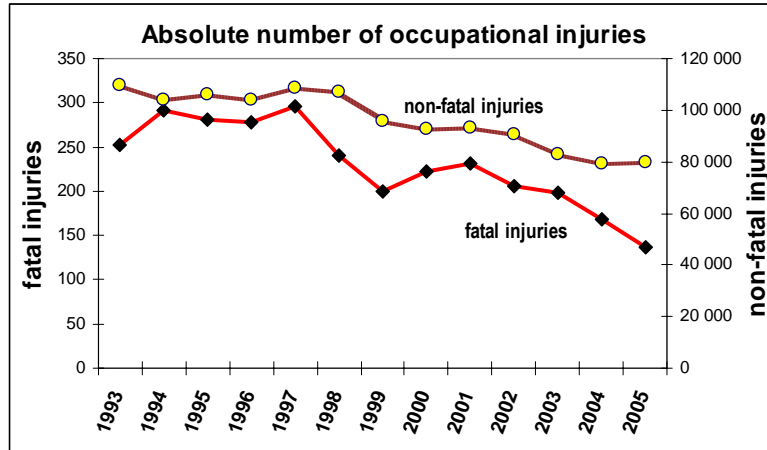
Figure 2: Fatal and non-fatal injuries per 10,000 employees, Czech Republic, 1993-2005.

Occupational inuries per 10,000 employees
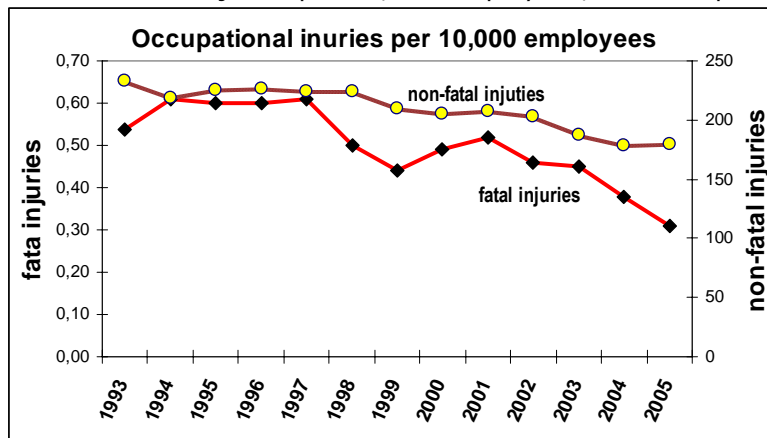
Figure 3: Fatal injuries in branches, Czech Republic, 1993-2005.
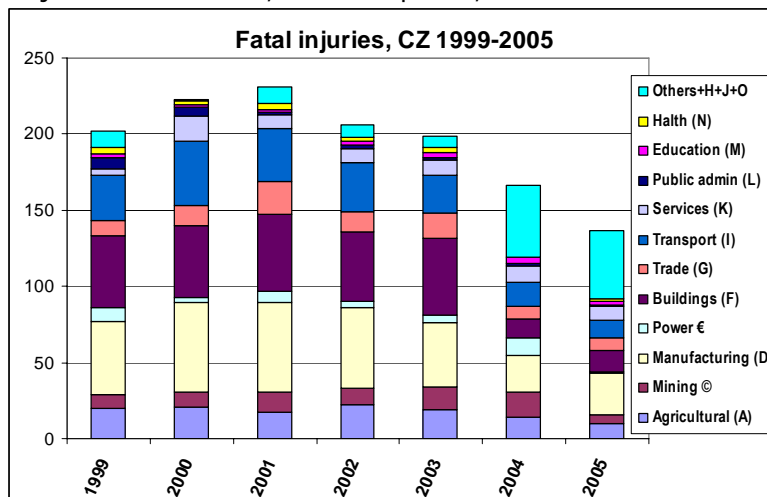
Fatal injuries, CZ 1999-2005

Table 1: Descriptive statistics – "Quality of Occupational Life- 2006" survey.

Variable	Variable type	whole sample			only exposed to risks					only man and exposed to risks				
		N	Mean	Std Dev	N	Mean	Std Dev	Min	Max	N	Mean	Std Dev	Min	Max
wage	thousands CZK	1 616	**15.38**	8.32	1 085	**16.42**	9.20	3	100	694	**17.89**	9.71	3	100
fatal	cases per 10.000	2 037	**1.24**	0.80	1 367	**1.29**	0.86	1	9	906	**1.41**	0.92	1	9
nonfatal	cases per 10.000	2 037	**14.71**	15.10	1 367	**16.15**	15.81	1	84	906	**19.52**	16.78	1	84
BOSS	dummy	2 042	**0.25**	0.43	1 373	**0.30**	0.46	0	1	909	**0.33**	0.47	0	1
BUILDWOK	dummy	2 043	**0.07**	0.25	1 373	**0.09**	0.29	0	1	909	**0.13**	0.34	0	1
cartravelling	dummy	2 043	**0.44**	0.50	1 373	**0.65**	0.48	0	1	909	**0.73**	0.44	0	1
EXPERIEN	years	2 043	**7.17**	8.15	1 373	**7.20**	8.36	0	50	909	**7.16**	8.52	0	50
MALE	dummy	2 043	**0.56**	0.50	1 373	**0.66**	0.47	0	1	909	**1.00**	0	1	1
University	dummy	2 043	**0.14**	0.35	1 373	**0.15**	0.35	0	1	909	**0.14**	0.35	0	1
A-level	dummy	2 043	**0.37**	0.48	1 373	**0.36**	0.48	0	1	909	**0.31**	0.46	0	1
AGE	years	2 036	**40.38**	29.37	1 370	**40.46**	29.32	18	72	906	**40.52**	29.67	18	72
BREADWIN	dummy	1 467	**0.62**	0.23	1 001	**0.64**	0.23	0	1	642	**0.68**	0.21	0	1
KIDS	no of children	2 043	**0.69**	0.89	1 373	**0.72**	0.91	0	4	909	**0.70**	0.91	0	4
kzam1	dummy	2 043	**0.09**	0.29	1 373	**0.12**	0.33	0	1	909	**0.14**	0.34	0	1
kzam2	dummy	2 043	**0.04**	0.20	1 373	**0.04**	0.19	0	1	909	**0.04**	0.19	0	1
kzam3	dummy	2 043	**0.17**	0.37	1 373	**0.16**	0.37	0	1	909	**0.12**	0.32	0	1
kzam4	dummy	2 043	**0.13**	0.33	1 373	**0.07**	0.26	0	1	909	**0.04**	0.19	0	1
kzam5	dummy	2 043	**0.21**	0.41	1 373	**0.20**	0.40	0	1	909	**0.16**	0.36	0	1
kzam6	dummy	2 043	**0.04**	0.20	1 373	**0.05**	0.22	0	1	909	**0.06**	0.25	0	1
kzam7	dummy	2 043	**0.14**	0.35	1 373	**0.17**	0.38	0	1	909	**0.25**	0.43	0	1
kzam8	dummy	2 043	**0.09**	0.28	1 373	**0.11**	0.32	0	1	909	**0.14**	0.35	0	1
kzam9	dummy	2 043	**0.09**	0.28	1 373	**0.07**	0.25	0	1	909	**0.06**	0.24	0	1
okec1	dummy	2 043	**0.04**	0.20	1 373	**0.05**	0.22	0	1	909	**0.06**	0.23	0	1
okec2	dummy	2 043	**0.00**	0.05	1 373	**0.00**	0.05	0	1	909	**0.00**	0.07	0	1
okec3	dummy	2 043	**0.01**	0.10	1 373	**0.01**	0.11	0	1	909	**0.02**	0.14	0	1
okec4	dummy	2 043	**0.16**	0.37	1 373	**0.16**	0.37	0	1	909	**0.19**	0.40	0	1
okec5	dummy	2 043	**0.03**	0.16	1 373	**0.03**	0.17	0	1	909	**0.04**	0.20	0	1
okec6	dummy	2 043	**0.10**	0.29	1 373	**0.12**	0.32	0	1	909	**0.17**	0.38	0	1
okec7	dummy	2 043	**0.14**	0.35	1 373	**0.13**	0.33	0	1	909	**0.11**	0.31	0	1
okec8	dummy	2 043	**0.06**	0.23	1 373	**0.05**	0.22	0	1	909	**0.03**	0.17	0	1
okec9	dummy	2 043	**0.08**	0.27	1 373	**0.09**	0.29	0	1	909	**0.12**	0.32	0	1
okec10	dummy	2 043	**0.03**	0.18	1 373	**0.03**	0.18	0	1	909	**0.03**	0.17	0	1
okec12	dummy	2 043	**0.06**	0.24	1 373	**0.06**	0.23	0	1	909	**0.05**	0.23	0	1
okec13	dummy	2 043	**0.08**	0.27	1 373	**0.06**	0.23	0	1	909	**0.03**	0.18	0	1
okec14	dummy	2 043	**0.08**	0.27	1 373	**0.09**	0.28	0	1	909	**0.04**	0.20	0	1
okec15	dummy	2 043	**0.08**	0.28	1 373	**0.07**	0.26	0	1	909	**0.06**	0.24	0	1
okec16	dummy	2 043	**0.01**	0.11	1 373	**0.01**	0.09	0	1	909	**0.00**	0.06	0	1

Table 2: KPZ-2006: full sample.

FULL SAMPLE	Model with the best lamda		Model with λ=0	
	Coefficient	Liberal p	Coefficient	Pr > ChiSq
Intercept	1.768	>= <.0001	1.718	<.0001
fatal	**0.148**	**>= 0.0015**	**0.136**	**0.001**
fatal2	**-0.021**	**>= 0.0016**	**-0.019**	**0.001**
BOSS	0.166	>= <.0001	0.150	<.0001
Cartravelling	0.082	>= 0.0001	0.073	0.000
MALE	0.185	>= <.0001	0.168	<.0001
University	0.347	>= <.0001	0.312	<.0001
A-level	0.145	>= <.0001	0.132	<.0001
BREADWIN	0.561	>= <.0001	0.509	<.0001
KIDS	0.035	>= 0.0010	0.032	0.001
kzam1	0.562	>= <.0001	0.506	<.0001
kzam2	0.509	>= <.0001	0.461	<.0001
kzam3	0.342	>= <.0001	0.313	<.0001
kzam4	0.311	>= <.0001	0.286	<.0001
kzam5	0.241	>= <.0001	0.221	<.0001
kzam6	0.198	>= 0.0030	0.181	0.003
kzam7	0.305	>= <.0001	0.279	<.0001
kzam8	0.343	>= <.0001	0.313	<.0001
okec1	-0.108	>= 0.0538	-0.096	0.055
okec4	-0.085	>= 0.0070	-0.076	0.007
okec6	-0.042	>= 0.2679	-0.037	0.284
okec7	-0.129	>= <.0001	-0.118	<.0001
okec13	-0.103	>= 0.0156	-0.091	0.017
okec14	-0.065	>= 0.1122	-0.059	0.109
okec15	-0.053	>= 0.1808	-0.048	0.169
N	1 462		1 462	
Lambda used	**0.038**		**0.000**	
LogLikelihood	-2212.0*		-406.3	
Adj R-Sq.	0.49			
WTP	0.106		0.097	
VSL (mil.Kč)	**175.6**		**179.4**	
VSL (mil.€)	**5.91**		**6.04**	

* Loglikelihood of lambda estimate.
Note: Exchange rate used 28.34 CZK/€ (2006).

Table 3: KPZ-2006: sub-samples of exposed all and exposed males.

	All but exposed to risks				Male exposed to risks			
	Coefficient	Liberal p	Estimate	Pr > ChiSq	Coefficient	Liberal p	Estimate	Pr > ChiSq
Intercept	1.692	>= <.0001	1.657	<.0001	1.700	>= <.0001	1.770	<.0001
fatal	**0.157**	**>= 0.0045**	**0.145**	**0.004**	**0.138**	**>= 0.0061**	**0.163**	**0.005**
fatal2	**-0.024**	**>= 0.0019**	**-0.022**	**0.001**	**-0.017**	**>= 0.0201**	**-0.020**	**0.018**
BOSS	0.154	>= <.0001	0.141	<.0001	0.098	>= 0.0014	0.115	0.001
BUILDWOK	0.151	>= 0.1031	0.137	0.102	0.148	>= 0.0571	0.179	0.047
Cartravelling	0.109	>= <.0001	0.100	<.0001	0.080	>= 0.0031	0.095	0.003
MALE	0.189	>= <.0001	0.174	<.0001				
University	0.367	>= <.0001	0.335	<.0001	0.258	>= <.0001	0.307	<.0001
A-level	0.151	>= <.0001	0.140	<.0001	0.095	>= 0.0031	0.112	0.003
BREADWIN	0.603	>= <.0001	0.554	<.0001	0.385	>= <.0001	0.458	<.0001
KIDS	0.038	>= 0.0028	0.035	0.002	0.046	>= 0.0002	0.053	0.000
kzam1	0.551	>= <.0001	0.502	<.0001	0.526	>= <.0001	0.628	<.0001
kzam2	0.406	>= <.0001	0.372	<.0001	0.468	>= <.0001	0.556	<.0001
kzam3	0.286	>= <.0001	0.264	<.0001	0.308	>= <.0001	0.361	<.0001
kzam4	0.262	>= 0.0003	0.243	0.000	0.251	>= 0.0034	0.291	0.004
kzam5	0.234	>= <.0001	0.216	<.0001	0.299	>= <.0001	0.351	<.0001
kzam6	0.204	>= 0.0131	0.189	0.011	0.134	>= 0.0520	0.155	0.054
kzam7	0.280	>= <.0001	0.258	<.0001	0.282	>= <.0001	0.331	<.0001
kzam8	0.327	>= <.0001	0.301	<.0001	0.320	>= <.0001	0.376	<.0001
okec1	-0.120	>= 0.0820	-0.109	0.080				
okec4	-0.052	>= 0.1704	-0.047	0.171				
okec6	-0.145	>= 0.0708	-0.130	0.072	-0.123	>= 0.0701	-0.150	0.057
okec7	-0.137	>= 0.0005	-0.128	0.000	-0.071	>= 0.0794	-0.083	0.081
okec13	-0.097	>= 0.0754	-0.087	0.080	-0.087	>= 0.1727	-0.105	0.158
N	997		997		640		640	
Lambda used	**0.050**		**0.000**		**0.050**		**0.000**	
LogLikelihood	-1603.7*		-313.7		-1096.3*		-201.0	
Adj R-Sq.	0.47				0.37			
WTP	0.109		0.101		0.103		0.122	
VSL (mil.Kč)	**195.2**		**198.0**		**263.3**		**261.5**	
VSL (mil.€)	**6.57**		**6.67**		**8.87**		**8.80**	

* Loglikelihood of lambda estimate.
Note: Exchange rate used 28.34 CZK/€ (2006).

Table 4: Descriptive statistics – statistical data for sectors, CZ, 2003-2005.

Variable		FULL SAMPLE	only POSITIVE	MANUAL
Wage	1000 CZK per empl.	325.16	316.16	301.98
Net_wage	1000 CZK per empl.	262.73	256.34	246.45
r_fatal	cases per 1000	0.03	0.06	0.07
r_injur3	cases per 1000	17.39	21.29	24.61
r_injury	cases per 1000	8.39	10.22	12.24
r_longill	cases per 1000	0.41	0.32	0.39
r_sickdays	cases per 1000	35.56	56.59	70.17
r_longrisk	cases per 1000	0.05	0.07	0.08
Kcpain	1000 CZK per empl.	0.14	0.09	0.10
Kcprevent	1000 CZK per empl.	0.18	0.17	0.18
L_productivity	1000 CZK per empl.	705.24	616.51	655.76
Labour	number of empl.s	71 040	105 225	88 774
okec_agri	dummy	0.05	0.07	0.09
okec_ind	dummy	0.47	0.44	0.56
okec_ener	dummy	0.04	0.06	0.07
okec_stav	dummy	0.02	0.03	0.04
okec_serv	dummy	0.35	0.33	0.15
okec_tran	dummy	0.07	0.07	0.09
Dchemie	dummy		0.02	0.03
Dplast	dummy		0.06	0.07
Dkovy	dummy		0.07	0.09
Dstroje	dummy		0.02	0.03

Table 5: Estimation results – statistical data for sectors 2003-2005: full sample.

	MODEL 1a		MODEL 2a		MODEL 3a	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
intercept	10.777	>= <.0001	9.214	>= <.0001	2.077	>= <.0001
Fatal	**0.295**	**0.1987**	**0.261**	**0.1627**	**0.001**	**0.0980**
kcprevent	0.953	>= <.0001				
LP	0.000	>= <.0001	0.000	>= .0007	0.000	>= .0005
Okec_ind	-0.122	>= <.0001	-0.081	>= .0004	0.000	>= .0006
Okec_agri	-0.213	>= .0006	-0.201	>= .0001	-0.001	>= .0001
Dependent var	**wage**		**wage**		**net_wage**	
Lambda used	**-0.02**		**-0.05**		**-0.48**	
LogLikelyhood λ	-1188		-1184		-1801	
Adj R-Sq	0.63		0.1888		0.192	
VSL(mil.Kč)	91.0		116.8		107.8	
VSL(mil. €)	**3.06**		**3.92**		**3.62**	
VSL(m€; PPP)	6.50		8.34		7.70	

Note: Exchange rate used 29.78 CZK/€ (2005).

Table 6: Estimation results – statistical data for sectors 2003-2005: only sectors with positive fatal rates.

	MODEL 4a		MODEL 5a		MODEL 6a	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
intercept	97595.04	>= <.0001	463902.75	>= <.0001	1884327.06	>= <.0001
fatal	**69560.01**	**0.0350**	**436430.48**	**0.0238**	**1900912.21**	**0.0219**
LP	58.49	>= .0001	352.25	>= .0001	1510.09	>= .0001
okec_ind		>= .0006				
okec_agri		>= .0001				
injur3	-2.56	0.1714				
injury	2.64	0.11				
Dplast	8581.97	0.34				
Dkovy	23829.16	0.0087	120773.82	>= .0214	516612.95	0.0219
Dstroje	22663.10	0.12				
Dependent var	**wage**		**wage**		**net_wage**	
Lambda used	**0.96**		**1.105**		**1.245**	
LogLikelyhood λ	-702.8		-704.2		-688.6	
Adj R-Sq	0.4965		0.4795		0.4798	
VSL(mil.Kč)	113.9		119.7		96.4	
VSL(mil. €)	**3.82**		**4.02**		**3.24**	
VSL(m€; PPP)	8.13		8.55		6.89	

Note: Exchange rate used 29.78 CZK/€ (2005).

Table 7: Estimation results – statistical data for sectors 2003-2005: only sectors with positive and services excluded.

kod dat	Model 7a		Model 7a	
	Coeff.	p-value	Coeff.	p-value
intercept	3.249	>= <.0001	3.6212109	>= <.0001
Fatal	**0.014**	**0.068**	**0.021**	**0.065**
LP	0.000	>= .0001	0.0000125	>= .0001
injur3	0.000	>= .0001	-0.0004094	>= .0001
Injury	0.000	>= .0493	0.0001329	>= .0461
Plast	0.004	0.086	0.0052480	0.091
Dkovy	0.006	0.003	0.0091681	0.003
Dstroje	0.005	0.122	0.0069761	0.124
Dependent var	**Wage**		**net_wage**	
Lambda used	-0.3		**-0.265**	
LogLikelyhood λ	-907		-886.8	
Adj R-Sq.	0.4423		0.44444	
VSL(mil.Kč)	134.1		106.1	
VSL(m€)	**4.50**		**3.56**	
VSL(m€; PPP)	9.58		7.58	

Note: Exchange rate used 29.78 CZK/€ (2005).

Table 8: Descriptive statistics – Working conditions 2000, CZ 2000.

Variable	Description	N	Mean	Std Dev	Minimum	Maximum
Net wage	Net monthly wage per month	786	9 728	7 155	2 125	119 000
priplatek	dummy=1 if compensation	892	0,12	0,33	0	1
noc	dummy=1 if compensation for working during night	891	6,97	11,64	0	90
vikend	dummy=1 if compensation for working during weekend	892	1,89	2,29	0	9,33
praxe	Working practise	890	8,32	2,50	0	12,58
vedouci	Boss	892	0,17	0,38	0	1
RISK	dummy=1 if subjectively perceived occupational risks	892	0,42	0,49	0	1
RISK_fyz	dummy=1 if perceived physical risks	892	0,36	0,48	0	1
RISK_psy	dummy=1 if perceived psychological risk	892	0,21	0,41	0	1
RISK_fn	dummy=1 if perceived risk due to physical aggression	892	0,07	0,25	0	1
okec_zem	dummy for sector (agriculture)	892	0,06	0,23	0	1
okec_prum	dummy for sector (industry)	892	0,31	0,46	0	1
okec_stav	dummy for sector (construction	892	0,06	0,24	0	1
okec_dopr	dummy for sector (transport)	892	0,07	0,26	0	1
okec_slu	dummy for sector (services)	892	0,50	0,50	0	1
	Dummies for profession					
kzam1	Managers	892	0,06	0,23	0	1
kzam2	research and intellectuals	892	0,06	0,23	0	1
kzam3	Technicians	892	0,18	0,38	0	1
kzam4	lower administration	892	0,12	0,32	0	1
kzam5	service and sellers	892	0,18	0,38	0	1
kzam6	blue-collars in agri/forestry	892	0,02	0,12	0	1
kzam7	blue-collars in industry	892	0,19	0,40	0	1
kzam8	machinery service, drivers	892	0,11	0,31	0	1
kzam9	non-professional blue-collars	892	0,08	0,27	0	1
zena	dummy=1 if female	892	0,51	0,50	0	1
vek	Age	886	39,84	11,21	15	76
zenaty	dummy=1 if married	892	0,56	0,50	0	1
eaosob	Number of economic-active person in household	892	1,74	0,79	0	6
deti	Number of children in household	892	0,65	0,87	0	4
osob	Number of person in household	892	2,94	1,19	0	7
zivitel	dummy=1 if brings large part of money to family	892	0,61	0,49	0	1
obec1	dummy=1 if small village	892	0,25	0,44	0	1
obec2	dummy=1 if small town	892	0,29	0,45	0	1
obec3	dummy=1 if larger city	892	0,24	0,43	0	1
obec4	dummy=1 if city with more than 100,000 inhabitants	892	0,22	0,41	0	1

Table 9: Estimation results – Working Conditions 2000, CZ 2000.

	Coeff.	liberal p-value
Intercept	5.761	>= <.0001
Fatal-sq	**0.003**	**>= 0.1800**
VIKEND	0.003	>= 0.0533
PRAXE	0.010	>= <.0001
ZIVITEL	-0.046	>= 0.0604
ZENA_BI	-0.065	>= <.0001
Age	-0.001	>= 0.0004
Ecoactive person in household	0.015	>= 0.0076
Person in household	-0.026	>= <.0001
okec_industry	-0.034	>= 0.0028
okec_services	-0.025	>= 0.0255
KZAM2	0.038	>= 0.0659
KZAM3	-0.108	>= <.0001
KZAM4	-0.116	>= <.0001
KZAM5	-0.204	>= <.0001
KZAM6	-0.212	>= <.0001
KZAM7	-0.165	>= <.0001
KZAM8	-0.163	>= <.0001
KZAM9	-0.220	>= <.0001
City1	-0.073	>= <.0001
City2	-0.068	>= <.0001
City3	-0.059	>= <.0001
Riskwomen	0.024	>= 0.0496
riskzivitel	-0.047	>= <.0001
riskbenefit	0.042	>= 0.0040
pecovatel	0.039	>= <.0001
Dependent var	**Net_wage**	
Lambda used	**-0.12**	
LogLikelyhood λ	-9098	
Adj R-Sq	0.19	