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ECONOMIC IMPACT OF ROAD ACCIDENTS ON COSTS OF EMPLOYEE TURNOVER: A QUANTITATIVE STUDY FROM POLAND

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Abstract:

The article presents the results of the Polish research in 2014 and 2020 involving economic loss in enterprises due to employees' work disability due to road accidents. Road safety is one of the most essential global declines in social health, but marginal external road transport costs are not easy to measure. Typically, the aspect of risk in road safety in the operations of enterprises is viewed in the context of transport or logistic companies. However, the risk of becoming a road accident victim is not limited to fleet drivers. Better information about employee road accident costs needs to be provided in the literature. The Polish research shows that employees' work disability due to road accidents is extremely costly, often more than one would expect. A decrease in the risk of death in road safety in Poland in 2014-2019 did not reduce the costs to enterprises, which grew from PLN 1.1 million to PLN 1.6 million. Management of economic loss in enterprises due to road accidents is essential not only from the financial point of the organisation but also from the idea of corrective instruments to equate marginal social costs with marginal social benefits of transport The results of the conducted research bridge the research gap, vital from the point of view of community and corporate operations, regarding the volume of losses of enterprises due to employee turnover due to road accidents, which are likely to affect any. Further research should aim at specific conditions of minimizing employer losses discussed here, e.g. in the area of health policy improvement, which would allow a faster personal and professional recovery. The issue of the employer's employee social policy regarding creating suitable conditions for taking out life insurance is crucial. Ultimately, it is worth looking closer at employees' willingness to buy insurance coverage if the risk of a loss of life or health due to a road accident is real and substantial. Moreover, results show the critical direction for business – corporate social responsibility for road safety. It is warranted that further research should focus on recognizing and enhancing this role.

Keywords: *: negative externalities in the transport, accidents externalities, costs of employee turnover JEL: R41, R48, E24*

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1. Introduction

1.1. Background

There is consensus in the literature that road transport's most important negative externalities include accidents along with road damage, environmental damage, congestion and oil dependence (Santos et al., 2010). Generally, accidents are unforeseen events which cause damages or injuries unintentionally and unexpectedly. Road accidents are one of the most important sources of global hypermortality and decline in health. According to international research on current morbidities and mortalities coordinated by the Institute for Health Metrics and Evaluation in Seattle (IHME), the population of those struggling with the consequences of road accidents has been growing dramatically since 1990 (IHME, 2015). In Poland, road accidents are the tenth leading cause of death after cardiovascular disease, tumours, respiratory system diseases, diseases of the digestive system, pneumonia, myocardial infarction, diabetes, falls and suicide (Eurostat, 2020). In addition to personal losses, road accidents are a source of emotional suffering and a deterioration in quality of life. As a result, accident prevention, which had been advocated on a moral basis, is also justified in economic terms. 20-40% of accident survivors develop post-traumatic stress disorder (PTSD) and/or depression in the first year after the injury (Zazik et al., 2008; Zazik et al., 2007). PTSD and depression are major risk factors for loss of productivity, poor quality of life, physical recovery deficits, and social and functional impairment (Scott et al., 2016).

External accident costs are the accident costs' not covered by risk-oriented insurance premiums' (Santos et al., 2010). The externality would be fully internalized if insurance premiums covered all accident costs. For example, in the USA, only about half of all accident costs are paid by private insurers (Santos et al., 2010). It is estimated that, on average, the annual share of the social costs of road accidents ranges from 0.4% to even 4.1% of each country's GDP (World Health Organization, 2015). The overall cost of accidents in Poland is approximately 56,6 billion annually (2,7% of Polish GPD). Accident costs include material damage, insurance administration, legal and court costs, police and fire services costs, medical costs, lost economic output, and the pain, grief and suffering imposed on the victims and their friends and families (Santos et al., 2010). In Poland, accident costs include GDP losses, medical expenses, operational costs and property damage (Jaździk-Osmólska, 2015, 2019).

There are various estimation methodologies for road accident costs, but they all fall into the above categories to a greater or lesser extent. The number of accidents and the number of victims are key safety statistics, and their availability is usually not a problem. However, problems arise when monetization of these effects begins. The effectiveness of policies implemented in the road transport sector depends on perfectly measured marginal external costs. An efficient mobility model for the future must consider the true costs of transport, and its regulatory framework will need to create incentives for people to make sustainable transport choices.

1.2. Objectives

This article presents the findings of the authors's research into the determination of the value of the intellectual capital of an individual in an organization in the context of road traffic threats. The study explores two key questions: Does the road safety situation affect the cost borne by enterprises, and if so, in what way? How are enterprises' human and financial aspects linked to road accidents? Hence, this study aims to evaluate and analyze the cost of employee turnover due to road accidents at two provincial levels in Poland. The unique challenge of the study was to conduct a survey twice: first in 2014 and repeat in 2020 to compare results.

The massive nature of the phenomenon and low road safety indices in Poland led to the advance of the following thesis: The high probability of road accidents is not irrelevant to unexpected employee turnover and sudden loss of human capital in enterprises, and, ultimately, it generates additional costs in enterprises.

The results of the conducted research bridge the research gap, vital from the point of view of community and corporate operations, regarding the volume of losses of enterprises due to employee turnover due to road accidents, which are likely to affect any.

The article consists of four main parts. The first part presents the theoretical foundations related to employee turnover resulting from road accidents and the state of research on the valuation of the economic consequences for enterprises. The second chapter describes the research methodology. The third chapter is devoted to the results of the analyses

that were conducted, which are presented in the form of charts and tables. The final chapter discusses the interpretation of the results, including their potential implications for corporate social responsibility in improving road safety. The article ends with a conclusion summarising key observations and proposing directions for further research.

2. Literature review

2.1. Employee turnover

Employee turnover remains one of enterprises' most persistent and frustrating problems. Hom and Griffeth (1994) define employee turnover as 'voluntary terminations of members from enterprises' (Hom PW, 1995; Fisher, Schoenfeldt and Shaw, 1996). Involuntary turnover is when the employee has no choice in terminating as it might be due to long-term sickness, death, moving overseas, or employer-initiated termination (Colvin, 2011). For most part, voluntary turnover is treated as a managerial problem that requires attention (Hom and Kinicki, 2001). Therefore, most studies have focused on voluntary rather than involuntary turnover (Wright and Bonett, 1993). Whether involuntary, such as termination due to poor performance, or voluntary, such as resignations, turnover is extremely costly (often more than expected) (Hall, 1981; Griffeth and Hom, 2001).

Moreover, this real business cost is often ignored, and the lack of primary data is a significant problem in costing turnover. Additionally, enterprises need to pay more attention to the true cost of turnover. Perhaps it's because there isn't a line-item in most profit and loss statements, nor is it typically adequately defined in the budget, and no one submits an invoice at the end of the month for "turnover." However, collectively, turnover costs enterprises billions of dollars a year (Group, 2020). The total rotation costs in Polish conditions amount to approximately—85% of annual leaving employees (HRownia, 2017). The issue of employee turnover is a natural phenomenon only to a limited extent. There are several reasons why people quit from one organisation to another. The experience of job-related stress (job stress), the range of factors that lead to job-related stress (stressors), lack of commitment in the organisation, and job dissatisfaction make employees quit (Firth et al., 2004). Mano et al. (2004) argue that employees quit from organization due economic reasons (Mano-Negrin and Shay, 2004). Some factors are, in part, beyond the control of management, such as the death or incapacity of a member of staff (Ongori, 2007). However, in the event of disease or death resulting from a road accident, an organization faces an increased risk of loss due to reasons which are uncontrolled, highly probable and, above all, sudden.

For several years, the employee turnover rate in Poland has been 21,6% and has been at the infamous forefront of the European Union countries (GUS, 2017; Sas, 2020). Also, despite significant safety improvements through which the number of road accidents in Poland fell from 34970 accidents in 2014 to 20936 accidents in 2023 the risk of death on Polish roads is among the highest in the European Union (European Commission, 2018; OECD / ITF, 2019). In 2017, the number of fatalities in road accidents was 75 per one million inhabitants and 135 per 10 billion vehicle kilometers. The ratios' mean value in EU-28 was 49 per one million inhabitants and 50 per 10 billion vehicle kilometers. There is no data on the share of road accidents in the causes of involuntary employment turnover. However, it may turn out that excessive mortality among employees arising from road accidents is similar to mortality due to cardiac diseases or cancer. In 1990, road traffic was listed as the 9th most prevalent cause of diseases, ailments and injuries on a global scale. Road accidents are ranked 5th in the classification of reasons for premature deaths and disabilities (IHME, 2015; OECD / ITF, 2019). In addition, the situation is not the same everywhere. In 2002, 90% of all lost years of life posed by disability resulting from road injuries were identified in low- and average-income countries (WHO, 2004). From the year 2004 to the year 2016, we could observe a record number of people died on Polish roads – nearly 60,000. It is as if one district of a 1.5-million metropolis died over 13 years. Since that time, nearly 1 million people in Poland have been hospitalized for extended periods. Most likely, 50 thousand affected people will never regain full ability (Jaździk-Osmólska, 2020).

As it appears, road accidents are the most democratic "phenomena" of the contemporary world. Everyone may participate. Pedestrians, cyclists, drunk drivers, young people, ageing society – are only a few of the contexts of considerations regarding the problem of road traffic safety (Assum and Sørensen, 2010; Jing Xu et al., 2018; Casado-Sanz, Guirao and Gálvez-Pérez, 2019; Chen et al., 2019; Fridman et al., 2019).

In addition, most of the literature discusses direct costs, such as vehicle replacement and medical treatment, but does not discuss spillover effects on employment and productivity. It is worth noting that expenses related to disruption to employment, loss of productivity and long-term disability significantly burden businesses, workers and the broader economy (Blincoe et al., 2023).Typically, the aspect of risk in road safety in the operations of enterprises is viewed only in the context of transport or logistic companies (Nævestad, Hesjevoll and Ross, 2018; Rainey, Parenteau and Kales, 2019). In this case, a road accident is defined as an accident at work. Road accidents are devastating not only to the persons involved but also to enterprises' financial and legal standing and reputation. Investment in road safety may generate substantial savings for transport companies (Cascio, 1992; Belzer and Kirby, 2012; Huang et al., 2016; Gurzhii et al., 2021).

Due to the minimization of the risk of fleet driver participation in road accidents, enterprises may save on insurance, downtime, productivity loss, employee sick leaves, unsold, damaged or lost goods, and finally, reputation loss (Bacon, 2007; Nævestad, Hesjevoll and Ross, 2018). Insurers encourage you to manage the impact of a road accident in your business with appropriate insurance, highlight the challenges of risk management for employees driving company vehicles and provide suggestions for implementing written driver policies and regular safety training that can be found on insurer websites. Available insurer guides discuss the importance of adequate auto insurance for employees and strategies for managing road accident risks, such as reviewing insurance policies and setting minimum coverage requirements (Gunnin Insurance and Risk Management Services, 2022; mBurse, 2023). However, it is not that easy. The European Commission's data demonstrate that logistics services companies increasingly face growing road accidents. Even though most accidents only result in economic damage, in 10% of the cases, the consequences affect employees and result in absenteeism. According to the analyses conducted in 2011 among Belgian transport enterprises, it was forecast that if one failed to undertake additional preventive actions, the losses of transport companies could be as high as EUR 40,614.27 – 121,842.81 over the following four years. In the United Kingdom, it was estimated that in 2008 the accident cost for employers exceeded GBP 2.7 billion (Insurance for Small Businesses: a guide to protecting your business, 2008).

In 2019, U.S. traffic crashes cost employers $72.2 billion—up from $47.4 billion in 2013—in direct crash-related expenses, which include medical care, liability, lost productivity and property damage. In 2024 in U.S. motor vehicle accidents alone account for over 1.5 million lost work days per year, and their average economic cost is over $250 billion annually (Blincoe et al., 2023). Generally, driver behaviours - on and off the job - contribute significantly to the enterprise's costs (Miller and McKnight, 2021). From a financial point of view, investment in fleet-related risk management is a sensible step for all enterprises employing staff, tiny and medium-sized enterprises with tight budgets and profit margins. Road risk management is also a principal part of the legal and moral responsibility of the employer concerning commitment to employees and the environment. Car driving is the most risky activity most employees are involved in. Road accidents account for 39% of work-related deaths in the European Union (Work related traumatic injury fatalities, Australia 2009-201, 2012).

However, the risk of becoming a road accident victim is not limited to fleet drivers. It can affect anyone, even those commuting to work by public communication means, bicycles or on foot (ITF, 2016). Every company employing staff that commutes to work – whether it is a fleet of commercial vehicles, a company car, or staff using their means of transport to go to business meetings – may find ignoring road safety expensive. Nonetheless, it is not only transport companies' corporate culture liable for road safety (Nævestad et al., 2019) but also other enterprises. Thus, can the level of road traffic safety affect organizational performance in the context of the continuing problem regarding staff liquidity? Are economic losses enterprises suffer so substantial that they can impede company operations? According to the authors, the lack of research into the amount of enterprises' losses relative to the high risk of employee loss due to road accidents is a significant research gap. Insofar as transportation companies have sustainable tools for minimizing the risk of their staff involvement in road accidents, the managers of other types of enterprises may only rely on the efficiency of government programs dedicated to road safety improvement. Should we add to it some economic consequences the enterprises must face, it

may be one of the most critical safety stakeholders in road traffic.

Today's safety policies, especially for the largest fleets, boil down to the following:

- proper selection of cars for the fleet,
- appropriate selection of tyres,
- introduction of the safety and damage management aspect of the company's fleet policy,
- the use of telematics and thus the introduction of a system of penalties and rewards for users for their driving style,
- damage analysis, with regular discussion of key findings among company management and vehicle users.

In the case of entrepreneurs from outside the transport industry, the level of involvement of management staff in safety policy while commuting to work is low. There is a significant lack of national guidance for employers on reducing motor vehicle accidents, which would guide all employers to develop safety programs to reduce the number of road accidents involving employees. Generally, it doesn't matter whether we manage a fleet of vehicles or commuters; by implementing a workplace driver safety program, we can significantly reduce the risk our employees and their families face while protecting the company's bottom line. To understand the impact of motor vehicle crashes on an organisation, to have to know the costs of traffic crashes to employers (Guidelines for employers to reduce motor vehicle crashes, 2006).

Also, in light of recent experiences such as sudden economic crises, including the COVID-19 pandemic and the war in Ukraine, increased attention to managing employee turnover resulting from road accidents is particularly justified. Research consistently highlights a correlation between such crises and a rise in road accidents driven by organisational disruptions, logistical pressures, and changes in employee commuting patterns. These findings underscore the importance of proactive measures to mitigate the financial and operational risks associated with employee turnover. Enhanced road safety management and strategic workforce planning can help businesses navigate these challenges effectively, ensuring resilience in the face of future crises.

The COVID-19 pandemic and the war in Ukraine have significantly impacted businesses worldwide, both in the transport and non-transport sectors. These events have increased the risk of road accidents and elevated the costs associated with employee turnover. However, the extent of this impact varies depending on the nature of the enterprises and their exposure to organisational, economic, and societal changes.

The pandemic necessitated significant changes in work organisation, including hybrid work models and increased demand for local transportation and "last-mile" deliveries. Studies indicate that higher logistical pressures and the reorganisation of work systems contributed to an increased risk of road accidents. Furthermore, the pandemic created uncertainty, stress, and tension among employees, which heightened absenteeism and turnover rates (Kilhoffer, 2021).

In the non-transport sector, the increased risk of road accidents was more indirect. Forced work reorganisations, such as employees relying on private transport or companies relocating resources between sites, led to additional turnover-related costs. The pandemic also spurred changes in Corporate Social Responsibility (CSR) policies to address transportation safety and employee health concerns (Riepina et al., 2022).

The war in Ukraine introduced further challenges in managing human resources and operational expenses. In the transport sector, increased road traffic, especially in freight transport, contributed to a higher incidence of road accidents. Costs associated with vehicle repairs, compensation, and hiring new employees rose significantly, affecting companies' financial performance (Denysiuk and Orlova, 2023). The war's effects were less direct but equally substantial in non-transport businesses. Logistical constraints, rising fuel costs, and pressure for local deliveries forced companies to reorganise workflows, increasing employee exposure to road accidents. Studies suggest that turnover costs stemmed from the need to replace employees and additional expenditures on safety training (Hasanli, 2022). The COVID-19 pandemic and the war in Ukraine have impacted all sectors of the economy, intensifying costs associated with employee turnover and road accidents. In the transport sector, these challenges largely revolved around increased accidents in freight transport and the pressures of expedited deliveries. In non-transport sectors, the impact was more indirect, linked to work reorganisations, increased reliance on private transportation, and costs related to absenteeism and training.

These crises have highlighted the necessity for modern safety management strategies and robust employee protection measures across all industries. Further research is essential to better understand the long-term effects of these global events.

2.2. Methods of measuring human capital

Although the economic impact of accidents is significant, it can be challenging to measure it precisely. Among the whole range of cost categories borne by employers due to staff turnover, we can distinguish three groups related to a temporary or permanent loss of an employee due to a random event (Jasińska, 2018):

- cost related to finding a substitute – a lack of staff may result in task performance failure;
- cost related to employing a new staff member, such as information about the vacancy, selection tests, medical examinations, costs of training and on-site training by a senior employee, and cost of training materials;
- the difference between the added value earned by the leaving employee and the one earned by the new employee before he gains relevant experience.

We can separate the costs associated with turnover into indirect costs and direct costs. Direct turnover costs include leaving, replacement, and transition costs, while indirect turnover costs include the loss of production and reduced performance (Maertz, C. P., & Campion, 1998).

The literature provides several methods of measuring human capital in terms of costs. For example, the friction cost method is a method to estimate the indirect cost due to productivity loss. The value of the indirect cost is approximated by the value of an average individual's future earnings over the friction period. The friction cost method reflects the true cost of productivity loss for employers (‘Friction Cost Method’, 2018). One of the most popular approaches is the intellectual capital concept, in which employees are a strategic resource with a significant role in an organization's economic performance. The methods of intellectual capital measurement may be divided into two groups (Allen, 2019):

1. quality methods – where, with the application of several indices, one attempts to show quality changes in human capital;
2. Financial methods – allowing capital measurement at the level of individual and whole societies and its demonstration in a monetary form.

The most popular approach to the qualitative measurement of human capital is to determine the degree of social education, which may be conducted in two ways (OECD, 1998): as calculation of a percentage share of those who completed education at various levels of the education system in the general population; as calculation of the average number of years per individual in the general population. While attempting to determine human capital by applying the two methods, one assumes that the higher the level of education attained, or the more years an individual devoted to education, the greater the human capital. This assumption, for obvious reasons, is unquestionable. However, comparing the results obtained using the two methods may be problematic. Similarly, as in the case of qualitative methods, we can distinguish financial methods. The first method of measuring the value of human capital derives from the well-established relationship between the value of the capital and the income it generates. Here, the value of the human capital of a given individual may be expressed by discounting its future income.

Nonetheless, the method fails to provide the complete picture of individual productivity and excludes the possibility of employees leaving the organization. The second method of human capital measurement is associated with the costs of education and maintenance borne during one's lifetime. This approach assumes that human capital means the abilities, wisdom and skills which require expenditure to be gained. In an organization, the costs cover the costs of recruitment, employment, training, etc. (Lawler, 2000). This approach seems most appropriate when estimating human capital lost by employees due to employee loss.

Each of the available methods features certain advantages and limitations. For example, from a long-term perspective, the friction cost method estimates lower indirect costs than the human capital approach. However, even though none is the "perfect" method, they can estimate the above capital.

3. Material and methods

3.1. Input data

The data used in the paper originate from two surveys focused on Polish enterprises in 2014 and again in 2020. The first survey was conducted in 2014 on behalf of the Office of the National Board of Road Traffic Safety by the Ministry of Infrastructure concerning the valuation of the socio-economic cost of road accidents in Poland by the end of 2013 (Jaździk-Osmólska, 2014). An additional study of losses in enterprises resulting from employee loss due to road accidents was conducted as part of the principal study. 2020, the survey was repeated and conducted, as was already the case in 2014. The survey focused on the same enterprises as the previous survey in 2014.

Polish enterprises in two Provinces, Lubelskie and Małopolskie, were tested. The selected provinces (in Polish: województwo) feature a moderate number and size of enterprises. Thus, they could be considered "typical" at the national level. In order to ensure the highest possible quality of the sample, the study of micro-enterprises (employing up to 10 employees) was waived.

Therefore, it was assumed that enterprises employing 11 to 50 people would be representative of the whole segment of small enterprises. Finally, small, medium-sized and large enterprises were examined. The period of the analysis was the ultimate five years of company activities. In 2014, 150 enterprises were examined.

In 2020, the research was repeated, but finally, only 108 enterprises sampled in 2014 replied to the questionnaire in 2020. The study was performed according to the scheme presented in Table 1.

The quota sample selection scheme guaranteed an optimum diversification of the enterprises. The surveyors were to collect company address details and stamp marks on the control form (other than the survey questionnaire) to verify correct survey performance. The underlying assumption of the research was that the sources of corporate losses arising from road accidents are short- and long-term employee indispositions or complete losses due to death or permanent disability consequential to involvement in a road accident. The method of valuation selected for the research was the approach assuming that:

– the value of human capital invested in an employee is composed of the cost of employee training and education;
– the cost of human capital is affected by the position of an employee and his experience due to years in service;
– a separate human capital cost factor is a derivative of recruitment due to staff turnover and costs of lost orders/projects or substitutes.

3.2. The questionnaire

The research questionnaire comprised four modules:

A. Overview of the enterprise.
B. Overview of victims of road accidents during the last five years.
C. Overview of employees on sick leave due to road accidents during the last five years.
D. Overview of employees who died of natural causes during the last five years.

Details regarding sick leaves and deaths were to constitute supplementary material concerning the cost of absences, mainly if too few "B" forms were obtained (reg. victims of accidents). The details of the interview by modules are presented in Table 2.

The analysis of the degree of preparedness of an enterprise to interview in 2014 demonstrated that, of 150 enterprises, 80% (122) employers were ready for the study, and 20% (35) needed to be better prepared. In 2020, the degree of preparedness was higher: only 15% (26) of employers needed to prepare better.

Table 1. Basic company details in 2014 and 2020

Province	Company size	Criteria	N - 2014	N - 2020
Lubelskie	Small (11-50 people)	Owner or co-owner	30	18
Lubelskie	Medium (50-250 people)	Owner or co-owner or HR manager	30	25
Lubelskie	Large (> 250 people)		15	10
Małopolskie	Small (11-50 people)	Owner or co-owner	30	20
Małopolskie	Medium (50-250 people)	Owner or co-owner or HR manager	30	25
	Large (> 250 people)		15	10
		TOTAL:	**150**	**108**

Table 2. The scope of the interview survey

Module A	**Overview of organization**
1	Main field of operations
2	Legal form
3	Ownership structure
4	Operating radius
5	Number of persons employed
6	Number of persons recruited during the last 12 months
7	Number of persons leaving the organization and made redundant during the last 12 months
8	Annual turnover
9	Number of persons on eaves or dead due to road accidents during the last 5 years
10	Number of employees on leaves due to health issues during the last 5 years.
11	Number of employees who died during the last 5 years from reasons other than a traffic accident
Module B	**Overview of victims of road accidents during the last 5 years.**
1	Date of accident
2	Was the accident fatal
3	Sick leave duration of a road accident victim
4	Place of accident
5	Gender
6	Age
7	Position in organization
8	Seniority
9	Risks relating to the position held by victim at the time of the accident
10	Was the victim covered by a group life insurance program for employees at the time of the accident?
11	Evaluation of organization's preparation for employee absence
12	Organization's actions undertaken when faced with the sudden employee absence
13	Average gross monthly remuneration of the victim for the 3 months preceding the accident
14	Costs of recruitment and introduction of the victim when he joined the organization
15	Costs of absence and replacement of the victim during his absence
Module C	**Overview of employees on sick leaves as a result of road accidents during the last 5 years** *(from 8 to 30 days/up to 90 days/over 90 days)*
1	Medical leave duration
2	Gender
3	Age
4	Education
5	Position in organization
6	Seniority of the person on leave at the time of the medical leave
7	Risks relating to the position held by victim at the time of the medical leave
8	Evaluation of organization's preparation for employee absence
9	Organization's actions undertaken when faced with the sudden employee absence
10	Average gross monthly remuneration of the victim for the 3 months preceding the medical leave
11	Costs of recruitment and introduction of the victim when he joined the organization
12	Costs of absence and replacement of the victim during his absence
Module D	**Overview of employees who died of natural causes during the last 5years**
1	Date of accident
2	Was the accident fatal
3	Sick leave duration of a road accident victim
4	Place of accident
5	Gender
6	Age
7	Position in organization
8	Seniority
9	Risks relating to the position held by victim at the time of the accident
10	Was the victim covered by a group life insurance program for employees at the time of the accident?

Module D	Overview of employees who died of natural causes during the last 5years
11	Evaluation of organization's preparation for employee absence
12	Organization's actions undertaken when faced with the sudden employee absence
13	Average gross monthly remuneration of the victim for the 3 months preceding the accident
14	Costs of recruitment and introduction of the victim when he joined the organization
15	Costs of absence and replacement of the victim during his absence

4. Analysis of the data and results

4.1. Weighing

Based on the Polish data by the Central Statistical Office (GUS) for the year of the survey, the first step was to calculate the weight correcting the structure of enterprises, which accounted for:

- the proportion of the Lubelskie and Małopolskie Provinces,
- the proportion of large, medium-sized and small enterprises.

4.2. Employer's Total Expense Ratio – per capita

The calculation of the employer's total expense ratio per capita (ETER per capita) was performed under questions 14 and 15 in Module B, 11-12 in Module C and 11-12 in Module D**.** In order to capitalize the person-hours, the point of reference adopted was grossed-up remuneration declared in the question preceding a given module (it was assumed that colleagues of the person the form referred to were remunerated at a level similar to that person). Further analyses excluded deviants – not more than 5% of the observations per given form type (separate for modules B, C and D).

4.3. Total expenses of enterprises in the Lubelskie and Małopolskie Provinces arising from road accidents

The estimates of the structures of losses in enterprises due to staff turnover (fluctuation) arising from their involvement in road accidents are presented in Table 3 and Table 4.

It was estimated that in 2013, in two Provinces in Poland, Lubelskie and Małopolskie, the loss of enterprises concerning staff turnover amounted to PLN 1,1mln due to road accidents. The following research shows that a decrease in the risk of death in road safety in Poland in 2014-2019 did not reduce employers' costs. In 2014 Lubelskie Province and Małopolskie Province, the loss of enterprises concerning staff turnover amounted to PLN 1,6 mln. 1 shows the distribution of the organization's losses concerning the percentage of employee absences.

The analysis of the distribution leads us to the conclusion that, from the point of view of employer's losses, there might be two types of accidents: "light", which generates costs similar to sick leave costs, and "dramatic", which are the source of costs incomparable to any others:

- the blue and the orange lines on the presented chart run almost identically until ca. 60%;
- past the 60th percentile, accident-related costs surge;
- the "slot" between the blue and the orange line is around ten percentage points - these are the "dramatic" accidents. Even though few, they are associated with dreadful costs for employers.

The profile of road accident victims among enterprises' employees is presented in Table 5.

Table 3. Cost of employee absence without α adjustment for micro companies

Type of absence	Median [PLN]	Mean [PLN]	Number /year	Value/year [PLN thous.]
2013				
Accidents	1 196	5 513	26	143,3
Sick leaves	1 463	2 060	126	259,5
Deaths	438	460	5	2,3
Total 2013			**157**	**405,1**
2019				
Accidents	1 734	7 994	23	183,9
Sick leaves	2 195	3 069	130	398,9
Deaths	534	541	6	3,2
Total 2019			**169**	**586,1**

Table 4. Cost of employee absence with α adjustment for micro companies

Type of absence	Median [PLN]	Mean [PLN]	Number /year	Value/year [PLN thous.]
2013				
Accidents	3 488	15 475	26	402,3
Sick leaves	4 266	5 584	126	703,6
Deaths	1 276	1 262	5	6,3
Total 2013			**157**	**1112.2**
2019				
Accidents	5 029	22 384	23	514,8
Sick leaves	6 365	8 286	130	1 077,2
Deaths	1 548	1 460	6	8,8
Total 2019			**169**	**1 600,8**

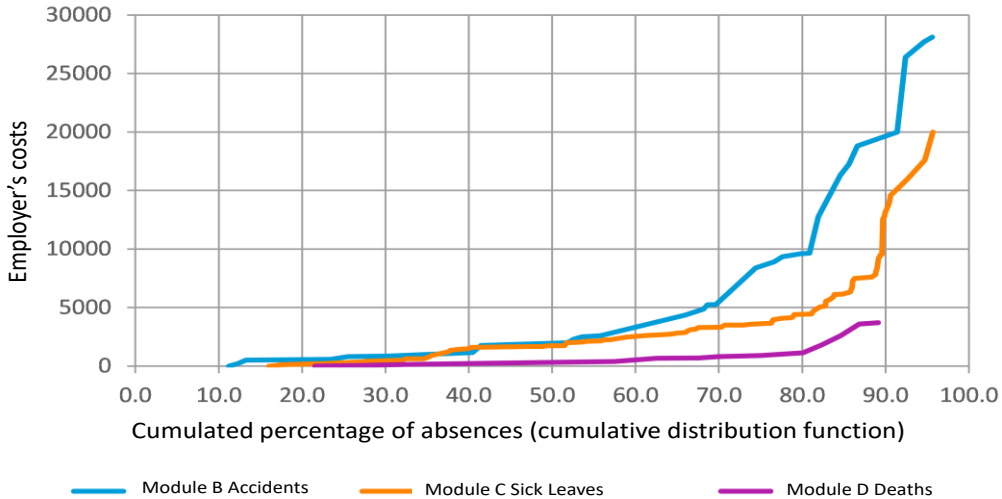

Fig. 1. Distribution of employer's cost against percentage of employee absences

Table 5. The structure of accident victims among enterprises' employees by selected features

Feature	Group	N unweighted	N weighted	% weighted	Mean	Standard deviation	Median
Gender	Female	10	9	2,0	16,416	24,184	6,170
	Male	24	17	3,7	8,675	9,456	4,154
	Total	34	26	5,8	11,421	16,218	5,673
Age	25-39	19	19	4,.2	12,169	18,722	5,348
	40-59	14	7	1,6	9,606	7,050	11,615
	60+	1		,0	2,138	,0	2,138
	Total	34	26	5,8	11,421	16,218	5,673
Education	Elementary or high-school	24	19	4,2	7,566	8,713	3,488
	Higher education	10	7	1,6	21,691	26,212	9,774
	Total	34	26	5,8	11,421	16,218	5,673
Company size	Small	8	17	79,2	10,998	18,446	3,488
	Medium and Large	26	9	20,8	12,266	11,493	9,713
	Total	34	26	100,0	11,421	16,218	5,673

The analysis of the structure of accident victims reveals that the most frequent victims of road accidents employed in the studied enterprises were males aged 25 to 39, elementary or high-school graduates, typically employed with medium-sized and large enterprises.

Moreover, the research results allowed the author to estimate the expected value of the losses due to road accidents by employee age and organization size (Table 6). The author states that the average volume of losses in the organization, considering the size, is similar. However, the losses detected in large enterprises are, understandably, higher than those in smaller enterprises. The heaviest average losses in enterprises are reported regarding the loss of employees aged 25-39. These are followed by losses from 40-59-year-old employee indisposition, while the 60+ group generates the most minor losses.

5. Conclusions

Contemporary societies face numerous unprecedented risks, among which road accidents remain one of the most pervasive threats. Globally, nearly 1.25 million people die annually as a result of road accidents, which is double the number of deaths caused by wars, crimes, and terrorism combined. Against this background, the lack of adequate systems to mitigate road accident risks or provide effective healthcare underscores the importance of addressing road safety as a critical societal issue, comparable to that of armed conflict.

The conducted research demonstrates that improving road safety is not only a public health concern but also an essential element of corporate management. Road accidents generate significant expenses for organisations, which could otherwise be allocated to business development and employee training. This supports findings from global literature, such as Huang et al. (Huang et al., 2016) who emphasise the economic and operational benefits of creating safer work environments to reduce employee turnover and improve satisfaction.

Moreover, minimising the risk of road accidents represents an opportunity to address economic losses caused by employee turnover. Studies, including those by Belzer (Belzer and Kirby, 2012), highlight the link between safety practices and reduced absenteeism in high-risk industries like transport. Even in non-transport sectors, indirect risks stemming from employee commuting or job-related travel warrant strategic action to mitigate costs.

The findings of this study, estimating enterprise-related costs of PLN 1.1 million (2013) and PLN 1.6 million (2014-2019) in Polish regions, align with international evidence demonstrating the financial toll of road accidents. Research by Bertera (Bertera, 1990) underscores the potential of workplace health and safety initiatives to reduce absenteeism and turnover costs across industries. The current study identifies a significant disparity in economic losses depending on employee age groups, with the highest losses incurred from accidents involving employees aged 25–39.

This aligns with career development theories (De Cenzo and Robbins, 1994; Marstone, 2008), which indicate that employees at the peak of their professional development represent the greatest value to organisations. Conversely, losses among older employees are less pronounced, likely due to career stagnation or diminished productivity associated with this demographic group.

Another crucial direction highlighted by this study is the role of CSR in promoting road safety. Literature, including Voordt and Jensen (Voordt and Jensen, 2023) demonstrates that integrating road safety initiatives within CSR strategies enhances not only employee well-being but also corporate reputation and economic sustainability. Businesses, especially those in non-transport sectors with limited tools to ensure road safety, have a unique opportunity to lead community-oriented safety initiatives while safeguarding their workforce.

Table 6. Expected value of average losses of enterprises in respect of accidents by age and organization size

Age	Small Companies [PLN thous]	Large Companies [PLN thous]	On average [PLN thous]
25-39	11,718	13,069	12,169
40-59	9,250	10,317	9,606
60+	2,058	2,296	2,138
On average	10,998	12,266	11,421

Building on these findings, future research should focus on enhancing health policies to support faster recovery for accident victims, enabling quicker reintegration into the workforce; examining insurance adoption, exploring how employees perceive the risks of road accidents and the extent to which organisations can facilitate access to life and health insurance and strengthening CSR approaches to address road safety more comprehensively, leveraging cross-sector collaboration to reduce accident risks.

These recommendations align with global priorities to address road safety as a critical element of organisational resilience. Further exploration in these areas will not only improve economic outcomes for businesses but also contribute to broader societal well-being.

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