The impact of worker's age on the consequences of occupational accidents: empirical evidence using Spanish data

Bande, Roberto and López-Mourelo, Elva

GAME-IDEGA, University of Santiago de Compostela, International Labour Office

2014

The impact of worker's age on the consequences of occupational accidents: Empirical evidence using Spanish data

Roberto Bande[∇*] **and Elva López-Mourelo**[◊]

January, 2014

Abstract

This paper examines the impact of worker's age on the consequences of occupational injuries. Using data from the *Spanish Statistics on Accidents at Work* for 2004-2010, a multinomial model is estimated in order to analyse the impact of the age on the probability of suffering a severe or fatal accident. Further, a duration model is used to assess the effect of worker's age on the length of sick leave caused by occupational injuries. The analysis shows that the probability of suffering a severe or fatal accident, as well as the duration of the sick leave, increases with the worker's age once personal, job, and accident characteristics are controlled for. From a policy perspective, the results point out that decisions about delaying the retirement age require additional measures, such as the occupational reallocation of these older workers towards tasks with lower incidence rates, in order to minimise these effects.

JEL Codes: J14**,** J28**,** J81

Key words: occupational accidents, ageing, sick leave

[∇] GAME-IDEGA, University of Santiago de Compostela. E-mail: roberto.bande@usc.es
[*] Corresponding author: Department of Economics. Facultad de Ciencias Económicas y Empresariales. Avenida do Burgo s/n. 15782 Santiago de Compostela. A Coruña (Spain). E-mail: roberto.bande@usc.es. Phone: +34 881 811 666. Fax: +34 981 547 134
[◊] International Labour Office and GAME-IDEGA, University of Santiago de Compostela. E-mail: lopezmourelo@ilo.org

1. Introduction

In the coming years, the Spanish labour force will age significantly. From 2012 to 2020, the economically active population aged 60 and over will increase by 33 per cent. Moreover, by 2020, workers aged 60 and over will represent 6.2 per cent of the labour force, while they accounted for 4.7 per cent in 2012. As a result, older workers will be called on to remain productive later in life. In fact, the demographic pressure has led the European Union to develop some measures to foster what has been called active ageing, within the Stockholm and Barcelona targets (von Nordheim, 2004; Walker, 2008). The main goal is to achieve an increase in the participation rate of the elderly. These measures have been followed by complementary decisions by national governments. For example, in 2011, Spain delayed the mandatory retirement age from 65 to 67 years old (through a gradual increase from 2013 to 2027). If all of these measures succeed, the most visible result will be an increased number of older workers in the labour market. This ageing of the labour force may have important consequences for occupational accidents.

When the relationship between age and the consequences of the occupational injuries is analysed, it is important to take into account that older workers may exhibit certain characteristics that may exert opposite effects. On the one hand, these workers are generally more experienced and have a greater concern for the risks related to their job. This tends to reduce the number of injuries suffered by this group. On the other hand, given their age, these workers have a decreased ability to avoid unexpected accidents, suffer from diminished hearing and sight, and exude excessive confidence due to their experience, which could lead them to disregard the prevention measures for certain risks (Root, 1981; Blanch et al., 2009). Therefore, *a priori*, it is not easy to disentangle the ways in which ageing affects consequences of occupational injuries.

The evidence about the relationship between age and occupational accidents has been highly contradictory. Nevertheless, the most common finding is that accident frequency tends to decrease as age increases (Root, 1981; Mitchell, 1988), but that accident severity tends to increase with age (Landen and Hendricks, 1992; Truchon and Fillion, 2000). However, a negative relationship between age and accident severity was found in the case of temporary disabilities (Root, 1981; Mitchell, 1988), as well as to the average number of lost working days for white-collar and service workers (Dillingham, 1981). Additionally, a U-shaped relationship between age and the number of lost days per injury has also been reported (Blanch et al., 2009).

This paper sheds light on this debate by providing empirical evidence regarding the effect of the worker's age on the severity of occupational injuries. Using data from the Spanish Statistics on Accidents at Work (*Estadística de Accidentes de Trabajo* in Spanish, EAT), an administrative record of all of the workplace accidents that caused sick leave, we assess if, once the accident has happened, the age of the worker has a significant effect on the severity of his or her injury, as well as on the duration of the sick leave. We add to the literature in several respects. First, previous authors who have examined this issue have generally used survey data. This type of data involve several limitations, among them the possibility of bias as the information on workplace accidents and risk factors are collected in the same survey. The bias could occur because certain risk factors could make subjects more likely to remember occupational injuries and vice versa. We solve this limitation by using administrative data that contains information about all the work accidents that have occurred during a whole year and where all the information related to the accident is collected when the accident occurred. Second, the other important advantage of the database is that it includes a wide set of variables related to how the accident happened and its consequences. This allows us to take into account unobserved accident heterogeneity, a fact that, as discussed in next section, is especially relevant because older workers are more prone to suffer some type of accidents or injuries. Finally, the analysis takes into account two aspects of the consequences of occupational accidents: the degree of the injury and the duration of the sick leave. This allows us to study if there are differences in both consequences of occupational injuries across individuals classified by age.

In this context the paper is organised as follows. Section 2 describes the data used and summarises a descriptive analysis. Section 3 provides an econometric analysis of the impact of age on the severity of injuries, while Section 4 presents the results of the estimation of a model explaining the impact of age on the duration of the sick leave caused by occupational injuries. Finally, Section 5 presents the main conclusions.

2. Data and descriptive statistics

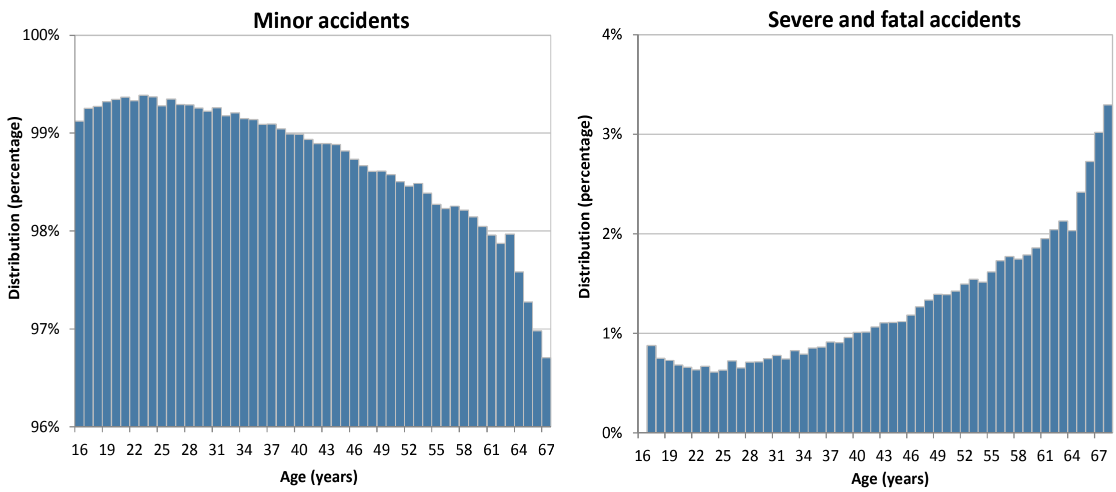
The data used are the administrative microdata from the Spanish Statistics on Accidents at Work (*Estadística de Accidentes de Trabajo* in Spanish, EAT), compiled by the Spanish Ministry of Labour. This database is based on administrative registrations of all of the workplace accidents that caused sick leave. Thus, the database includes every accident that caused the injured person to miss at least one day of work (excluding the day when the accident occurred) after a medical report was issued. In the event that an accident occurs, employers (or workers themselves when the injured person is self-employed) must fill in a form where they report (through the so-called "*parte de accidentes de trabajo con baja*", PAT) all of the information related to the accident.

The EAT provides information on personal characteristics of each individual who has suffered an accident –such as gender, age, and place of birth– and also information about their professional characteristics –such as job seniority, type of contract, occupation, and daily earnings. Moreover, the EAT also contains information related to employer's characteristics, such as industry, sector (public versus private), province where the firm operates, and number of workers in the firm. The EAT includes information on the establishment where the accident happened if the establishment is different from the place that the injured worker belongs. Finally, the EAT provides exhaustive information on the causes, circumstances, and consequences of the accident.

Regarding the sample selection we perform for our analysis, we focus on occupational injuries that occurred between 2004 and 2010. This is because a new notification procedure was fully implemented in 2004 and some relevant variables not considered previously were included in the files. Still, 2010 is the last year for which there is fully available information. In order to reduce heterogeneity associated with the labour supply side, we limit our sample to those workers covered by the Social Security General Regime. We also exclude self-employed workers from the sample because they are likely to have different incentives and possibilities to report work-related injuries. Moreover, observations corresponding to commuting accidents (i.e., those that occurred while the worker was commuting to or from his or her workplace) and to relapses have been deleted. Our selected sample, therefore, consists of 5,104,179 occupational injuries, of which 5,053,188 (99 per cent) are minor and 50,991 (1 per cent) are severe or fatal.

Figure 1 depicts descriptive statistics to compare the consequences of occupational injuries across individuals classified by age. We observe that the injuries of older workers are substantially more likely to be severe or fatal than those of younger workers. Indeed, the more severe cases and fatalities account for larger proportions of the accidents among older workers than among younger ones. Conversely, minor accidents are more prevalent among younger workers.

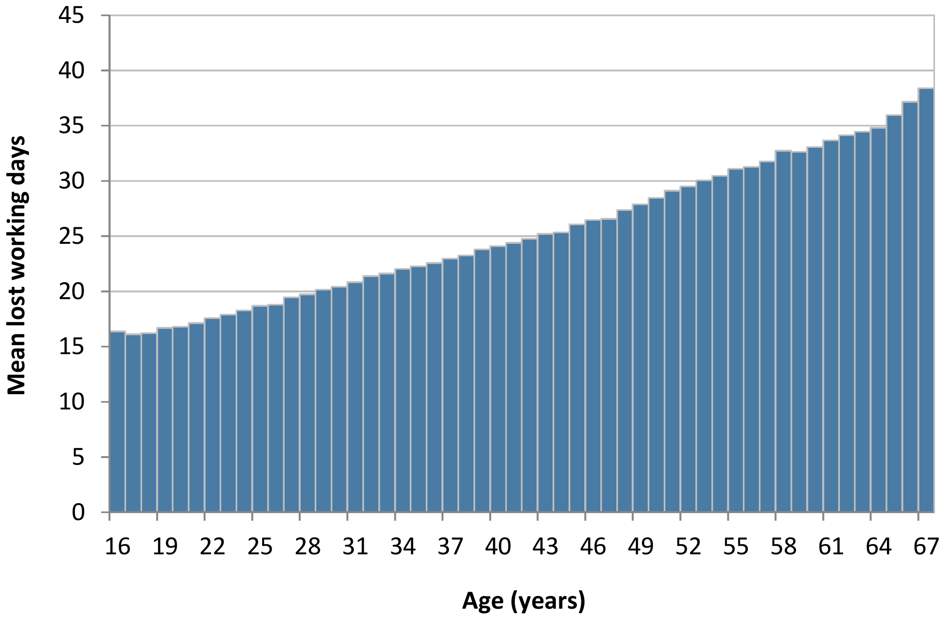
Figure 1.Distribution of the severity of occupational accidents by age



Source: Authors elaboration based on EAT.

Figure 1 suggests that a work-related accident to an older worker would more likely result in greater severity of injury than it would if the same accident happened to a younger worker. As a result, it is expected that the average duration of the sick leave caused by an occupational injury would increase with age. In fact, Figure 2 shows that the highest average in lost working days due to occupational injury is found for higher age intervals. In particular, the average number of non-working days among workers aged 65 and over (36.6 days) is twice as high as for workers aged 16 to 24 (17.3 days).

Figure 2. Mean lost working days due to occupational accidents by age



Source: Authors elaboration based on EAT.

Differences in the consequences of occupational injuries between older and younger workers could reflect the physical effects of ageing. For instance, declining bodily coordination among older workers could likely contribute to a greater number of injuries due to falling. Table 1 provides the distribution of occupational injuries according to the worker's specific physical activity at the moment the accident occurred as well as how the injury was incurred, both broken down by the worker's age. A look at the events leading to occupational accidents suggests that the relative risks of some types of events jump for the oldest group of workers. For instance, injuries due to bodily motion among workers aged 65 and over account for 42.1 per cent of all their injuries, but for workers aged 16-24 they represent only 23.6 per cent. Conversely, injuries associated with handling of objects are significantly higher for younger workers. The frequency declines from 32.5 per cent among 16-24 year-olds to 22.4 per cent for workers aged 65 and older.

Likewise, there also are age-specific patterns in how the injury was incurred. Falls account for about 23 per cent of injuries to workers aged 65 and over, but the percentage steadily declines for younger workers (9.5 per cent). Conversely, injuries due to contact with sharp, pointed, rough, or coarse objects are markedly more frequent for younger workers. For workers aged 16 to 24, the contact with a sharp object produces 15.9 per cent of injuries compared with about 9.7 per cent for workers aged 65 and over (see Table 1).

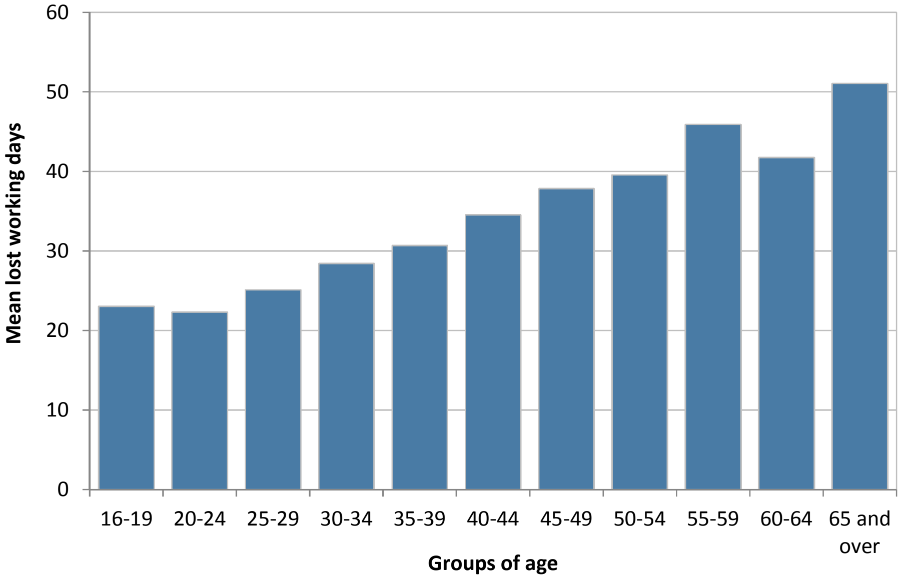
Table 1. Distribution of the characteristics of occupational accidents by age (percentage)

	16-24	25-39	40-49	50-59	60-64	65 and over
Specific physical activity						
Bodily motion	23.6	26.9	30.3	32.9	35.2	42.1
Handling of objects	32.5	30.6	29.3	28.2	26.6	22.4
Working with hand-held tools	15.7	14.3	13.6	13.6	14.0	11.9
Carrying by hand	14.2	13.7	13.4	12.2	11.6	9.9
Driving/being onboard a means of transport	5.8	5.7	4.8	3.9	4.0	5.3
Operating machinery	5.9	6.1	5.7	6.1	5.5	4.0
Other	2.4	2.7	2.9	3.0	3.2	4.4
Mode of injury						
Suffered acute overloading of body	31.9	38.4	40.5	37.8	33.6	27.3
Fall	9.5	10.0	11.6	14.3	17.1	23.4
Struck by or collided with something	21.4	18.5	16.7	16.5	17.0	17.5
Crashed into something	10.1	9.9	10.1	10.7	11.4	11.4
Came into contact with sharp, pointed, rough, or coarse object	15.9	12.5	10.7	10.2	10.7	9.7
Contact with electric voltage, temperature extreme, or hazardous substance	3.7	3.5	3.3	3.1	2.9	2.6
Trapped, crushed	3.6	3.1	2.9	3.0	2.8	2.6
Kicked or bitten	1.0	1.3	1.3	1.0	1.0	1.4
Heart attacks, strokes, or other non-traumatic pathologies	0.0	0.1	0.2	0.5	0.7	1.0
Drowning, buried	0.3	0.4	0.3	0.3	0.3	0.3
Other	2.6	2.4	2.4	2.5	2.6	2.8

Source: Authors elaboration based on EAT.

Beyond the fact that older workers are more likely to be injured when they are performing physical activity (i.e., movement) or are more prone to certain type of accidents (i.e., falls), they will remain absent from their job more days than their younger counterparts who suffer the same occupational injury. Figure 3 depicts the mean lost working days due to a fall in the workplace for workers in elementary occupations in the manufacturing sector, separated by 11 age intervals. Once a worker has been injured by a fall in the workplace, the average number of lost working days is higher among the oldest group of workers than among other workers. Thus, workers aged 16-24 show an average of 23 days, while the mean lost working days among workers aged 65 and over is 51 days. This finding might indicate that older workers need a longer period of healing of an occupational accident when considering the same industry, occupation, and type of accident due to physiological changes related with age that impact on the body's capacity to recover.

Figure 3. Mean lost working days due to a fall in the workplace for manufacturing workers in elementary occupations by age group



Source: Authors elaboration based on EAT.

In this section, we have shown that the workplace injuries of workers aged 65 and over are more likely to be severe or fatal. Furthermore, we observe that the physiological characteristics of the worker may imply a concentration of certain types of accidents. However, the descriptive analysis suggests that age effects are not only the result of job differences between younger and older workers, since the results hold even when we consider the same occupation, industry, and type of accident. In the next section, we analyse econometrically if age remains as a determinant of the severity of occupational injuries once we control for the worker's personal and professional characteristics, as well as for the characteristics of his or her workplace.

3. The impact of worker's age on the severity of occupational injuries

3.1. Empirical strategy

The aim of this section is to evaluate empirically the impact of worker's age on the severity of occupational injuries. In particular, we want to identify if, once the accident has happened, the age of the injured worker has a significant effect on the severity of the injury. The following equation is estimated:

$$y_{ijk} = \alpha + \beta_1 Age_{ijk} + \beta_2 X_{ijk} + \beta_3 V_{jk} + \beta_4 Z_k + \varepsilon_{ijk} \tag{1}$$

where i indexes individuals, j corresponds to a specific workplace and k corresponds to a particular accident; *Age* is worker's age, *X* is a vector of worker's characteristics, *V* is a vector of workplace's characteristics and *Z* is a vector of variables capturing how the accident occurred.

The probability of a worker suffering a severe or fatal accident rather than minor can be written as a function of a series of covariates as:

$$y^*_{ijk} = \Pr(y_{ijk} = 1) = F(Age_{ijk}, X_{ijk}, V_{jk}, Z_k, \beta) \quad (2)$$

At the individual level we would observe $y_{ijk} = 1$ if $F(Age_{ijk}, X_{ijk}, V_{jk}, Z_k, \beta) > z^*$ and $y_{ijk} = 0$ otherwise. Taking into account that the dependent variable has a dichotomous nature, the appropriate model is a linear probability model (either a logit or a probit).

The explanatory variables in the empirical analysis include several personal attributes of the individuals, job characteristics and establishment features, as well as regressors capturing specific characteristics of the occupational injury.

Worker's personal characteristics

As discussed in the introduction, although the economic literature has stressed that worker's age is important in determining the severity of work-related accidents, there is no consensus about its effect. Indeed, some studies suggest that the severity of occupational injuries increases with age (Landen and Hendricks, 1992; Truchon and Fillion, 2000) and others, in contrast, find a negative relationship (Root, 1981; Mitchell, 1988, both in the case of temporary disabilities). Additionally, a U-shaped relationship between age and the number of lost days per injury has also been reported (Blanch et al., 2009). To isolate the importance of worker's age as a factor to explain the consequences of work-related accidents, we have introduced five dummy variables to represent age group: aged 25-39; aged 40-49; aged 50-59; aged 60-64; and aged 65 and over. The omitted category in this case is aged 16-24.

The age of the worker is strongly correlated with length of service. Older workers generally are more experienced and are therefore more mindful of workplace hazards. But at the same time, they might be exposed to more dangerous jobs that require greater experience. In order to reduce the heterogeneity among workers due to different levels of experience at the same job, we have added 5 additional dummy variables: from 3 to 6 months; from 6 months to 1 year; from 1 to 3 years; from 3 to 10 years; and 10 or more years. The group of reference is less than 3 months of job seniority. Moreover, age by tenure interaction has been included as an explanatory variable. Finally, regressions have also been run for employees with 3 years of job seniority or less.

Regarding worker's personal characteristics, we also have controlled for worker's gender and place of birth.

Worker's professional characteristics:

From the dataset, we observe the worker's status in employment (employed in the private sector versus employed in the public sector), type of contract (open-ended or fixed-term), occupation, and earnings.

Information about the occupations of workers is an extremely important element in the analysis of occupational injuries. Moreover, we can consider this variable as a proxy for educational attainment. We have included nine dummy variables, one for each one of the occupation groups: armed forces; legislators, senior officials and managers; professionals; technicians and associate professionals; clerks; service workers and shop and market sales workers; skilled agricultural and fishery workers; craft and related trade workers; and plant and machine operators and assemblers. The omitted category for comparison is elementary occupations.

The existing literature has pointed that worker's earnings may have an impact on the incentive to report an occupational injury. In particular, the impact of wages on absenteeism is ambiguous due to the income and substitution effects. When the paid sick leave represents 100 per cent of the wage, the substitution effect disappears and the effect of wage on sick leave is therefore positive. However, in the Spanish system the paid sick leave due to occupational injury represents 75 per cent of the wage. To study which of the two effects has a higher impact, we have introduced a dummy variable for each one of the four salary quantiles with quantile 3 as the omitted category.

Establishment characteristics

One of the reasons that the consequences of occupational accidents vary among workers' age groups could be that the establishments where the accidents occur also differ (García-Serrano et al., 2010). In order to account for the link between the consequences of accidents and the attributes of establishments, a set of covariates has been included in the estimation: a dummy variable to indicate if the establishment belongs to the worker's firm, economic activity (grouped into ten categories: agriculture, forestry and fishing; mining and quarrying; manufacturing; construction; transportation and storage; accommodation and food service activities; public administration, defence and compulsory social security; education; human health, social work and veterinary activities; and other service activities), the size of the establishment, and its geographic location (coded according to the 17 Spanish regions).

As in many other countries, Spanish health and safety regulations fix certain requirements for safety equipment and procedures in terms of the number of workers employed. The Occupational Risk Prevention Act (ORPA) of 1995 requires firms with 500 employees or more in all industries and with 250-499 workers in certain industries to establish their own programmes for the prevention of occupational injuries, including the formation of health and safety committees involving both management and workers. Therefore, the size of the establishment where the accident happened is a potentially relevant driver of the consequences of occupational accidents, and it can be taken as a proxy of the prevention system that the firm establishes (García-Serrano et al., 2010). We have included seven dummy variables to describe the size of the establishment: 5-9 employees, 10-24 employees, 25-49 employees, 50-99 employees, 100-249 employees, 250-499 employees, and 500 and more employees. The group of reference is less than 5 employees. We also have included a dummy variable to indicate if the establishment has conducted an evaluation of workplace risks.

Accident characteristics

Additionally, we have included a set of covariates capturing specific characteristics of the accident: type of location (in the usual establishment, on work-related travel, or somewhere else); year, day of the week, hours worked (grouped in 8 levels, from "0 to 3 hours of work" to "more than 22"), and time of day (day versus night work) when the accident occurred; if the type of activity carried out by the worker constitutes his or her usual task; place of occurrence (industrial site; construction site; farming, breeding, fish farming, or forest zone; tertiary activity area; health establishment; public area; at home; sports area; in the open air; underground; on/over water; in high pressure environments; and other); type of task the worker was performing (production, manufacturing, processing and storing; excavation, construction, repair and demolition; agricultural type work, forestry, horticulture, fish farming and work with live animals; service provided to enterprises and/or to the general public; movement, sport, and artistic activity; and other); and specific physical activity (operating machinery; working with hand-held tools; driving or being on board a means of transport or handling equipment; handling of objects; carrying by hand; movement; and other).

Finally, we have added a set of control variables related to how the injury incurred. In particular, we observe the mode of injury (contact with electrical voltage, extreme temperatures, or hazardous substances; drowning, buried; crashed into something; fall; struck by or collided with something; came into contact with sharp/pointed/rough/coarse object; trapped, crushed; suffered acute overloading of body; kicked or bitten; heart attacks, strokes and other non-traumatic pathologies; and other); the type of injury (superficial injuries and open wounds; fractures; dislocations, sprains and strains; traumatic amputations; concussion and internal injuries; burns, corrosions, scalds and frostbite; acute poisonings and infections; asphyxiation, drowning and non-fatal submersion; effects of noise, vibration, and pressure; effects of heat, light and radiation; psychological trauma, traumatic shock; multiple injuries; heart attacks, strokes and other non-traumatic pathologies; and other) and the part of the body injured (head; neck; back; trunk and internal organs; upper extremities; lower extremities; whole body and multiple sites; and other).

3.2. Summary of results

The results of the estimation of the probit model[1] are summarised in Table 2. The values in the table represent the coefficients of the categories of the variables. A negative coefficient indicates that the corresponding category decreases the probability of suffering a severe or fatal accident, while a positive coefficient indicates the opposite. Estimates that reach a significant probability level are denoted by asterisks; the standard errors are shown in parentheses. As evidenced by the large value of the likelihood ratio test, the overall explanatory power of the models is highly significant. The first column contains estimates based on the full sample and the second column offers the results for those workers with three or fewer years of job seniority. To preserve space, Table 2 includes the results regarding only our main variables of interest; the full results are shown in Table A1 of the Appendix.

From the results reported in Table 2, we may conclude that the probability that an occupational injury is severe or fatal clearly increases with the age of the injured worker. Taking the group of the youngest workers (from 16 to 24) as a reference, we observe that for every age group, the probability of a more severe accident increases from 7.5 per cent for the group aged 25 to 39 to 32.6 per cent for workers aged 65 and older. We observe that job seniority is significant only when the worker has been working less than 1 year at the same job. In particular, the injuries of workers who have been working at the same job from 3 months to 1 year are 3 per cent less likely to be severe or fatal than those of workers with less than 3 months of experience. Thus, the results suggest that after one year on the job, workers acquire enough tenure to avoid workplace hazards related to the lack of experience. Furthermore, we observe that the age by tenure interaction variable is insignificant.

When we observe the estimated results for the sample of accidents involving individuals with 3 years of tenure or less, the outcomes are very similar. Therefore, we can affirm that the large presence of experienced workers in the full sample is not affecting the impact of the worker's age in our analysis.

Given these results, we conclude that the impact of age on the severity of occupational injuries is mainly determined by the physiological characteristics of the worker. In other words, being a more experienced worker does not affect the severity of an occupational injury.

[1] A probit model is estimated because the probabilistic regression is the more natural model when the outcome is 1 exactly when a hidden Gaussian variable $Z_0 = X'\beta_0 + \varepsilon_0$ exceeds a threshold c with $\varepsilon \sim N(0, \sigma^2)$.

Table 2. Estimation results of probit models on the probability of suffering a severe or fatal work-related accident. Main variables

	All employees	Employees with 3 years of seniority or less
Gender (ref. Women)		
Men	0.216** (0.008)	0.223** (0.010)
Age (ref. 16-24)		
25-39	0.075** (0.007)	0.072** (0.008)
40-49	0.183** (0.008)	0.181** (0.009)
50-59	0.245** (0.009)	0.245** (0.011)
60-64	0.288** (0.013)	0.290** (0.019)
65 and over	0.326** (0.045)	0.337** (0.068)
Age*Tenure	0.000* (0.000)	0.000 (0.000)
Job seniority (ref. Fewer than 3 months)		
From 3 to 6 months	-0.034** (0.008)	-0.036** (0.008)
From 6 months to 1 year	-0.030** (0.008)	-0.035** (0.008)
From 1 to 3 years	-0.010 (0.007)	-0.024* (0.011)
From 3 to 10 years	-0.002 (0.009)	
10 or more years	0.021 (0.014)	
Number of observations	5,104,179	3,446,587
Log-likelihood value	-186,479.9	-125,909.6

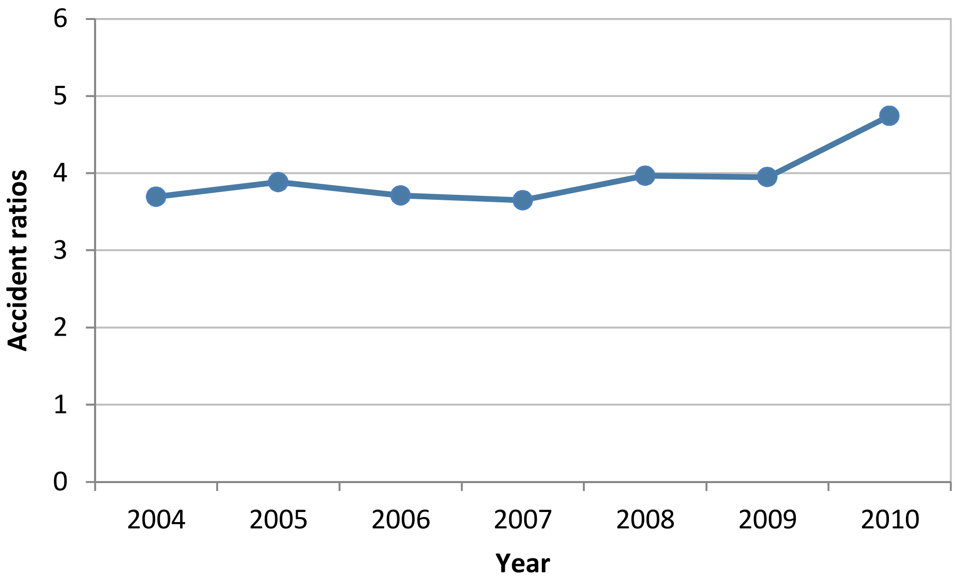
Notes: Standard errors in parentheses. Significance levels: *significant at 5 per cent; **significant at 1 per cent.

3.3. Sample selection bias correction

The EAT database presents an important limitation: it contains data only on workers that have experienced an accident, not data on all workers potentially at risk of having an accident. The main consequence is that the sample is highly selected. The variables that influence the probability of having an accident (among them, the age of the worker) determine whether or not an individual is included in the data set. To circumvent this problem, we follow the strategy proposed by García-Serrano et al. (2010) to estimate the impact of worker's age on the consequences of occupational injuries, in spite of the presence of sample selection.[2] The strategy consists of using an even more selected sample. On some occasions, when a worker suffers a work-related accident, other workers are involved in this accident. These workers are included in the data set as well and we can identify them through the variable *multiple accidents*.

Figure 4 shows evidence for the validity of our strategy. If multiple accidents capture the changes in the accident proneness composition of different groups, then the ratio of multiple to total accidents should be stable over time, everything else equal. In fact, Figure 4 shows that this ratio remains stable over the period of study. The strategy appears valid and, by focusing on this subset of accidents, the link between a worker's age and his or her inclusion in the sample is eliminated (García-Serrano et al., 2010). Our selected sample, therefore, consists of 39,108 occupational injuries, of which 37,130 (94.9 per cent) are minor and 1,978 (5.1 per cent) are severe or fatal.

Figure 4. Ratio multiple accidents to total accidents, 2004-2010



After limiting the sample to multiple accidents, the positive effect of age on the severity of occupational injuries survives. Further, controlling for sample selection significantly increases the impact of being an older worker (i.e. aged 65 and over) on the consequences of a workplace accident. In fact, controlling for sample selection, the injuries of workers aged 65 and over are 90 per cent more likely to be severe or fatal than those of their counterparts aged 16 to 24 (see Table 3).

[2] This strategy in turn is based on the identification strategy proposed by Levitt and Porter (2001) in the context of the study of seat belt and air bag effectiveness.

Table 3. Estimation results of probit models on the probability of suffering a severe or fatal work-related accident correcting for sample selection. Main variables

	Sample correcting for sample selection
Gender (ref. Women)	
Men	0.228** (0.057)
Age (ref. 16-24)	
25-39	0.115* (0.047)
40-49	0.207** (0.053)
50-59	0.275** (0.062)
60-64	0.365** (0.104)
65 and over	0.896* (0.385)
Age * Tenure	0.000 (0.000)
Job seniority (ref. Fewer than 3 months)	0.001 (0.052)
From 3 to 6 months	-0.010 (0.052)
From 6 months to 1 year	-0.020 (0.049)
From 1 to 3 years	-0.019 (0.058)
From 3 to 10 years	-0.039 (0.094)
10 or more years	0.001 (0.052)
Number of observations	38,974
Log-likelihood value	-4,675.7

Notes: Standard errors in parentheses. Significance levels: *significant at 5 per cent; **significant at 1 per cent.

Throughout this section, we have observed that, once we control for the main personal characteristics of the worker, his or her workplace, and the way the accident took place, the variable age significantly increases the probability that a given injury is severe or fatal. Furthermore, the analysis of occupational injuries and its determinants is strongly related to a rather different issue: the length of the sick leave associated to each injury. The expected result is that more severe injuries should be related to longer sick leave spells. The next section deals with this issue, analysing if age is a significant variable in the explanation of the duration of the sick leave caused by occupational injuries.

4. The impact of worker's age on the duration of sick leave caused by occupational injuries

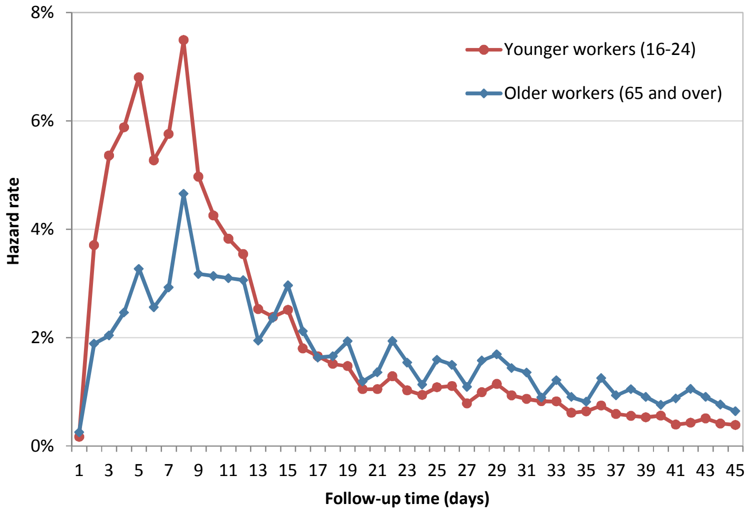
Our previous results in Section 3 suggest that the older a worker is, the greater the probability that if he or she suffers an occupational injury, it will be severe or fatal. The expected result in terms of the duration of sick leave is that older workers will be out of work for longer periods of time. This fact would have an immediate impact on the health care cost (either public or private), and therefore should be added to the relevant information set in the debate regarding, for instance, the delay of the mandatory retirement age. In this section, we econometrically assess the impact of age on the duration of sick leave caused by occupational injuries. Our main objective is to analyse the number of days between the occurrence of an occupational injury until the worker returns to the workplace, and assess the effect of personal and job characteristics on such length. For this reason we make use of the econometric duration models, which we describe briefly below.

In the first step, a preliminary descriptive analysis of the sick leave spells is produced using hazard functions. The hazard ratio, or the probability of failure at a certain time, is the conditional probability of returning to work after sick leave at that time, given that an individual has not had this event just prior to that time. Figure 5 plots these hazard rates for workers aged 16 to 24 and workers aged 65 and over. Looking at Figure 5, we can observe that institutional settings play a crucial role in the duration of sickness absence. In fact, Figure 5 reveals that many exits from activity occur at seven-day intervals starting on the 8th day, corresponding to the day after the medical certificate needs to be reissued. On the other hand, most sick leave spells end within the first 20 days. Given the shapes of these estimated baseline hazards, it seems clear that fitting a Weibull hazard would be appropriate.[3]

Further, Figure 5 shows that there are strong differences between younger (16-24) and older (65 and over) workers in the duration of sick leave spells due to occupational injuries. In fact, during the first 15 days, the hazard rate of returning to work after an occupational injury is higher for younger than for older workers. This means that the duration of sick leave spells is generally longer for older workers.

[3] The Weibull distribution is suitable for modeling data with monotone hazard rates that either increase or decrease exponentially with time.

Figure 5. Hazard rates of returning to work after an occupational injury by age group



Source: Authors elaboration based on EAT.

This study applies a duration model to estimate the hazard of ending the spell of sick leave due to occupational injury. Specifically, we study how a set of covariates have an impact on the probability of returning to the workplace when a worker has a sickness absence due to a work-related accident. We have estimated the model for the total sample, as well as for those workers who have been working at the same job for less than 3 years. We also have run the model controlling for sample selection. From our data, we select those observations with a sick leave of at least one day. We exclude the observations for fatal injuries. Our sample consists of 5,099,464 observations, for which we observe 4,241,796 complete durations (83.2%). We have included the same explanatory variables as the model for analysing the severity of occupational injuries. Nevertheless, we have also controlled for accident severity by including one dummy variable to indicate if the accident was severe.

Let us consider a population of individuals. For each individual we observe the period of time until the transition or the loss (censoring)[4]. We express the hazard rate as a function both of time and of the explanatory variables, following the proportional hazard model:

$$\lambda(t, X) = \lambda_0(t)\exp(x\beta) \qquad (3)$$

[4] The main problem related to duration models is that of censured data. There are several types of censoring. Left censoring occurs when we do not know the starting moment of the event; right censoring occurs when the ending moment of the event in unknown; and interval censoring occurs when both are unknown. In our case we face right censoring. This may be caused by two different reasons. First, it may be the case that the analyst observes the duration before the transit occurs; second, it may be the case that the phenomenon under study ends before we observe the transit. Our dataset shows the first type of right censoring, given the annual structure of the register. There are injured workers in each year that at the end of that are still under sick leave, and these will not be present in the next year data, since the EAT registers occupational injuries along the year. In any case we have full durations for 86% of total observations. Additionally, our empirical approach makes use of the remaining 14% for the estimation, as we describe next.

where $\lambda_0(t)$ is the baseline hazard.

There are different duration models, depending on the way the hazard function is specified. The Weibull model assumes a baseline hazard of the form:

$$\lambda_0 = pt^{p-1}\exp(\beta_0) \quad (4)$$

So, the hazard function in the Weibull model can be expressed as follows:

$$\lambda(t,X) = pt^{p-1}\exp(\beta_0 + x\beta) \quad (5)$$

Next, we introduce the unobserved heterogeneity in the model ("frailty"). The frailty hazard rate may be written as:

$$\lambda(t,X|v) = \lambda(t,X).v = \lambda_0(t)\exp(x\beta).v = \lambda_0(t)\exp(x\beta + u) \quad (6)$$

Where v is a random variable taking on positive values, with the mean normalised to one and finite variance σ^2; $\lambda_0(t)$ is the baseline hazard function; and $u \equiv \ln(v)$, which is a random variable with a zero mean. A crucial assumption in these models is that v is distributed independently of X and t.

Taking this into account, the frailty hazard function in the Weibull model is:

$$\lambda(t,X|v) = pt^{p-1}\exp(\beta_0 + x\beta + u) \quad (7)$$

One of the limitations in these models is that T is not observed for the censored cases. However, the method of maximum likelihood allows making full use of the information available for these cases. The general likelihood equation for censored data is:

$$\mathcal{L} = \prod_{i=1}^{n}[f(t_i)]^{\delta_i}\ [1 - F(t_i)]^{1-\delta_i} \quad (8)$$

In this likelihood equation, we observe that each individual contributes to the density function if the duration is complete and to the survival function (1 minus the cumulative distribution function) if the duration is censored. Given that the functions depend on the vector of covariates, we can express equation (8) as:

$$\mathcal{L} = \prod_{i=1}^{n}[\lambda(t_i, x_i|v)]^{\delta_i}\ [1 - F(t_i, x_i|v)]^{1-\delta_i} \quad (9)$$

Taking into account that the survival function can be expressed as

$$S(t,X|v) = exp\left(-\int_0^t \lambda(s, x_i|v)\, ds\right) = exp\left(-v\int_0^t \lambda(s, x_i)\, ds\right) \quad , \quad (10)$$

we can observe that the survival function is also conditional on both the covariates and that the frailty term because the hazard is a function of the frailties.

To derive the expected value of the survival function, we need to specify a probability distribution for v_i $[g(v)]$. We consider that frailty follows a Gamma distribution. Thus, the expected survival function can be derived from the hazard rate as follows:

$$S(t) = E[S(t, X|v)] = E\left[exp\left(-v\int_0^t \lambda(s, x_i)\, ds\right)\right] = L\left[exp\left(\int_0^t \lambda(s, x_i)\, ds\right)\right] \quad (11)$$

where L is the Laplace transformation. The use of the Laplace transformation is required to integrate out the distribution of the unobserved frailty.

Therefore, the cumulative distribution function is:

$$F(t_i, x_i|v) = 1 - S(t) = 1 - L\left[exp\left(\int_0^t \lambda(s, x_i)\, ds\right)\right] \quad (12)$$

This allows the likelihood function to be expressed entirely in terms of the frailty hazard rate:

$$\mathcal{L} = \prod_{i=1}^{n}[\lambda(t_i, x_i|v)]^{\delta_i}\ L\left[exp\left(\int_0^t \lambda(s, x_i)\, ds\right)\right] \quad (13)$$

Finally, we obtain the estimated parameters by maximising $\mathcal{L}$.

The regression results for the total sample, for workers with 3 or fewer years of job seniority and correcting for sample selection can be found in Table 3. This table provides the estimated hazard ratios. Hazard ratios at each survival time are related to absolute differences in characteristics:

$$\frac{h(t, X_1)}{h(t, X_2)} = \exp[\beta'(X_1 - X2) \quad (14)$$

Therefore, hazard ratios are interpreted as follows. A value below (above) 1 means that the likelihood of a transition from sick leave back to work is lower (higher) than that of a worker in the comparison group with all others covariates held constant. As in the previous section, we will focus exclusively on the main variables affecting age differences on sick leave duration and omit the effects of other explanatory variables. The full estimation results for all variables are available in Table A2 of the Appendix

Table 4. Estimation results of models on the duration of sick leave after an occupational accident. Main variables

	Full Sample		Sample correcting for sample selection
	All employees	Employees with 3 or fewer years of tenure	All employees
Gender (ref. Women)			
Men	1.074** (0.002)	1.075** (0.002)	1.159** (0.023)
Age (ref. 16-24)			
25-39	0.866** (0.002)	0.868** (0.002)	0.799** (0.017)
40-49	0.743** (0.002)	0.744** (0.002)	0.706** (0.017)
50-59	0.651** (0.002)	0.650** (0.002)	0.611** (0.019)
60-64	0.588** (0.003)	0.578** (0.004)	0.531** (0.032)
65 and over	0.567** (0.011)	0.569** (0.017)	0.498* (0.060)
Age*Tenure	0.999** (0.000)	0.999** (0.000)	0.999 (0.000)
Job seniority (ref. Fewer than 3 months)			
From 3 to 6 months	1.026** (0.002)	1.027** (0.002)	1.073** (0.027)
From 6 months to 1 year	1.030** (0.002)	1.034** (0.002)	1.050* (0.026)
From 1 to 3 years	1.024** (0.002)	1.041** (0.003)	1.040 (0.024)
From 3 to 10 years	1.004 (0.002)		0.994 (0.026)
10 or more years	0.975** (0.004)		0.942 (0.041)
Number of observations	5,099,464	3,443,734	38,708
Log-likelihood value	-7,160,347.7	-4,814,933.2	-53,442.0

Notes: Standard Errors in parentheses. Significance levels: *significant at 5 per cent; **significant at 1 per cent

Ignoring sample selection, our empirical results suggest that the duration of sick leave increases clearly with age. The hazard rate of returning to the workplace after sick leave for workers aged 65 and over is 0.57 times the hazard rate of workers aged 16 to 24. In other words, older workers remain absent from work more days after an occupational injury than younger workers.

Regarding job seniority, we find a U-shaped relationship between the number of lost working days due to an occupational injury and the length of service. Thus, the highest durations of sick leave are predicted for workers with fewer than 3 months of experience and for those with 10 or more years, while the lowest durations are rather found in the groups of workers with moderate experience – i.e. from 3 months to 3 years.

These results are observed in the three samples, but more clearly so when sample selection is controlled for. In fact, when sample selection is controlled, the expected absence duration for workers aged 65 and over is twice the duration expected for workers aged 16 to 24. In sum, our empirical evidence suggests that age is an important determinant in the explanation of sick leave duration related to occupational injuries. Once we control for the remaining determinants, we find a positive relationship between age and sick leave duration, which implies a greater cost in health care.

5. Conclusions

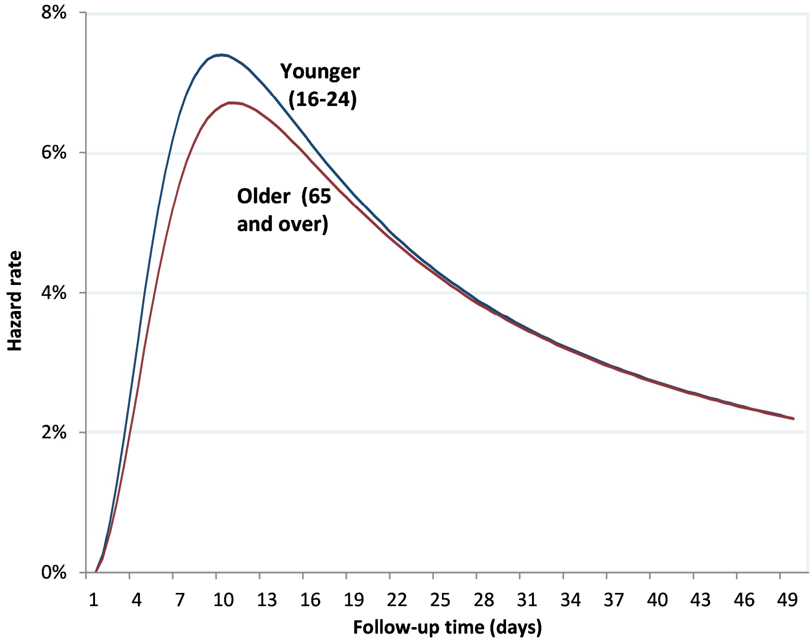
The current debate regarding the recent extension of the mandatory retirement age from 65 to 67 years has attracted the public attention, both from the media and academia, with strong opposite arguments between those defending the political decision and those opposed to it. In any case, and given the public statements of the main agents involved in this decision (government, worker's and employer's organizations, etc.) it seems that the main underlying concern is the financial sustainability of the public pension system. This paper, however, brings to light different aspects of the decision of delaying the retirement age (or in other terms, increasing the number of older workers in activity), which remain hidden in the debate. Specifically, in this paper we analyse the impact of age on the severity of occupational injuries, as well as on the duration of the sick leave related to them. If severity and the duration of the sick leave increase with age, we should expect that the delay of the retirement age would bring a greater number of severely injured workers. This may increase the cost of healthcare and thus compromise the potential gains from the delay in the retirement age. If, on the contrary, severity of injuries does not depend on age, there would not be special risks derived from this political decision. In order to clarify this fact, we need a detailed account of the impact of age on the severity of the injuries and the duration of the sick leave related to them; this is the contribution of the paper.

We have developed our task in two steps. First, we have estimated a probit model, in which we explain the severity of a given injury as a function of the personal and professional characteristics of the injured worker, as well as of his or her workplace and of the accident itself. Our results allow us to assert that once the accident has happened, the probability that it results in a severe or fatal injury clearly increases with age. Second, we have applied a duration model to estimate the hazard of returning to work after a sick leave spell due to occupational injury. Our empirical analysis allows us to conclude that the duration of sick leave increases significantly with age, once we have controlled for the personal characteristics of the worker, the workplace, the type of accident, and the way in which it took place.

From a policy perspective our results suggest that the decision regarding increasing the total number of older workers in the labour market should be made with caution. If the retirement age is delayed, the *ceteris paribus* effect must be an increase in the total number of severely injured workers with prolonged sick leave, which may increase the total public health cost expenses. Delaying the retirement age requires additional measures in order to minimise these effects. For instance, the functional reallocation of these older workers towards tasks with lower incidence rates (or less severe injuries) could help in alleviating the aforementioned effects. Our results highlight the importance of a proper link between the skills of the individual and the demands of the job. In fact, older workers are not only more prone to certain types of accidents (i.e. falls), but they also remain on sick leave longer than their younger counterparts due to the same occupational injury. Figure 6 shows that, after controlling for the other workers' characteristics, around 7.5 per cent of the workers aged 16 to 24 return to activity after a sick leave spell due to a fall in the workplace before the 11th day, while this percentage decreases to less than 7 per cent in the case of workers aged 65 and over. In other words, even considering the same type of injury, the duration of a sick leave caused by occupational injury is clearly higher for the oldest workers.

Furthermore, older workers could benefit from continuous prevention training programmes. In this respect, even though the Occupational Risk Prevention Act (ORPA) had a great success in reducing the overall number of occupational injuries and their incidence, especially those deemed severe and fatal, there are still some aspects where legal regulation is still needed. The ORPA, passed in 1995, requires firms with 500 employees or more in all industries and with 250-499 workers in certain industries to establish their own programmes for the prevention of occupational injuries, including the formation of health and safety committees involving both management and workers. The ORPA was a legislative reaction to the high level of incidence of occupational injuries in the 1990s, with a special emphasis on the immediate physical determinants of occupational injuries, such as the manipulation of hazardous materials, body protection, signalling, etc. Age was not specifically considered as a determinant of occupational injuries, and our econometric results suggest that some legal reform is needed in this regard, given that the effect of this variable on the probability that an accident results in more severe injuries is as important as the usual suspects (for example, if the accident took place in the main workplace or not). In any case, our work suggests that age is an important variable to explain occupational injuries in Spain, and therefore should be taken into account in the empirical studies.

Figure 6. Estimated hazard rate of returning to work after sick leave due to a fall in the workplace



References

1- Blanch, A.; Torrelles, B.; Aluja, A. and Salinas, J.A. 2009. “Age and lost working days as a result of an occupational accident: A study in a shiftwork rotation system”, in Safety Science, Vol. 47, pp. 1359-1363.

2- Dillingham, A. E. 1981. “Age and workplace injuries”, in Aging and Work, Vol. 4, pp. 1-10.

3- García-Serrano, C.; Hernanz, V. and Toharia, L. 2010. “Mind the gap, please! The effect of Temporary Help Agencies on the consequences of work accidents”, in Journal of Labor Resources, Vol. 31, pp. 162-182.

4- Landen, D.D. and Hendricks, S.A. 1992. “Estimates from the national health interview survey on occupational injury among older workers in the United States”, in Scandinavian Journal of Work, Environment and Health, Vol. 18, No. 2, pp. 18-20.

5- Levitt, S.D. and Porter, J. 2001. “Sample selection in the estimation of air bag and seat belt effectiveness”, in Review of Economics and Statistics, Vol. 83, No. 4, pp. 603-615.

6- Mitchell, O.S. 1988. “The relationship of age to workplace injuries”, in Monthly Labour Review, July, pp. 8-13.

7- Root, N. 1981. “Injuries at work are fewer among older workers”, in Monthly Labour Review, March, pp. 30-34.

8- Truchon, M. and Fillion, L. 2000. “Biopsychosocial determinants of chronic disability and low-back pain: a review”, in Journal of Occupational Rehabilitation, Vol. 10, pp. 117-142.

9- von Nordheim, F. 2004. "Responding well to the challenge of an ageing and shrinking workforce: European Union policies in support of member state efforts to retain, reinforce and re-integrate older workers in employment", in Social Policy and Society, Vol. 3, No. 2, pp. 145–153.

10- Walker, A. 2008. "The emergence and application of active aging in Europe", in Journal of Aging and Social Policy, Vol. 21, No. 1, pp. 75–93.

Appendix

Table A1. Estimation results of probit models on the probability of suffering a severe or fatal workplace accident. All variables

	Full Sample		Sample correcting for sample selection
	All employees	Employees with 3 or less years of tenure	All employees
Gender (ref. Women)			
Men	0.216** (0.008)	0.223** (0.010)	0.228** (0.057)
Age (ref. 16-24)			
25-39	0.075** (0.007)	0.072** (0.008)	0.115* (0.047)
40-49	0.183** (0.008)	0.181** (0.009)	0.207** (0.053)
50-59	0.245** (0.009)	0.245** (0.011)	0.275** (0.062)
60-64	0.288** (0.013)	0.290** (0.019)	0.365** (0.104)
65 and over	0.326** (0.045)	0.337** (0.068)	0.896* (0.385)
Age*Tenure	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)
Place of birth (ref. Spain)			
EU-15	0.117** (0.018)	0.122** (0.019)	-0.051 (0.109)
Rest of Europe	0.158** (0.014)	0.145** (0.015)	0.225* (0.096)
Africa	0.070** (0.012)	0.066** (0.013)	0.030 (0.085)
Latin America	0.018 (0.011)	0.012 (0.012)	-0.044 (0.075)
Rest of the world	0.208** (0.028)	0.227** (0.029)	0.297 (0.209)
Missing	0.039 (0.079)	0.081 (0.091)	
Professional situation (ref. Employee private sector)			
Employee public sector	0.103** (0.012)	0.098** (0.016)	-0.175* (0.080)
Occupation (ref. Elementary occupations)			
Armed Forces	0.072* (0.034)	0.076 (0.043)	0.045 (0.226)
Legislators, senior officials and managers	0.211** (0.030)	0.149** (0.049)	0.343 (0.186)
Professionals	0.208** (0.017)	0.228** (0.024)	0.385** (0.104)
Technicians and associate professionals	0.142** (0.014)	0.181** (0.018)	0.197* (0.086)
Clerks	-0.037* (0.015)	-0.126** (0.021)	0.107 (0.110)
Service workers and shop and market sales workers	-0.067** (0.01)	-0.060** (0.013)	-0.082 (0.070)
Skilled agricultural and fishery workers	0.013 (0.024)	0.002 (0.030)	-0.023 (0.177)
Craft and related trades workers	0.040** (0.006)	0.038** (0.007)	0.024 (0.042)
Plant and machine operators, and assemblers	0.048** (0.007)	0.042** (0.009)	0.153** (0.049)

Type of contract (ref. Fixed-term contract)			
Open-ended contract	-0.017**	-0.015*	0.019
	(0.006)	(0.007)	(0.042)
Job seniority (ref. Less than 3 months)			
From 3 to 6 months	-0.034**	-0.036**	0.001
	(0.008)	(0.008)	(0.052)
From 6 months to 1 year	-0.030**	-0.035**	-0.010
	(0.008)	(0.008)	(0.052)
From 1 to 3 years	-0.010	-0.024*	-0.020
	(0.007)	(0.011)	(0.049)
From 3 to 10 years	-0.002		-0.019
	(0.009)		(0.058)
10 or more years	0.021		-0.039
	(0.014)		(0.094)
Earnings (ref. Quantile 3)			
Quantile 1	0.006	0.009	0.032
	(0.007)	(0.008)	(0.050)
Quantile 2	0.004	0.003	0.024
	(0.006)	(0.007)	(0.044)
Quantile 4	0.009	0.028**	0.077
	(0.007)	(0.009)	(0.043)
Does the establishment belong to the worker's firm? (ref. No)			
Yes	-0.128**	-0.119**	-0.170**
	(0.007)	(0.008)	(0.044)
Economic activity (ref. Construction)			
Agriculture, forestry and fishing	0.034	0.045	0.070
	(0.022)	(0.027)	(0.135)
Mining and quarrying	0.123**	0.103**	0.434**
	(0.022)	(0.029)	(0.131)
Manufacturing	0.028**	0.032**	0.005
	(0.008)	(0.009)	(0.049)
Transport and storage	-0.013	0.012	0.057
	(0.011)	(0.014)	(0.072)
Accommodation and food service activities	-0.090**	-0.116**	0.019
	(0.015)	(0.017)	(0.124)
Public administration and defence; compulsory social security	-0.071**	-0.075**	-0.102
	(0.015)	(0.020)	(0.099)
Education	-0.037	-0.070*	-0.268
	(0.024)	(0.033)	(0.191)
Human health, social work and veterinary activities	0.055**	0.064*	-0.210
	(0.020)	(0.026)	(0.131)
Other service activities	-0.055**	-0.058**	-0.052
	(0.009)	(0.010)	(0.054)
Location of the establishment (ref. Andalucía)			
Aragón	-0.307**	-0.305**	-0.305**
	(0.015)	(0.018)	(0.093)
Asturias	-0.237**	-0.221**	-0.157
	(0.016)	(0.020)	(0.099)
Baleares	-0.192**	-0.187**	-0.395**
	(0.014)	(0.017)	(0.114)
Canarias	-0.292**	-0.281**	-0.235**
	(0.012)	(0.015)	(0.085)
Cantabria	-0.221**	-0.242**	-0.324*
	(0.020)	(0.026)	(0.125)
Castilla-La Mancha	-0.179**	-0.177**	-0.077
	(0.011)	(0.013)	(0.074)
Castilla y León	-0.203**	-0.208**	-0.060
	(0.011)	(0.013)	(0.066)
Cataluña	-0.110**	-0.099**	-0.073
	(0.008)	(0.009)	(0.053)
Comunidad Valenciana	-0.176**	-0.175**	-0.083

	(0.008)	(0.010)	(0.058)
Extremadura	0.028	0.014	0.129
	(0.015)	(0.018)	(0.100)
Galicia	-0.001	-0.012	-0.000
	(0.009)	(0.011)	(0.063)
Madrid	-0.310**	-0.303**	-0.238**
	(0.008)	(0.010)	(0.055)
Murcia	-0.217**	-0.195**	-0.223*
	(0.014)	(0.017)	(0.099)
Navarra	-0.204**	-0.188**	-0.356**
	(0.018)	(0.023)	(0.130)
País Vasco	-0.311**	-0.300**	-0.365**
	(0.012)	(0.015)	(0.076)
La Rioja	-0.316**	-0.303**	-0.072
	(0.028)	(0.035)	(0.148)
Ceuta y Melilla	-0.277**	-0.271**	-0.133
	(0.051)	(0.064)	(0.233)
Number employees of the firm (ref. 1-4 employees)			
5-9 employees	-0.053**	-0.050**	0.029
	(0.008)	(0.009)	(0.058)
10-24 employees	-0.108**	-0.114**	-0.078
	(0.007)	(0.008)	(0.053)
25-49 employees	-0.157**	-0.165**	-0.069
	(0.008)	(0.009)	(0.056)
50-99 employees	-0.190**	-0.204**	-0.116
	(0.009)	(0.010)	(0.061)
100-249 employees	-0.262**	-0.260**	-0.149*
	(0.009)	(0.011)	(0.063)
250-499 employees	-0.262**	-0.262**	-0.326**
	(0.012)	(0.016)	(0.080)
More than 500 employees	-0.260**	-0.274**	-0.215**
	(0.011)	(0.015)	(0.075)
Did the establishment realised evaluation of workplace risks? (ref. No)			
Yes	0.042**	0.052**	0.066
	(0.005)	(0.006)	(0.034)
Location of accident (ref. In the usual establishment)			
On work-related travel	0.192**	0.164**	0.204**
	(0.010)	(0.012)	(0.055)
Somewhere else	0.291**	0.278**	0.267**
	(0.007)	(0.008)	(0.046)
Day of the week when the accident occurred (ref. Saturday or Sunday)			
Monday	-0.084**	-0.088**	-0.114
	(0.009)	(0.012)	(0.060)
Tuesday	-0.062**	-0.072**	0.053
	(0.009)	(0.012)	(0.060)
Wednesday	-0.048**	-0.050**	-0.055
	(0.009)	(0.012)	(0.061)
Thursday	-0.037**	-0.037**	0.004
	(0.010)	(0.012)	(0.060)
Friday	-0.043**	-0.044**	-0.061
	(0.010)	(0.012)	(0.062)
Hours worked when the accident occurred (ref. 1, 2 or 3)			
4, 5 or 6	0.034**	0.034**	0.069*
	(0.005)	(0.006)	(0.033)
7, 8 or 9	0.050**	0.053**	0.052
	(0.006)	(0.007)	(0.041)
10, 11 or 12	-0.017	-0.030	0.044
	(0.013)	(0.017)	(0.088)
13, 14 or 15	0.098**	0.137**	0.145

	(0.032)	(0.040)	(0.202)
16, 17 or 18	0.044 (0.030)	0.056 (0.037)	0.214 (0.218)
19, 20 or 21	0.113* (0.051)	0.149* (0.062)	0.660* (0.277)
22 and over	0.017 (0.076)	0.081 (0.093)	0.683 (0.354)
Time of day when the accident occurred (ref. From 8am to 8pm)			
From 8pm to 8am	0.036** (0.007)	0.041** (0.008)	0.020 (0.041)
Worker's usual task (ref. Yes)			
No	0.075** (0.01)	0.050** (0.013)	0.141* (0.061)
Place of occurrence (ref. Industrial site)			
Construction site, construction, opencast quarry, opencast mine	0.061** (0.009)	0.062** (0.010)	0.170** (0.060)
Farming, breeding, fish farming, forest zone	0.043 (0.022)	0.031 (0.028)	0.131 (0.146)
Tertiary activity area, office, amusement area, miscellaneous	0.036** (0.010)	0.056** (0.013)	-0.265** (0.089)
Health establishment	0.130** (0.020)	0.135** (0.027)	-0.047 (0.149)
Public area	-0.013 (0.010)	0.007 (0.013)	-0.109 (0.068)
In the home	0.035* (0.014)	0.050** (0.018)	-0.187 (0.122)
Sports area	0.171** (0.022)	0.181** (0.027)	0.152 (0.143)
In the air, elevated, excluding construction sites	0.593** (0.026)	0.596** (0.032)	0.962** (0.128)
Underground, excluding construction sites	0.011 (0.047)	0.031 (0.058)	0.135 (0.178)
On/over water, excluding construction sites	-0.009 (0.044	-0.037 (0.054)	0.326 (0.247)
In high pressure environments, excluding construction sites	0.244 (0.170)	-0.473 (0.327)	
Other place of occurrence	0.013 (0.021)	0.014 (0.026)	-0.072 (0.130)
Type of task the worker was performing (ref. Production, manufacturing, processing, storing)			
Excavation, Construction, Repair, Demolition	0.061** (0.008)	0.066** (0.010)	0.114 (0.060)
Agricultural type work, forestry, horticulture, fish farming, work with live animals	0.107** (0.023)	0.103** (0.029)	-0.010 (0.170)
Service provided to enterprise and/or to the general public; intellectual activity	0.028* (0.011)	0.006 (0.014)	0.083 (0.080)
Movement, sport, artistic activity	0.127** (0.011)	0.137** (0.013)	0.064 (0.071)
Other working process	0.068** (0.006)	0.075** (0.008)	0.130** (0.049)
Specific physical activity (ref. Operating machine)			
Working with hand-held tools	-0.211** (0.009)	-0.215** (0.011)	-0.108 (0.069)
Driving/being on board a means of transport or handling equipment	-0.107** (0.012)	-0.115** (0.015)	-0.150 (0.081)
Handling of objects	-0.262** (0.008)	-0.278** (0.010)	-0.244** (0.065)
Carrying by hand	-0.365** (0.011)	-0.387** (0.014)	-0.354** (0.093)
Movement	-0.282** (0.009)	-0.286** (0.011)	-0.219** (0.071)

Other specific physical activity	-0.085**	-0.092**		-0.105*
	(0.012)	(0.015)		(0.073)
Mode of injury (ref. Fall)				
Contact with electric voltage, temperature extreme or hazardous substance	-0.290**	-0.307**		0.227**
	(0.015)	(0.018)		(0.085)
Drowning, buried	-0.300**	-0.294**		0.390**
	(0.030)	(0.035)		(0.113)
Crashed into something	-0.401**	-0.418**		-0.208**
	(0.009)	(0.011)		(0.074)
Struck by or collided with something	-0.289**	-0.314**		-0.224**
	(0.007)	(0.008)		(0.051)
Came into contact with sharp/pointed/rough/coarse object	-0.031**	-0.053**		-0.060
	(0.009)	(0.010)		(0.093)
Trapped, crushed	0.170**	0.149**		0.430**
	(0.009)	(0.011)		(0.067)
Suffered acute overloading of body	-0.625**	-0.679**		-0.922**
	(0.009)	(0.012)		(0.102)
Kicked or bitten	-0.447**	-0.402**		-0.667**
	(0.020)	(0.023)		(0.099)
Heart attacks, strokes and other non-traumatic pathologies	0.545**	0.591**		0.472
	(0.063)	(0.092)		(0.569)
Other mode of injury	-0.314**	-0.358**		-0.222
	(0.014)	(0.017)		(0.115)
Type of injury (ref. Superficial injuries and open wounds)				
Fractures	1.345**	1.371**		1.873**
	(0.007)	(0.008)		(0.058)
Dislocations, sprains and strains	0.040**	0.030**		0.241**
	(0.009)	(0.011)		(0.073)
Traumatic amputation	2.160**	2.210**		2.580**
	(0.014)	(0.017)		(0.169)
Concussions and internal injuries	0.804**	0.817**		1.279**
	(0.009)	(0.010)		(0.065)
Burns, corrosions, scalds and frostbite	0.857**	0.851**		1.204**
	(0.017)	(0.021)		(0.089)
Acute poisonings and infections	0.504**	0.480**		0.459**
	(0.040)	(0.050)		(0.144)
Asphyxiation, drowning and non-fatal submersion	0.807**	0.793**		0.778**
	(0.037)	(0.044)		(0.115)
Effects of noise, vibration or pressure	0.272**	0.320**		
	(0.073)	(0.091)		
Effects of extreme temperatures, light and radiation	0.282**	0.242**		0.665
	(0.072)	(0.087)		(0.347)
Psychological trauma, traumatic shock	0.751**	0.754**		1.187**
	(0.031)	(0.039)		(0.137)
Multiple injuries	1.218**	1.238**		1.441**
	(0.011)	(0.013)		(0.059)
Heart attacks, strokes and other non-traumatic pathologies	2.089**	1.894**		1.602**
	(0.062)	(0.091)		(0.547)
Other injuries	0.503**	0.509**		0.872**
	(0.013)	(0.016)		(0.092)
Part of body injured (ref. Head)				
Neck	-0.438**	-0.408**		-0.613**
	(0.018)	(0.022)		(0.091)
Back	-0.340**	-0.312**		-0.055
	(0.011)	(0.013)		(0.070)
Trunk and internal organs	-0.224**	-0.232**		-0.037
	(0.011)	(0.013)		(0.068)
Upper extremities	-0.584**	-0.588**		-0.591**
	(0.008)	(0.010)		(0.061)
Lower extremities	-0.322**	-0.316**		-0.182**
	(0.008)	(0.010)		(0.060)

Whole body and multiple sites	0.154**	0.153**	0.372**
	(0.011)	(0.013)	(0.053)
Other parts of the body	-0.094**	-0.107**	0.263*
	(0.021)	(0.027)	(0.106)
Year of the accident (ref. 2010)			
2004	0.175**	0.165**	0.143*
	(0.009)	(0.012)	(0.059)
2005	0.122**	0.118**	0.172**
	(0.009)	(0.012)	(0.058)
2006	0.079**	0.082**	0.116*
	(0.009)	(0.012)	(0.059)
2007	0.065**	0.060**	-0.125*
	(0.009)	(0.012)	(0.058)
2008	0.011	0.009	-0.093
	(0.009)	(0.012)	(0.059)
2009	0.001	-0.003	-0.095
	(0.010)	(0.013)	(0.063)
Constant	-2.189**	-2.190**	-2.422**
	(0.023)	(0.028)	(0.162)
Number of observations	5,104,179	3,446,587	38,974
Log-likelihood value	-186,479.9	-125,909.6	-4,675.7

Table A2 Estimation results of model on the duration of sick leave after an occupational accident. All variables

	Full Sample		Sample correcting for sample selection
	All employees	Employees with 3 or less years of tenure	All employees
Gender (ref. Women)			
Men	1.074** (0.002)	1.075** (0.002)	1.159** (0.023)
Age (ref. 16-24)			
25-39	0.866** (0.002)	0.868** (0.002)	0.799** (0.017)
40-49	0.743** (0.002)	0.744** (0.002)	0.706** (0.017)
50-59	0.651** (0.002)	0.650** (0.002)	0.611** (0.019)
60-64	0.588** (0.003)	0.578** (0.004)	0.531** (0.032)
65 and over	0.567** (0.011)	0.569** (0.017)	0.498* (0.060)
Age*Tenure	0.999** (0.000)	0.999** (0.000)	0.999 (0.000)
Place of birth (ref. Spain)			
EU-15	0.722** (0.004)	0.721** (0.004)	0.631** (0.047)
Rest of Europe	0.715** (0.003)	0.718** (0.004)	0.763** (0.046)
Africa	0.772** (0.003)	0.770** (0.003)	0.736** (0.034)
Latin America	0.794** (0.007)	0.794** (0.008)	0.736* (0.092)
Rest of the world	0.780** (0.002)	0.784** (0.002)	0.882** (0.031)
Missing	0.948* (0.021)	0.937* (0.024)	1.210 (0.192)
Professional situation (ref. Employee private sector)			
Employee public sector	0.858** (0.003)	0.878** (0.004)	0.777** (0.025)
Occupation (ref. Elementary occupations)			
Armed Forces	0.993 (0.009)	0.990 (0.011)	0.821* (0.077)
Legislators, senior officials and managers	0.914** (0.010)	0.908** (0.016)	0.840 (0.089)
Professionals	0.921** (0.005)	0.898** (0.007)	0.928 (0.047)
Technicians and associate professionals	0.951** (0.004)	0.941** (0.005)	0.966 (0.037)
Clerks	1.026** (0.004)	1.027** (0.005)	1.020 (0.041)
Service workers and shop and market sales workers	1.004 (0.002)	1.011** (0.003)	1.054* (0.027)
Skilled agricultural and fishery workers	1.009 (0.007)	1.007 (0.008)	1.156 (0.087)
Craft and related trades workers	0.986** (0.002)	0.987** (0.002)	0.957* (0.020)
Plant and machine operators, and assemblers	0.979** (0.002)	0.981** (0.002)	0.938** (0.023)
Type of contract (ref. Fixed-term contract)			
Open-ended contract	0.989** (0.002)	0.981** (0.002)	1.027 (0.020)

Job seniority (ref. Fewer than 3 months)			
From 3 to 6 months	1.026**	1.027**	1.073**
	(0.002)	(0.002)	(0.027)
From 6 months to 1 year	1.030**	1.034**	1.050*
	(0.002)	(0.002)	(0.026)
From 1 to 3 years	1.024**	1.041**	1.040
	(0.002)	(0.003)	(0.024)
From 3 to 10 years	1.004		0.994
	(0.002)		(0.026)
10 or more years	0.975**		0.942
	(0.004)		(0.041)
Earnings (ref. Quantile 3)			
Quantile 1	1.018**	1.016**	1.043
	(0.002)	(0.002)	(0.023)
Quantile 2	1.012**	1.007**	1.038
	(0.002)	(0.002)	(0.022)
Quantile 4	0.987**	0.982**	1.009
	(0.002)	(0.002)	(0.021)
Does the establishment belong to the worker's firm? (ref. No)			
Yes	0.958**	0.942**	1.009
	(0.002)	(0.002)	(0.025)
Economic activity (ref. Construction)			
Agriculture, forestry and fishing	0.979**	0.977**	0.982
	(0.006)	(0.007)	(0.067)
Mining and quarrying	0.957**	0.965**	0.891
	(0.007)	(0.009)	(0.079)
Manufacturing	0.984**	0.985**	0.990
	(0.002)	(0.003)	(0.025)
Transport and storage	0.998	0.999	1.013
	(0.003)	(0.004)	(0.038)
Accommodation and food service activities	1.031**	1.034**	0.977
	(0.004)	(0.004)	(0.046)
Public administration and defence; compulsory social security	1.096**	1.060**	1.142**
	(0.005)	(0.006)	(0.049)
Education	1.072**	1.070**	1.100
	(0.007)	(0.009)	(0.083)
Human health, social work and veterinary activities	0.924**	0.930**	0.877**
	(0.005)	(0.006)	(0.044)
Other service activities	1.007**	1.005	0.987
	(0.002)	(0.003)	(0.027)
Location of the establishment (ref. Andalucía)			
Aragón	0.915**	0.927**	0.898*
	(0.003)	(0.004)	(0.041)
Asturias	0.725**	0.745**	0.676**
	(0.003)	(0.004)	(0.033)
Baleares	1.168**	1.170**	1.116*
	(0.004)	(0.005)	(0.054)
Canarias	1.038**	1.042**	1.059
	(0.003)	(0.004)	(0.037)
Cantabria	0.813**	0.840**	0.741**
	(0.005)	(0.006)	(0.042)
Castilla-La Mancha	0.856**	0.860**	0.901**
	(0.003)	(0.003)	(0.033)
Castilla y León	0.891**	0.905**	0.888**
	(0.003)	(0.003)	(0.030)
Cataluña	0.887**	0.882**	0.931**
	(0.002)	(0.002)	(0.023)
Comunidad Valenciana	0.870**	0.878**	0.889**
	(0.002)	(0.002)	(0.025)
Extremadura	0.960**	0.963**	0.934
	(0.004)	(0.005)	(0.054)

Galicia	0.814**	0.829**	0.767**
	(0.002)	(0.003)	(0.026)
Madrid	0.981**	0.980**	1.040
	(0.002)	(0.002)	(0.025)
Murcia	0.771**	0.773**	0.724**
	(0.003)	(0.003)	(0.031)
Navarra	1.114**	1.120**	1.004
	(0.005)	(0.007)	(0.055)
País Vasco	0.943**	0.946**	0.919**
	(0.003)	(0.003)	(0.029)
La Rioja	1.068**	1.095**	1.143*
	(0.007)	(0.009)	(0.073)
Ceuta y Melilla	0.854**	0.860**	0.902
	(0.011)	(0.015)	(0.093)
Number employees of the firm (ref. 1-4 employees)			
5-9 employees	1.049**	1.048**	1.008
	(0.002)	(0.003)	(0.032)
10-24 employees	1.082**	1.079**	1.018
	(0.002)	(0.003)	(0.029)
25-49 employees	1.104**	1.099**	1.063*
	(0.002)	(0.003)	(0.031)
50-99 employees	1.113**	1.108**	1.042
	(0.003)	(0.003)	(0.032)
100-249 employees	1.110**	1.106**	1.048
	(0.003)	(0.003)	(0.032)
250-499 employees	1.097**	1.097**	1.017
	(0.003)	(0.004)	(0.035)
More than 500 employees	1.014**	1.024**	1.027
	(0.003)	(0.004)	(0.034)
Did the establishment realised evaluation of workplace risks? (ref. No)			
Yes	1.027**	1.029**	1.007
	(0.001)	(0.002)	(0.016)
Location of accident (ref. In the usual establishment)			
On work-related travel	0.936**	0.945**	0.935**
	(0.003)	(0.004)	(0.023)
Somewhere else	0.979**	0.983**	0.888**
	(0.002)	(0.003)	(0.025)
Day of the week when the accident occurred (ref. Saturday or Sunday)			
Monday	1.078**	1.083**	1.097**
	(0.003)	(0.003)	(0.028)
Tuesday	1.069**	1.076**	1.063*
	(0.003)	(0.003)	(0.028)
Wednesday	1.058**	1.064**	1.079**
	(0.003)	(0.003)	(0.029)
Thursday	1.013**	1.016**	1.027
	(0.003)	(0.003)	(0.027)
Friday	0.975**	0.976**	0.976
	(0.003)	(0.003)	(0.027)
Hours worked when the accident occurred (ref. 1, 2 or 3)			
4, 5 or 6	0.991**	0.990**	0.970*
	(0.001)	(0.002)	(0.015)
7, 8 or 9	0.994**	0.992**	0.956*
	(0.002)	(0.002)	(0.019)
10, 11 or 12	0.966**	0.962**	0.986
	(0.003)	(0.004)	(0.039)
13, 14 or 15	1.029**	1.010	0.831*
	(0.009)	(0.012)	(0.077)
16, 17 or 18	1.053**	1.055**	0.902
	(0.008)	(0.011)	(0.097)
19, 20 or 21	1.050**	1.046**	1.040

	(0.014)	(0.017)	(0.118)
22 and over	1.020 (0.019)	1.035 (0.025)	0.760 (0.133)
Time of day when the accident occurred (ref. From 8am to 8pm)			
From 8pm to 8am	0.983** (0.002)	0.984** (0.002)	0.979 (0.017)
Worker's usual task (ref. Yes)			
No	0.985** (0.003)	0.979** (0.003)	1.018 (0.031)
Place of occurrence (ref. Industrial site)			
Construction site, construction, opencast quarry, opencast mine	0.965** (0.002)	0.963** (0.003)	0.944 (0.031)
Farming, breeding, fish farming, forest zone	0.983** (0.006)	0.990 (0.008)	1.029 (0.079)
Tertiary activity area, office, amusement area, miscellaneous	0.990** (0.002)	0.985** (0.003)	0.972 (0.032)
Health establishment	0.875** (0.004)	0.881** (0.005)	0.908 (0.048)
Public area	0.968** (0.003)	0.965** (0.003)	0.993 (0.031)
In the home	0.992* (0.004)	0.989* (0.005)	1.049 (0.055)
Sports area	0.878** (0.006)	0.858** (0.007)	0.714** (0.058)
In the air, elevated, excluding construction sites	0.843** (0.011)	0.842** (0.014)	0.733* (0.093)
Underground, excluding construction sites	0.950** (0.013)	0.965* (0.016)	0.952 (0.111)
On/over water, excluding construction sites	1.011 (0.014)	0.999 (0.017)	1.049 (0.166)
In high pressure environments, excluding construction sites	0.777** (0.048)	0.713** (0.050)	1.859 -1.205
Other place of occurrence	0.932** (0.006)	0.922** (0.007)	1.039 (0.067)
Type of task the worker was performing (ref. Production, manufacturing, processing, storing)			
Excavation, Construction, Repair, Demolition	0.982** (0.002)	0.983** (0.003)	0.906** (0.030)
Agricultural type work, forestry, horticulture, fish farming, work with live animals	1.005 (0.007)	0.996 (0.008)	0.967 (0.079)
Service provided to enterprise and/or to the general public; intellectual activity	0.984** (0.002)	0.983** (0.003)	0.933* (0.029)
Movement, sport, artistic activity	0.931** (0.003)	0.934** (0.004)	0.957 (0.030)
Other working process	0.988** (0.002)	0.989** (0.002)	0.961 (0.023)
Specific physical activity (ref. Operating machine)			
Working with hand-held tools	1.123** (0.003)	1.127** (0.004)	1.140** (0.046)
Driving/being on board a means of transport or handling equipment	0.895** (0.004)	0.909** (0.005)	0.893* (0.039)
Handling of objects	1.115** (0.003)	1.117** (0.004)	1.155** (0.042)
Carrying by hand	1.117** (0.003)	1.122** (0.004)	1.159** (0.049)
Movement	1.061** (0.003)	1.067** (0.004)	1.164** (0.045)
Other specific physical activity	0.994 (0.004)	1.004 (0.005)	1.027 (0.043)
Mode of injury (ref. Fall)			
Contact with electric voltage, temperature extreme or hazardous substance	1.519** (0.007)	1.497** (0.008)	1.604** (0.082)

Drowning, buried	1.519**	1.485**	1.379**
	(0.017)	(0.019)	(0.123)
Crashed into something	1.241**	1.231**	1.331**
	(0.003)	(0.004)	(0.051)
Struck by or collided with something	1.230**	1.222**	1.162**
	(0.003)	(0.004)	(0.037)
Came into contact with sharp/pointed/rough/coarse object	1.339**	1.314**	1.352**
	(0.004)	(0.004)	(0.054)
Trapped, crushed	1.153**	1.140**	0.992
	(0.005)	(0.005)	(0.051)
Suffered acute overloading of body	1.172**	1.187**	1.283**
	(0.003)	(0.003)	(0.042)
Kicked or bitten	1.298**	1.282**	1.569**
	(0.007)	(0.009)	(0.062)
Heart attacks, strokes and other non-traumatic pathologies	0.822**	0.886	0.517
	(0.052)	(0.071)	(0.207)
Other mode of injury	1.137**	1.129**	1.075
	(0.005)	(0.006)	(0.066)
Type of injury (ref. Superficial injuries and open wounds)			
Fractures	0.318**	0.313**	0.232**
	(0.001)	(0.001)	(0.008)
Dislocations, sprains and strains	0.870**	0.871**	0.867**
	(0.001)	(0.002)	(0.016)
Traumatic amputation	0.292**	0.289**	0.233**
	(0.004)	(0.005)	(0.049)
Concussions and internal injuries	0.823**	0.835**	0.792**
	(0.002)	(0.003)	(0.025)
Burns, corrosions, scalds and frostbite	0.863**	0.871**	0.615**
	(0.005)	(0.006)	(0.033)
Acute poisonings and infections	1.024	1.044**	1.395**
	(0.014)	(0.017)	(0.107)
Asphyxiation, drowning and non-fatal submersion	1.018	1.045*	1.292**
	(0.017)	(0.020)	(0.100)
Effects of noise, vibration or pressure	0.942**	0.932**	0.504**
	(0.017)	(0.021)	(0.091)
Effects of extreme temperatures, light and radiation	1.394**	1.419**	1.616*
	(0.031)	(0.036)	(0.318)
Psychological trauma, traumatic shock	0.633**	0.666**	0.453**
	(0.009)	(0.011)	(0.035)
Multiple injuries	0.624**	0.624**	0.627**
	(0.004)	(0.005)	(0.021)
Heart attacks, strokes and other non-traumatic pathologies	0.269**	0.304**	0.953
	(0.017)	(0.024)	(0.349)
Other injuries	0.865**	0.887**	0.848**
	(0.003)	(0.004)	(0.036)
Part of body injured (ref. Head)			
Neck	0.600**	0.605**	0.700**
	(0.002)	(0.003)	(0.024)
Back	0.683**	0.688**	0.831**
	(0.002)	(0.002)	(0.027)
Trunk and internal organs	0.654**	0.659**	0.801**
	(0.002)	(0.003)	(0.032)
Upper extremities	0.536**	0.552**	0.730**
	(0.001)	(0.002)	(0.021)
Lower extremities	0.543**	0.554**	0.679**
	(0.001)	(0.002)	(0.021)
Whole body and multiple sites	0.510**	0.522**	0.648**
	(0.002)	(0.003)	(0.021)
Other parts of the body	0.584**	0.597**	0.753**
	(0.005)	(0.006)	(0.052)
Year of the accident (ref. 2010)			

2004	1.078**	1.101**	1.127**
	(0.003)	(0.003)	(0.031)
2005	0.978**	1.005	1.040
	(0.002)	(0.003)	(0.028)
2006	1.008**	1.024**	1.064*
	(0.002)	(0.003)	(0.028)
2007	0.822**	0.836**	0.899**
	(0.002)	(0.002)	(0.023)
2008	1.047**	1.043**	1.088**
	(0.002)	(0.003)	(0.028)
2009	1.037**	1.031**	1.150**
	(0.003)	(0.003)	(0.031)
Accident severity (ref. Minor)			
Severe	0.091**	0.089**	0.074**
	(0.001)	(0.001)	(0.004)
People who suffered a fall in the workplace			
Young (16-24)	1.114**	1.113**	0.950
	(0.006)	(0.006)	(0.063)
Older (65 and over)	0.931*	0.936*	0.433
	(0.040)	(0.021)	(0.348)
Constant	0.097**	0.094**	0.063**
	(0.001)	(0.001)	(0.005)
Number of observations	5,099,464	3,443,734	38,708
Log-likelihood value	-7,160,347.7	-4,814,933.2	-53,442.0

Notes: Standard errors in parentheses. Significance levels: *significant at 5 per cent; **significant at 1 per cent.