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Wage compensation for risk: The case of Turkey

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ABSTRACT

In this article, I estimate the premium associated with fatal and non-fatal risk within broad industry categories, using official figures provided by the Ministry of Labor and Social Security and wage data from the 2010 and 2011 Household Labor Force Surveys. The results show only positive and significant fatal risk premiums in the manufacturing sector, whereas injury risk premiums exist in both the manufacturing and industry-wide samples. When wage heterogeneity is allowed, fatal risk compensation increases along the distribution, while that of injury risk follows an inverse-u pattern. Compared to similar country cases, the VSL and VSI estimates are relatively small and not significant for low wage earners. Industry averages show that longer working hours are correlated with accidents rates which implies the importance of firm heterogeneity and institutional factors on the high level and variance, particularly for Turkey.

1. Introduction

According to recent estimates by the International Labor Organization, 6300 people die each day from occupational accidents or work-related diseases, and the yearly death toll exceeds more than 2.3 million. Turkey has the highest fatality and injury rates among OECD countries OECD (2006).[1] Between 2000 and 2005, the most occupational accidents in Turkey were observed in the sectors of manufacture of metal goods (excluding for machines), construction, the textile industry, coal mining, and manufacture of transportation vehicles Unsar and Sut (2009). Some papers addressed the issue of work safety in specific sectors such as shipyard Barlas (2012), mining Sari et al. (2004) and construction Gürcanli and Müngen (2009) fatalities. Turkey is not a exceptional case; in many developing countries, higher accident rates have emerged as result of fast growing and unregulated economies where institutional risk measures are largely neglected and increasing global competition weakens environmental and work safety Hämäläinen (2009). These stylized facts raise the question of risk compensation in low work safety environments particularly for developing countries. In this paper, I will investigate whether and to what extent workers are compensated by a premium for risky jobs in the Turkish labor market using the well-established methods of literature on the value of a statistical life (VSL) and injury (VSI). For the Turkish case, this study contributes as the first attempt to assess the risk compensation at the industry level using micro-data. In addition to the hedonic wage regression introduced by early studies Viscusi (1993), this paper adopts the quantile approach proposed by Evans and Schaur (2010) and Kniesner et al. (2010) in order to take into account the income (wage) heterogeneity in estimating the risk premium. This approach has the advantage of differentiating the wage-risk trade-off of workers along the wage distribution. The OLS results reveal that there is not a fatality risk premium when all industry-wide sub-sectors are included, there is a wage/risk trade-off for fatal risk only in manufacturing sector. For injury risk, both the industry-wide and manufacturing results show that workers are paid a risk premium. Once wage heterogeneity is assumed, the quantile results confirm the findings of the existing studies that workers are increasingly compensated for risky jobs along the wage distribution.

I will present the Turkish data then introduce the model and the estimation strategy to be used. Following the discussion of the OLS and quantile results and the VSL and VSI estimations, some specific issues will be addressed concerning the relationship between some industry-level characteristics and industrial accident rates in Section 3. Section 4 concludes.

2. Data and estimation strategy

Choosing an accurate indicator for accident risk is central to the measurement of the premium. Theoretically, in the wage bargaining framework, the compensating differential should be negotiated

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[1] Turkey has the highest fatal risk rate reported 20.6 per 100,000 workers. See "Work Accidents", *in Society at a Glance 2006: OECD Social Indicators.*

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according to the level of uncertainty related to the nature of the job and the position of the worker in the organization. The employer has information that workers do not have and workers have to deal with the contingencies of the job if they accept the job offer. For workers, the risks associated with certain jobs could be perceived either through their limited personal evaluations (whether on-the-job or prior to the job offer) or through the publicly available information. In some cases, it is possible that both parties might not evaluate the associated risks ex ante. For the Turkish case, to my knowledge, no subjective evaluation of workers for fatality and injury risks at the industry or occupation level is available. The available fatality and injury data are provided by the Ministry of Labor and Social Security (MLSS)[2] and they include all the formally employed wage earning workers who are subject to social coverage under article 4-1/a of Act 5510.[3] Given the size and low standards of informal employment in Turkey and given that the data exclude not only workers with no legal protection but also the self employed, the data excludes a considerable portion of workers.[4]

A two-digit industrial breakdown of risk data provides sufficient heterogeneity and conforms with the industry classification of the wage data obtained from the Household Labor Force Survey (HLFS) for 2010 and 2011. At the industry level, the MLSS provides gender-specific fatality and injury cases for 84 sub-sectors.[5] The total number of workers corresponding to each industry is obtained from the HLFS using weights given by TurkStat that conform to the criteria of coverage under article 4-1/a. The fatality risk ratio is calculated per 10,000 workers and the injury risk ratio is given as a percentage as commonly preferred in the literature. Choosing the denominator to be used is problematic. Viscusi (2004) discusses the issues in creating a job risk variable at the aggregated industry level and finds that most studies prefer to use blue-collar or male samples to estimate the risk premium. Without making any skill distinction, I choose gender specific risk rates for two reasons. Firstly, female participation is very low at every industry level and it increases with education level.[6] Thus the total accident figures corresponding to each industry would hide the gender-biased risk because of low participation. Secondly, industry or occupation choice can also indicate a gender bias. In addition to the participation issue, for female workers, the nature of work could also differ within each industry or occupation. In terms of risk disaggregation, it is evident that in industry pairs where gender participation is more balanced, the risk rate still reflects the aggregate level and does not produce any bias but sector selection.

Yearly gender-specific risk ratios (Table 1) reveal that fatality rates are high and show great dispersion across all industries although in the manufacturing sector, they are lower and relatively less dispersed. For Chile, Parada-Contzen et al. (2012) report fatal risk rates that are relatively lower than those of Turkey: 0.584 (3 times lower) and 0.406 (6 times lower) for the manufacturing sector and total industry respectively. However the injury rates are far higher compared to Turkey. Secondly, female rates are expectedly lower for both groups and the accident cases are quite limited compared to the male sample. For both male and female sample, the non-fatal injury risk rates are higher in the manufacturing sector and the existing gender gap is not so wide as it is for fatal risk.

Estimation of the risk premium is generally based on the canonical hedonic wage model which involves the usual wage regression plus a premium (taste) for risk. Following the accepted procedure, the wage Eq. (1) can be estimated including the premia for risks associated with a particular industry using HLFS data which include wage earners with a positive wage and working hours and an age interval between 21 and 65.

$$\ln(w_i) = \alpha + \beta_1 X_i + \beta_2 H_i + \gamma q_i + \varepsilon_i \tag{1}$$

In Eq. (1), w_i denotes the log hourly wage. X is a set of individual covariates including gender, education (5 categories) age, age squared, tenure and its square, regular working hours, an urban dummy, marital status (4 categories), firm size (6 categories) and a public employee dummy. We control for fixed effects for region (12), industry (84, 24 if manufacturing), occupation (9) and years (2 if pooled). H indicates the industry, occupation and region effects. γ_1 denotes the risk premium associated with the gender specific fatality or injury risk p_i. ε is the error term. Table 2 provides a brief description of variables used in all the regressions.

The estimating strategy of risk compensation requires consideration of the selection bias inherent to choosing a risky job. The OLS estimation of Eq. (1) has been criticized because it does not deal with the endogeneity problem. Under the assumption that safety is a normal good, workers with higher incomes could prefer safer jobs in the trade-off between risk and earnings. Following Garen (1988), most of the literature uses non-wage income heterogeneity as a selection criterion. Garen (1988) also argues that job risk is endogenous to worker productivity and some workers with unobservable attributes such as cool-headness are more productive in risky jobs than in safer ones. The general argument is that risk aversion increases with earnings, productivity or aging.[7] Considering that wage is an important component of income, Evans and Schaur (2010) and Kniesner et al. (2010) use the quantile regression approach to overcome the issue of income heterogeneity by allowing the wage elasticity to change along the distribution. The quantile wage regression allows the risk premium to vary with the wage and differentiates income elasticities for each quantile. Both studies find increasing income elasticity using the quantile approach. Evans and Schaur (2010) also include additional controls to account for age heterogeneity which allow for a differential effect of age on the wage-risk trade-off at different points in the wage distribution. I use both OLS and the quantile approach with different specifications to estimate fatality and injury risks separately for each year and pooled cross-sections. The results of the pooled regression will be the baseline model to estimate the monetary value of a statistical life and injury.

Suppose that the conditional quantile function for the quantile τ, denoted by Q_τ is given as in Eq. (2).

$$Q_\tau(\ln(w_i)|X_i) = \alpha + \beta_{1\tau} X_i + \beta_{2\tau} H_i + \gamma_\tau q_i \tag{2}$$

The significance of quantile regression here is that the coefficient γ_τ represents the marginal risk compensation of the individual worker conditional on the parameters of the explanatory variables estimated at the τth percentile. Evans and Schaur (2010) show using a simple model that the premium scheme could be differentiated when wage heterogeneity is introduced and that through quantile estimation, such differentials can be estimated. In

[2] According to Turkish labor law (acts: 6331 and 5110), all firms have to report job related accidents that their (formal) employees have had to the ministry within 3 days. The Ministry of Labor and Social Security gathers these reports and rearranges accident cases according to ILO standard classifications.

[3] ILOSTAT does provide comparable fatality and non-fatality figures for Turkey but figures are only updated through 2008.

[4] Turkey is not an exceptional case in providing fatality numbers only for insured/covered workers. By the same token, it has been argued that the global figures provided by ILO underestimate the real accident cases Hämäläinen et al. (2009).

[5] Among the 88 sub-sectors in the Nace 2 revision, four sectors are unreported.

[6] In recent years, there seems to have been a more equal reallocation of women between sector. See Bakis and Polat (2013) for within and between effects.

[7] Viscusi and Aldy (2007) report that the value of statistical life-age relationship follows an inverted U pattern.

[8] Koenker and Hallock (2001) argue that the method used in the standard Stata package (qreg) produces "standard errors (which) are frequently considerably smaller" (p. 16). Machado et al. (2011) compares their estimates with both standard and bootstrapping methods.