K3.1 Accident risk and wages – theoretical considerations

JÁNOS KÖLLŐ

Most people would offer all their possessions to avoid an *almost certain* death. We would also spend a lot of money and time to prevent a *highly likely* accident. However, in our everyday decisions, when these risks seem smaller and more distant, we tend to take risks that we would be able to mitigate or effectively prevent at some financial expense. When we make financial sacrifices to preserve our health or accept financial advantages in exchange for minor or major health or death risks, we implicitly put a price on our life and health whether admitting it or not. (For a more detailed and comprehensive description of this trade-off, see for example *Ashenfelter–Greenstone,* 2004b).

Take two firms, both with a thousand employees who have identical characteristics and do the same job. At firm *A* the probability of a fatal accident within a year is nearly zero ($p \gg 0$), while at firm *B* it is $p + 0{,}001$. The employees of firm *B* accept this additional risk for higher wages: whereas employees of firm *A* earn HUF *w* annually, employees at firm *B* earn HUF $w + 6600$. In other words, workers at firm *B* accept the one-thousandth higher risk in exchange for a premium of HUF 6600 – for the fact that one of them almost certainly dies each year. In total, the one thousand employees accept HUF 6.6 million for an annual fatality: according to their not necessarily conscious judgement reflected in their choice this is the value of a life. It is highly likely that the employees of firm *B* would not give this as an answer for the question "How much do you think a life is worth?" if they talked to you at all after hearing such a question. However, this is the judgement reflected in the preferences revealed by their decision, under certain circumstances.[1]

What are the circumstances? "Compensatory wage differences", reflecting differences in accident risks, can only evolve if workers are aware of the existence and extent of workplace risks (for example 60–70 years ago they knew very little about the carcinogenic effect of asbestos or petroleum). It is equally important that employees can choose from low- and high-risk but otherwise similar workplaces freely, aware of health risks and based on their risk preferences.[2] Another prerequisite is that the staff or institution deciding about wages appropriately assess the risk preferences of the typical member of the targeted segment of the labour force. It is disputed and needs thorough analysis to what extent these conditions exist in the various labour markets.

In a purely competitive economy, with well-informed and freely deciding actors, a specific balance is established between accident risk and wages. Individuals are different in assessing risk and wages and firms differ as to what costs they incur to reduce accident risks. Where these costs are high, it is worthwhile for firms to offer well-paid but high-risk jobs and where they are low, the offer of less risky but worse-paying firms is more competitive. The balance implies that risk averse employees find worse-paying but less risky vacancies more attractive and these are offered by firms that can mitigate risks at a low cost. Less risk averse employees prefer well-paid but high-risk jobs and these are offered by firms that would only be able to mitigate accident risks at very high costs. Ideally, a "wage–risk balance price curve" develops, which provides a range of equally favourable and feasible salary offers for heterogeneous employers and employees.

1 The labour economics textbook by *Borjas* (2009) uses a similar example to illustrate the notion of "statistical value of a life" *Borjas* (2009).

2 The time of learning about the risks is not crucial for *the development of compensatory wage differences*. The decrease in the number of applicants or the increasing number of those quitting may also force an employer to raise wages if staff turnover is costly for them. Obviously, from the point of view of individuals it is quite a difference whether they are informed about the risks before or after joining the firm.

The empirical analysis of these associations is particularly difficult (*Ashenfelter–Greenstone,* 2004a). It must be guaranteed that jobs differing in the extent of accident risk but similar in all other respects are compared and that the impact of workplace characteristics *generally considered* advantageous or disadvantageous on wages is included.[3] Consequently, it was only at the end of the twentieth century that significant research has started, when large and rich databases became accessible.

Several empirical studies have been conducted on the trade-off between accident risk and time saving valued at an average hourly wage (see *Bellavance et al,* 2009). The pioneering research of *Ashenfelter–Greenstone* (2004b), which explored the consequences of raising the speed limit in the United States, is a good example of the logic of this method. In the late 80's speed limit was raised for rural interstate roads in 38 states. The raise increased fatality rates per passenger-kilometre by 35 per cent but considerably reduced journey times. Based on the relationship of the two and traffic data, it was possible to estimate that every additional fatality saved 125,000 hours of journey time. Using the 12-dollar average hourly wage of the time, savings were estimated to be 1.5 million dollars per fatality: this is considered the value of a *statistical* life in the decision concerned.[4]

Estimates adopting similar logic have also been undertaken in Hungary about the trade-off between workplace accident risks and wages by *Adorján* (2001) and *Kaderják et al* (2005). The latter study included estimation based on 456 fatal and 90,673 non-fatal workplace accidents from the period 1994–1996. The time and location of the accidents, broken down by sector, occupation and firm, was also known. The authors estimated wage equations using explanatory variables measuring risk among others and found that a one-thousandth higher risk of fatality resulted in 20–25-months' and a one-thousandth higher risk of non-fatal accident in 1 months' of additional lifetime earnings. According to this estimate, the value of a statistical life was equal to HUF 13–44 million (HUF 78–264 million at current prices), while the price of preventing an accident was HUF 540–640 thousand (HUF 3.2–3.8 million at current prices). (More recent assessment of workplace accidents broken down by occupation, size of employer and sector is presented in *Subchapter 3.3.*)

Handling the Covid-19 pandemic, rampant both in Hungary and abroad at the time of writing the Subchapter, is a good example of a similar logic behind government decisions. Hungary restrained the number of serious cases within hospital capacities at great economic costs in the first wave. In the second wave, until the submission of this manuscript, the government refused to adopt measures which are significantly detrimental to economic performance, consciously acknowledging that it results in numerous fatalities avoidable at greater economic costs.

3 The importance of workplace attributes is subjective: for example some like to work indoors, at a permanent location, while others prefer to work outdoors and constantly on the move.

4 Adopting the difference-in-differences method, authors compared data from before and after the introduction of the measure in states raising and those not raising the speed limit.

References

ADORJÁN, R. (2001): Az emberi élet értéke Magyarországon. Statisztikai Szemle, Vol. 79, No. 8, pp. 669–689.

ASHENFELTER, O.–GREENSTONE, M. (2004a): Estimating the Value of a Statistical Life: The Importance of Omitted Variables and Publication Bias. American Economic Review, Vol. 94, No. 2, pp. 454–460.

ASHENFELTER, O.–GREENSTONE, M. (2004b): Using Mandated Speed Limits to Measure the Value of a Statistical Life. Journal of Political Economy, Vol. 112, No. S1, pp. S226–S267.

BELLAVANCEA, F.–DIONNE, G–LEBEAU, M. (2009): The value of a statistical life: A meta-analysis with a mixed effects regression model. Journal of Health Economics, Vol. 28, No. 2, pp. 444–464.

BORJAS, G. J (2009): Labor Economics. 5th edition, McGraw Hill.

KADERJÁK, P.–ÁBRAHÁM, Á.–PÁL, G. (2005): A csökkenő halálozási és baleseti kockázat közgazdasági értéke Magyarországon. [The economic value of falling risk of death and accident in Hungary.] Közgazdasági Szemle, Vol. 52, No. 3, pp. 231–248.